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ASSESSING THE ORIGIN OF SILT IN MEDITERRANEAN, GRANITOID-HOSTED SOILS

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SCHOOL OF GEOSCIENCES

BY THE COMMITTEE CONSISTING OF

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Abstract

The modes of production of silt in sufficient volumes to form loess deposits remains debated. In periglacial regions, glacial grinding typically prevails and is a non-controversial means to produce abundant silt. Nonglacial mechanisms proposed include eolian saltation, fluvial comminution, salt weathering, and derivation from silt-rich protoliths. Additionally, chemical weathering in soil profiles of tropical and mediterranean climates—a hypothesis first proposed in the 1980s—has garnered significant attention as a potentially effective means for silt production but has not been rigorously tested. Here we investigate weathering in Mediterranean, granitoid-hosted soils in northeastern Spain and southern France to test the efficacy of weathering for silt generation from coarse-grained hosts. Textural and geochemical data indicate that, despite significant evidence for chemical weathering, these profiles are dominated by sand and gravel, with only minimal (average across all profiles ~7.9%, average of individual profiles range 5-10%) mud (clay + silt). Provenance data indicate the influence of allochthonous additions of dust to several profiles, especially those in Spain and coastal France, with data from dust traps confirming contributions from sources in north Africa, as well as other potential sources in southern Europe. Although mud modes (17-52 μ m) from the profiles encompass common loess modes, the amount of mud produced in these weathering profiles is insufficient to create significant loess deposits, challenging the oft-cited hypothesis of the efficacy of chemical weathering for silt production.

Acknowledgements

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Assessing the Origin of Silt in Mediterranean, Granitoid-Hosted Soils

Introduction

When dust, or eolian silt accumulates on land in sufficient volume it can form loess deposits. But the starting point is generation of the silt. In the case of the loess deposits of the midwestern U.S. and Europe, the silt emanated predominantly from glacial grinding beneath Pleistocene ice sheets, a well-known mechanism for silt production (e.g. Smalley, 1966; Pye, 1995; Assallay, 1998). But loess also occurs in warm-desert regions, such as the Negev loess of Israel. Crouvi et al. (2008) suggested silt generation by eolian saltation for the Negev loess, although others have disputed the efficacy of eolian saltation in general for silt generation (Swet et al., 2019; Adams and Soreghan, 2020). Other mechanisms proposed for producing silt non-glacially include fluvial comminution (e.g., Wright and Smith, 1993), frost- and salt weathering (e.g., Pye and Sperling, 1983; Wright, 2001), and derivation from silt-rich protoliths (e.g. tuff, siltstone, phyllite). In a widely cited paper (>700 citations), Nahon and Trompette (1982) suggested that weathering profiles in tropical and mediterranean climates generate abundant silt sufficient for sourcing loess deposits. More recently, however, Bonar et al. (2023) disputed this; they found that eolian inputs of allochthonous dust are important contributors to the fines in the granitoid-hosted soils of both their hot-humid (Puerto Rico) and hot-arid (Southern California) study sites.

Southern Europe, especially areas proximal to the Mediterranean Sea, are affected by Mediterranean winds, also known as sirocco winds, that originate over the Sahara Desert and ferry material across the Mediterranean Sea into Europe (Orlić et al., 1994; Belhadj-Khedher et al., 2020). These sirocco winds carry dust from the Sahara Desert that can mix with moist air over the Mediterranean Sea and cause red rains, also known as “blood rains,” as well as red snow

in the Alps (Özsoy and Ornektekin, 2009, Raviglione and Barberis, 2018). Some of the earliest documentations of such events occurred when the Greek poet Homer attributed bloody rains to Zeus in “The Illiad” (Tatlock, 1914), and when the Roman historian Livy documented blood rains (White et al., 2013). In more recent history hundreds of red rains have occurred in countries such as Italy, France, and Spain (Avila et al., 1997; White et al., 2013). Additionally, both satellite observations and modeling show dust from northern Africa traveling north across the Mediterranean Sea and west across the Atlantic Ocean and accumulating in various locations along the way (Kandler et al., 2007; Coz et. al, 2009; Escudero et al., 2011; De La Campa et al., 2013; Wang et al., 2023). Several studies (Prospero et al., 1970; Glaccum and Prospero, 1980; Muhs and Budahn, 2009; Muhs et al., 2007, 2010, 2021; Bonar et al., 2023) have documented additions of allochthonous dust from north Africa to parts of Europe and the Atlantic, and as far west as Puerto Rico, Barbados, and Bermuda. In particular, the well-known terra rossa soils atop limestone in many parts of the greater Mediterranean are linked to allochthonous dust influx (Durn, 2003; Yaalon, 2009; Muhs et al., 2010).

The proximity of southern Europe to large dust sources in northern Africa implies that the addition of allochthonous dust might form a significant contribution to granitoid soils in the Mediterranean region. In this study we revisit Nahon and Trompette’s (1982) hypothesis that weathering in mediterranean soils is an important mechanism for the production of silt for loess deposits by assessing the relative contributions of autochthonous generation (chemical weathering) versus allochthonous additions (eolian dust) of fines in granitoid-hosted soils in areas of southern France and northeastern Spain. The goal of this study is to assess the origin of the silt fractions within these soils and to test the significance of autochthonous vs. allochthonous

contributions of silt. By scrutinizing the efficacy of potential mechanisms by which silt forms, this study contributes to the greater body of work on assessing the origin and significance of loess deposits.

Geologic and Climatic Settings

To test the significance of autochthonous vs. allochthonous contributions of silt to soils in the western Mediterranean, we identified six sites hosted atop granitoid bedrock. We selected granitoid lithologies because the crystal sizes are generally at least one to several orders of magnitude larger than silt (Blatt, 1967; Hoskin and Sundeen, 1975, 1985), thus eliminating the possibility of pre-existing silt-sized material in the host rock. Early studies on weathering of granitoid bedrock pointed to crystal sizes as a control on size modes of weathered material (Blatt, 1967), with further investigation leading to assertions that crystal textures in addition to crystal sizes are controls on the weathering of material into specific finer grain sizes such as silt (Harrell and Blatt, 1978). Three sites are in northeast Spain (Spain group), and three lie in southern and southeastern France (France group). Table 1 lists bedrock lithology along with location, elevation, and climate data for each site. Sample site names reflect nearby villages, but for simplification, we refer to sites hereafter using the reference names shown in Table 1 and Figure 1, specifically, Coastal Spain, Inland Spain, and the Pyrenees for the Spain Group, and Coastal France, Inland France 1 and Inland France 2 for the France Group.

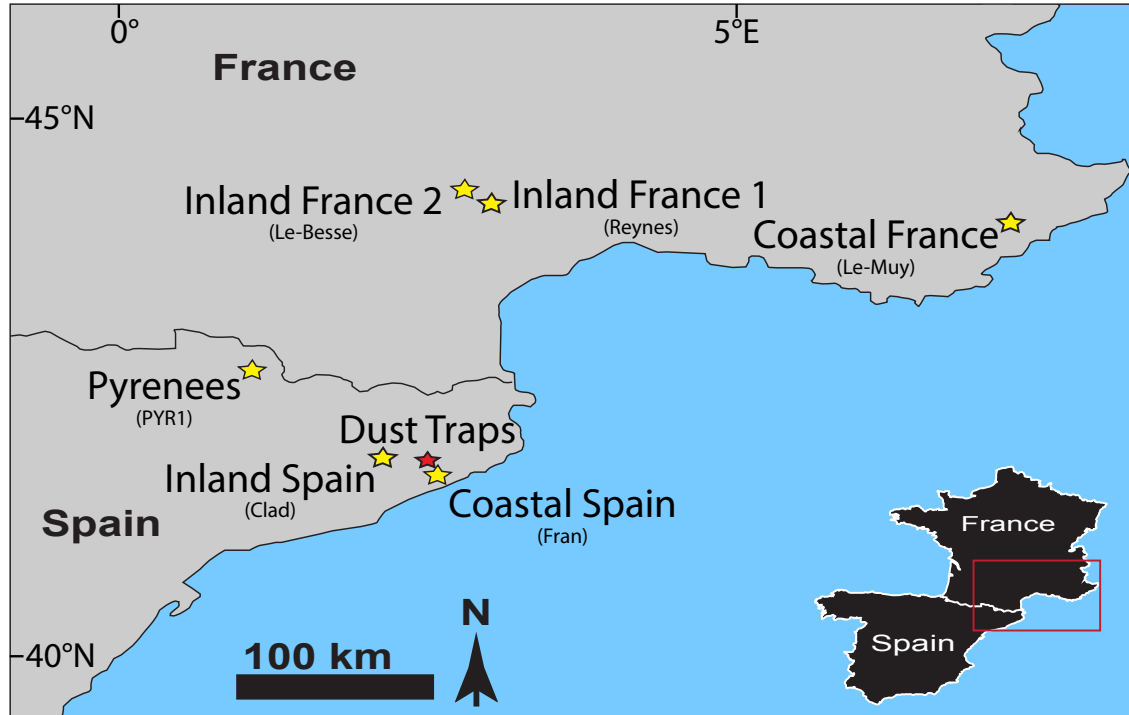


Figure 1: Map of field area with sample localities. Weathering profiles indicated with yellow stars, dust traps indicated with a red star. Reference names shown in larger font; original sample names shown in parentheses.

Table 1

Metadata for each sample site, including location, elevation, bedrock lithology, Köppen climate classification, mean annual precipitation, and mean annual temperature.

Group	Spain Group			France Group		
Sample Name	FRAN	CLAD	PYR1	REYNES	LE-BESSE	LE-MUY
Reference Name	Coastal Spain	Inland Spain	Pyrenees	Inland France 1	Inland France 2	Coastal France
Location	(41.659537, 2.502939)	(41.857255, 2.56385)	(42.613412, 0.765752)	(44.066904, 2.731944)	(44.078236, 2.711090)	(43.450003, 6.578099)
Elevation	277m	445m	1550m	770m	767m	560m
Bedrock Composition	Granite	Quartz Monzonite	Granodiorite	Granite	Granite	Granite
Köppen Climate Classification	Csa	Cfb	Dfb	Cfb	Cfb	Csa
Mean Annual Precipitation (mm)	650-750mm	700-800mm	1100-1200mm	1400-1500mm	1400-1500mm	800-900mm
Mean Annual Temperature (°C)	16-17°C	15-16°C	5-6°C	12-13°C	12-13°C	15-16°C

All bedrock units were emplaced during the Paleozoic, mostly during the significant magmatic activity associated with various stages of the collisional Variscan or Hercynian orogeny (Poulet et al., 2017). Today these bedrock units are exposed in various massifs across the study region. Carboniferous to Permian age granitoids (granite, granodiorite, and quartz monzonite)

underlie the sample sites in northeast Spain. Carboniferous granite underlies the coastal France site, and the Cambrian Pinet Orthogneiss underlies both sites in southern France. The Pinet Orthogneiss (Pinet Massif) formed during the collision of Gondwana and Laurussia during the early Hercynian Orogeny (Pin, 1981) and is part of the greater French Massif Central. The French Massif Central comprises granitic and metamorphosed basement uplifted into a massive plateau around 20-30 million years ago (Faure et al., 2009).

The climate across the study region is generally temperate with warm to hot summers and varying levels of aridity (Table 1). The six sites fall into three Köppen climate designations. The Cfb designation characterizes the Inland Spain site and the two Inland France sites and refers to a Temperate Oceanic Climate characterized by mild winters, warm summers and no distinct dry season. The Csa designation characterizes the Coastal Spain and Coastal France sites and refers to a Hot-summer Mediterranean Climate with mild winters, hot, dry summers and a dry summer season. The Dfb designation characterizes the Pyrenees Mountains site and refers to a Warm-summer Humid Continental Climate, characterized by cold, snowy winters, warm summers, and no dry season. All sites excepting the Pyrenees site are upland settings (200-1000 m elevation), with the coastal sites characterized by higher temperatures and lower rainfall relative to the inland sites. The Pyrenees site, at 1550 m elevation, is mountainous with mild summers and snowy winters.

Winds affecting the study areas emanate from both mainland Europe and north Africa. Two predominant wind patterns, the mistral and tramontane, originate in mainland Europe and are north-northwesterly, blowing between the Pyrenees and the Massif Central (tramontane), or

between the Massif Central and the Alps (mistral), through the Rhône River Basin, toward the Gulf of Lion (Obermann et al., 2018). Southerly (sirocco) and southeasterly (Marin) winds also affect the Mediterranean region, with the sirocco winds delivering hot, dry air and dust from the Sahara Desert and affecting all of southern Europe (Orlić et al., 1994), and the Marin winds bringing warm moist air and rain to the French and Spanish coasts (Fig. 2).

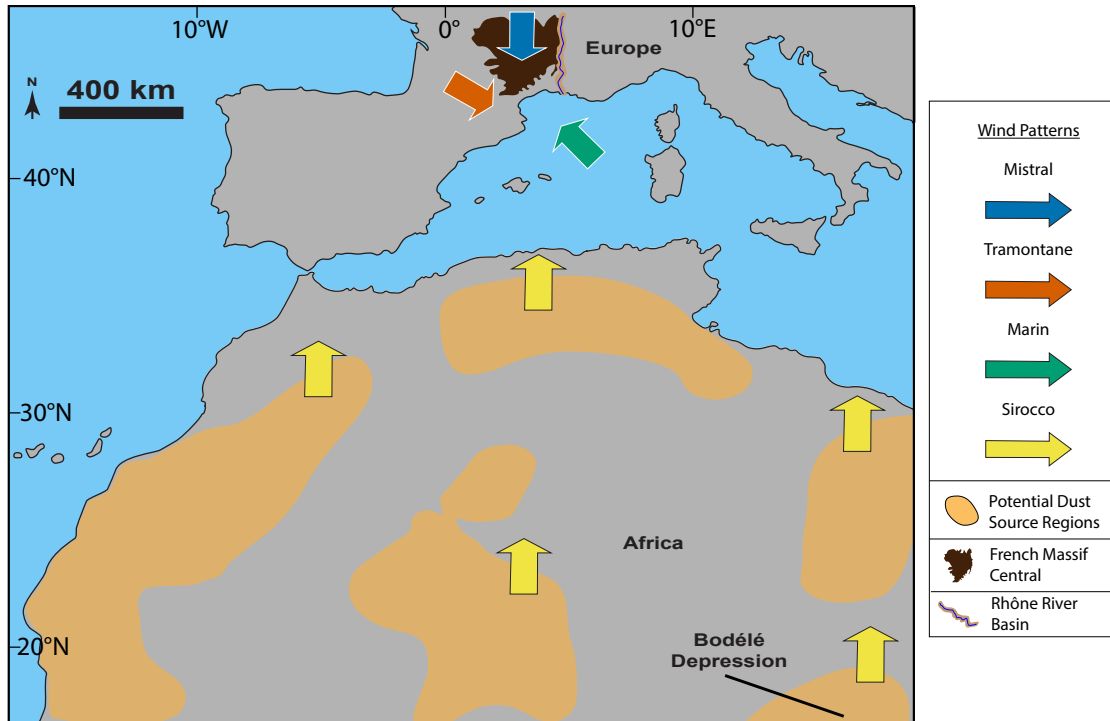


Figure 2: Map of the western Mediterranean and north African region showing major wind patterns and dust source regions. Mistral winds are displayed with an orange arrow coming from the north through south-central France. Tramontane winds are indicated by a red arrow from the northwest across the Pyrenees Mountains. Yellow arrows emanating from multiple locations across north Africa represent the Sirocco winds. Marin winds are displayed with a green arrow directed across the Mediterranean Sea from the southeast. Potential dust source regions in Africa (yellow shapes) are modeled from Muhs et al. 2021.

Methods

At each site, a one-meter vertical profile was excavated on road cuts to a depth of at least 1 m to expose fresh material. Sediment samples were collected from the surface down at 10 cm intervals to at least one meter depth where possible; additionally, a fresh and weathered bedrock

sample was collected. We sampled the freshest bedrock available at five of the six sites; we used the bedrock at the Inland France 1 site to represent both that site and the Inland France 2 site given that the same bedrock (Pinet Orthogneiss) underlies both (Appendix Fig. 3), and a fresh sample was unavailable at the second site. Point-count analysis ($n = 400$ points) of bedrock thin sections was used to confirm modal mineralogy and lithology. Sample sites were selected to avoid anthropogenically altered areas such as cultivation and infrastructure and can be described as “modern” profiles that likely record time-averaged climate conditions prevailing through the late Pleistocene to recent.

In addition to the sampled vertical profiles, two dust traps were deployed. The dust traps were placed in closest proximity to the coastal Spain site near the village of Montseny (Fig.1). Using locally available materials, we emulated the classic USGS design (Reheis & Kihl, 1995) suitable for relatively arid regions. Each dust trap consisted of a 25-cm diameter pan covered with a suspended UV-resistant plastic mesh holding glass marbles (Fig. 3). The glass marbles replicate a gravel surface, help eliminate leaves and extraneous matter and help



Figure 3: Dust Trap Design

prevent damage to the traps by animals. The dust traps were then secured to a fixed object with zip ties. Table 2 lists the locations and descriptions of the dust traps. After 10 months of field collection, the trapped sediment was washed into clean Nalgene bottles using distilled water.

Table 2

Metadata for each dust trap site, including location, elevation, and location description

Sample Name	Dust Trap #1	Dust Trap #1
Location	(41.779527, 2.431423) Coastal Spain	(41.770427, 2.408971) Coastal Spain
Elevation	1650m	813m
Location Description	~5m above ground level.	~2.4m above ground level.

Table 2: Dust Trap metadata.

In the lab, sediment samples were subsampled using the cone-and-quarter method to ensure a representative fraction for further processing. Samples were wet sieved with distilled water to separate the gravel (>2 mm), sand ($62.5\mu\text{m}$ - 2mm), and mud (silt+clay, i.e., <62.5 μm , using the Udden-Wentworth scale) fractions, then dried and weighed to assess mass. The mud fractions were then treated with acetic acid for 24 hours to remove carbonate, rinsed with distilled water and centrifuged (three times), then treated with hydrogen peroxide for 24-48 hours to remove organic material, followed by rinsing with distilled water and centrifuging (three times). Finally, the samples were freeze dried and weighed.

The mud fractions were then analyzed both granulometrically and geochemically. For granulometric analysis, a representative aliquot of the mud was suspended in distilled water, a few drops of sodium hexametaphosphate dispersant added, and the vial sonicated for one minute prior to analysis using a Malvern Mastersizer 3000 laser particle-size analyzer (LPSA).

Geochemical analysis was conducted by ALS Global including whole rock analysis using ICP-AES and trace element and rare earth element analysis using ICP-MS on the mud fractions from the vertical profiles and dust traps as well as the fresh and weathered bedrock from each site.

RESULTS

Granulometric Data

The mud ($<62.5 \mu\text{m}$) fraction of the dust trap sediment yielded modes of $34 \mu\text{m}$ and $29.5 \mu\text{m}$ (Fig. 4), which falls in the medium to coarse silt range using the Udden-Wentworth scale (Wentworth, 1922). Sediment samples from all three Spain profiles are sand dominated with moderate to minor gravel and minor mud. Within this group, samples from the Coastal Spain profile have the highest amounts of sand (59%-86%), with moderate (14%-36%) gravel and minor (2%-8%) mud (Fig. 6), with sand abundance peaking at ~ 30 -60 cm depth and gravel abundance peaking low in the profile (70 cm-100 cm depth). Mud modes range between 23-44 μm , with no consistent trend with depth, but the finest mode at 30 cm and coarsest modes deeper (50-60 cm). The Pyrenees profile is similarly sand dominated (61-81%) with subordinate gravel (8-28%) and minor mud (6-13%). Mud and gravel fractions in the Pyrenees profile generally increase with depth. Modes of the mud fractions range between 22-33 μm and remain relatively uniform from 20-80 cm, with the coarsest mode at 80 cm and the finest mode at 10 cm (Fig. 6).

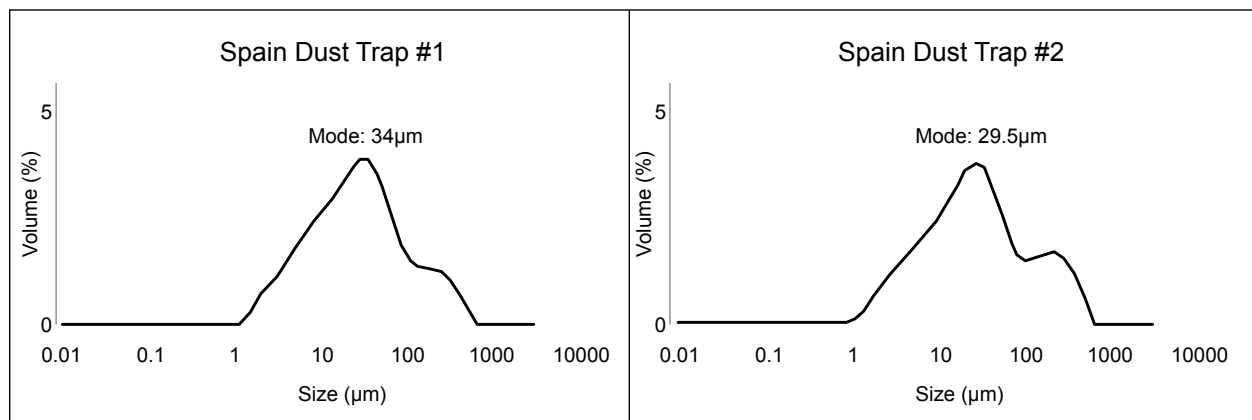


Figure 4: Dust trap granulometric data.

The Inland Spain profile is also sand dominated (68-78%) with subordinate gravel (13-22%) and relatively minor mud (4-15%). Mud content in the Inland Spain profile generally increases with

depth. Grain size modes of the mud in this profile range between 19-36 μm , with the coarsest mode at 60 cm and the finest mode at 10 cm and no consistent trend with depth (Fig. 7).

In general, sediment samples from all three France profiles, Inland France 1, Inland France 2, and Coastal France, exhibit larger amounts of gravel compared to the Spain Group profiles. The Inland France 2 profile exhibits the largest gravel fraction (31-68%) of the France Group, with moderate fractions of sand (26-63%) and minor mud (4-12%). The Inland France 2 profile exhibits the highest sand content in the upper 30 cm of the profile and no consistent trend of mud content with depth. Grain size modes of the mud fractions in the Inland France 2 range between 32-52 μm and show no vertical trend, with the coarsest modes between 50-70 cm and the finest mud at 40 cm (Fig. 8). The Inland France 1 profile contains mostly gravel (26-67%) and sand (28-61%) with minor mud (5-13%). The Inland France 1 profile has relatively consistent sand to gravel ratios from 30-80 cm, with the highest sand content in the upper 30 cm of the profile and the highest gravel content at 100 cm. Grain size modes of the mud fractions in the Inland France 1 profile range between 25-48 μm , and fine up profile relatively consistently in the upper 70 cm of the profile (Fig. 9). The Coastal France profile is the least gravel rich (15-38%) of the France Group, composing mostly sand (56-75%) with minor mud (5-11%). Sand and mud content peak in the upper 10 cm of the profile. Grain size modes of the mud fractions in the Coastal France profile show no vertical trends and range between 17- 35 μm , with the coarsest mode at 70 cm and the finest mode at 80 cm (Fig. 10).

In summary, the Spain profiles are dominated by sand, while the profiles in the France Group are more gravel rich. Both groups have similarly minor amounts of mud (averaging 5-10%), and

particle size modes of the mud fractions fall predominantly between $\sim 20\text{--}40\ \mu\text{m}$, with slightly coarser values in the France Group compared to the Spain Group.

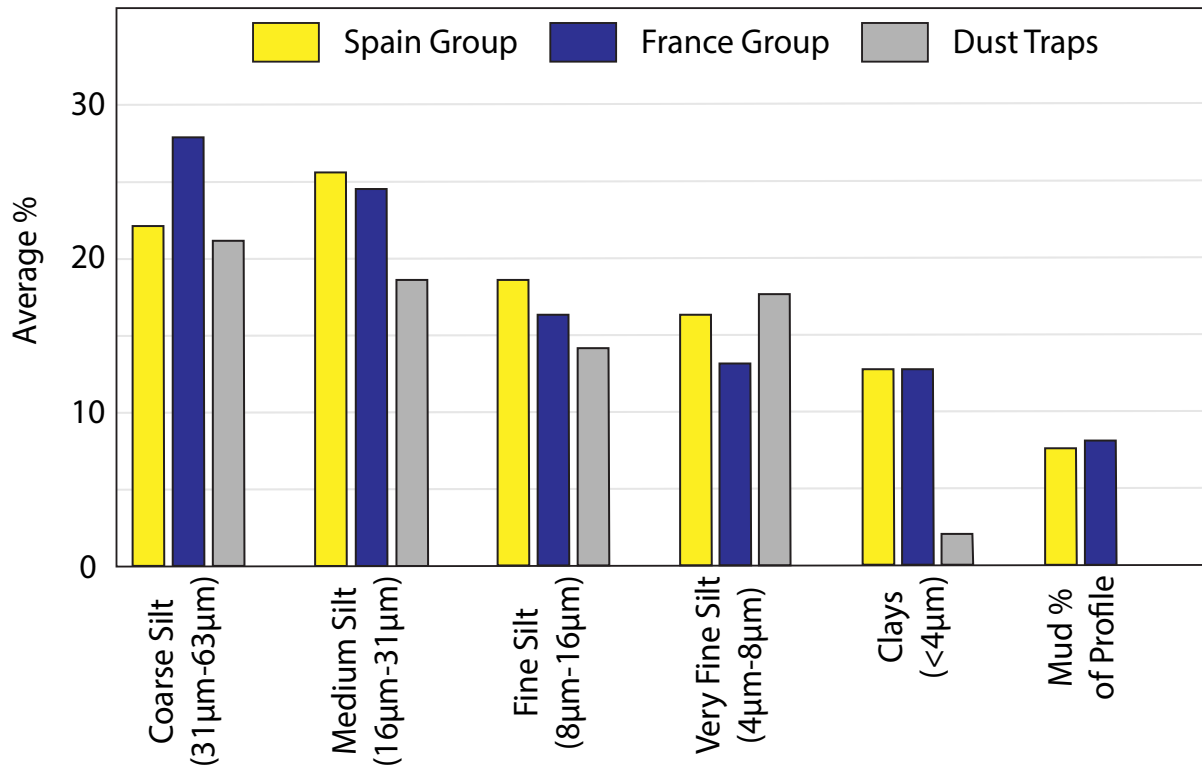


Figure 5: Distributions of particle size fractions within the mud from the Spain group, France Group, and Dust Traps, using the Udden-Wentworth (Wentworth (1922) designations of coarse silt, medium silt, fine silt, very fine silt, clay, and total mud.

To further analyze the granulometry of the mud fractions, Figure 5 shows each sample group and the dust traps subdivided into constituent categories of coarse silt, medium silt, fine silt, very fine silt, and clay, using the Udden-Wentworth grain size scale (Wentworth, 1922). Both the Spain and France Groups show a similar array of grain sizes in the mud fraction, with both groups consisting mostly of medium- and coarse silt sizes. Clays compose the smallest fraction of the mud, followed by very fine silt. The average mud percent ($\sim 8\%$) is nearly the same in both groups. Silt predominates in the mud fraction of the dust traps as well, with all silt sizes (coarse to very fine) ranging between ~ 15 and 20% .

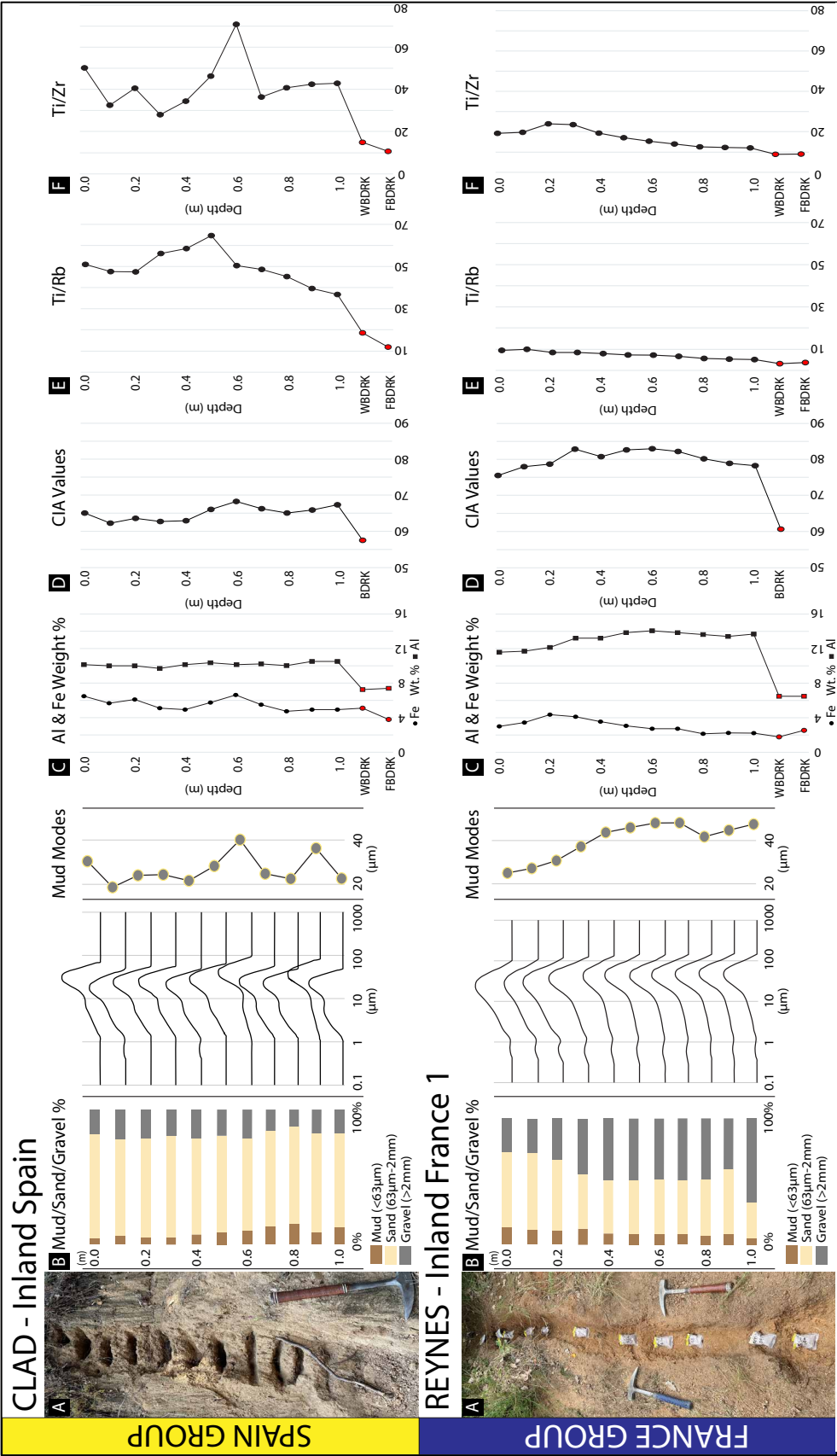


Figure 6.1 (Top): From the Spain Group, the Inland Spain (Inland Spain) sample set. A) Photo of weathering profile. B) Granulometric data breakdown including Mud, Sand, Gravel %, histograms of mud grain size, and mud modes. C) Al & Fe weight % by depth. D) CIA values by depth. E) Ti/Rb ratio by depth. F) Ti/Zr ratio by depth.

Figure 6.2 (Bottom): From the France Group, the Inland France #1 (Inland France #1) sample set. A) Photo of weathering profile. B) Granulometric data breakdown including Mud, Sand, Gravel %, histograms of mud grain size, and mud modes. C) Al & Fe weight % by depth. D) CIA values by depth. E) Ti/Rb ratio by depth. F) Ti/Zr ratio by depth.

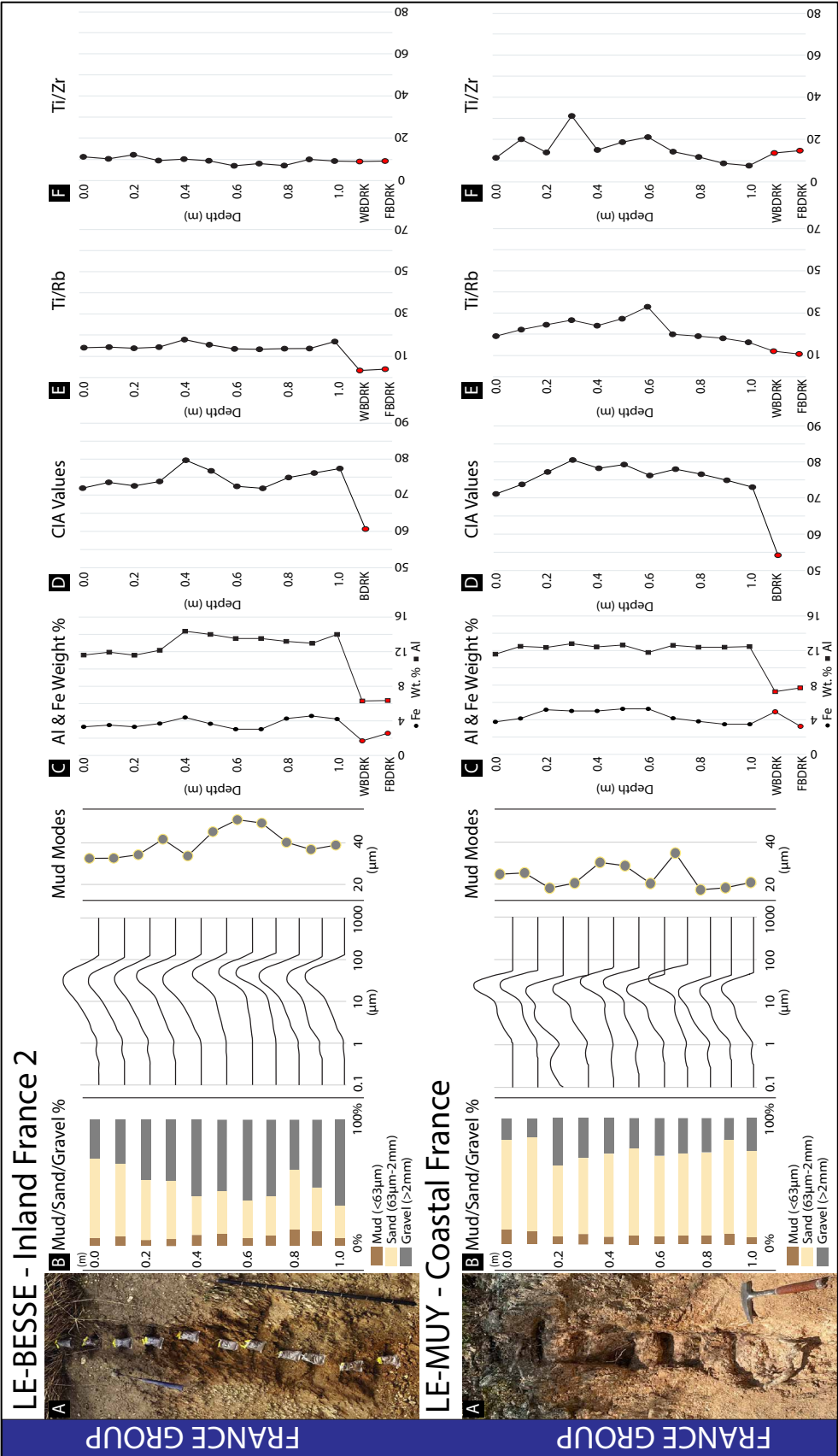


Figure 7.1 (Top): From the France Group, the Inland France #2 (Inland France #2) sample set. A) Photo of weathering profile. B) Granulometric data breakdown including Mud, Sand, Gravel %, histograms of mud grain size, and mud modes. C) Al & Fe weight % by depth. D) CIA values by depth. E) Ti/Rb ratio by depth. F) Ti/Zr ratio by depth.

Figure 7.2 (Bottom): From the France Group, the Coastal France (Coastal France) sample set. A) Photo of weathering profile. B) Granulometric data breakdown including Mud, Sand, Gravel %, histograms of mud grain size, and mud modes. C) Al & Fe weight % by depth. D) CIA values by depth. E) Ti/Rb ratio by depth. F) Ti/Zr ratio by depth.

Geochemical Data: Weathering

Major Element Profiles (Al, Fe):

Across all six profiles, Al concentrations in the mud fractions are substantially higher compared to the associated parent bedrock, indicating Al enrichment during weathering across all localities (Fig. 5C, Fig. 6C, Fig. 7C). General trends in the mud fractions between the Spain Group and the France Group include a higher abundance of Al (12-14 wt. %) in the France Group compared to the Spain Group. The Al content in the France Group profiles is relatively uniform with only minor variations with depth, such as a slight increase (~1-2%) in Al content down the Inland France 1 profile and a shift in Al content (~2%) at 40 cm depth in the Inland France 2 profile. In the Spain Group, Al content ranges from 8-12 % and is relatively uniform throughout the Inland Spain profile. Both the Coastal Spain and Pyrenees profiles exhibit increasing Al content down the upper half of the profile.

Compared to the associated parent bedrock, Fe content in the mud fractions of all the profiles have generally similar values to the bedrock (Fig. 5C, Fig. 6C, Fig. 7C). The Fe content in the Spain Group is generally higher (3-7 %) than Fe content in the France Group (2-5 %) and exhibits increasing trends of Fe down the upper half of the profile. In the France Group, Fe content remains relatively uniform throughout the profiles with only minor depth variations such as slight shifts (~1-2%) in Fe content at 40 cm and 80 cm in the Inland France 2 profile, 20 cm and 70 cm in the Coastal France profile, and 20 cm in the Inland France 1 profile.

The combination of higher Al content and lower Fe content in the France Group suggests a greater degree of chemical weathering and clay mineral development here in general compared

to the Spain Group, likely reflecting differences in climate, especially precipitation, between the two groups.

A-CN-K

Major element data from the bedrock and mud fractions from all six profiles illustrate weathering trends and intensities, utilizing the dimensionless CIA (Chemical Index of Alteration) value (Eq. 1), and the A-CN-K diagram (Fig. 8; Nesbitt and Young, 1982; Algeo et al., 2025). Fresh granite or granodiorite bedrock typically exhibits a CIA of ~45-55 (Nesbitt and Young, 1982). Lightly weathered material generally has a CIA value >65, while moderately weathered material generally exhibits CIA values between 65-85. Intense weathering, which usually signifies ultra kaolinite-rich material, generally results in CIA values >85 (Nesbitt and Young, 1982, 1984, 1989).

$$CIA = \left[\frac{Al_2O_3}{Al_2O_3 + CaO^* + Na_2O + K_2O} \right] \times 100$$

Equation 1: CIA equation using molar proportions of Aluminum, Calcium, Sodium, and Potassium oxides to calculate a value that indicates the intensity of weathering. CaO is the CaO content only from the silicate fractions (Nesbitt & Young, 1982).*

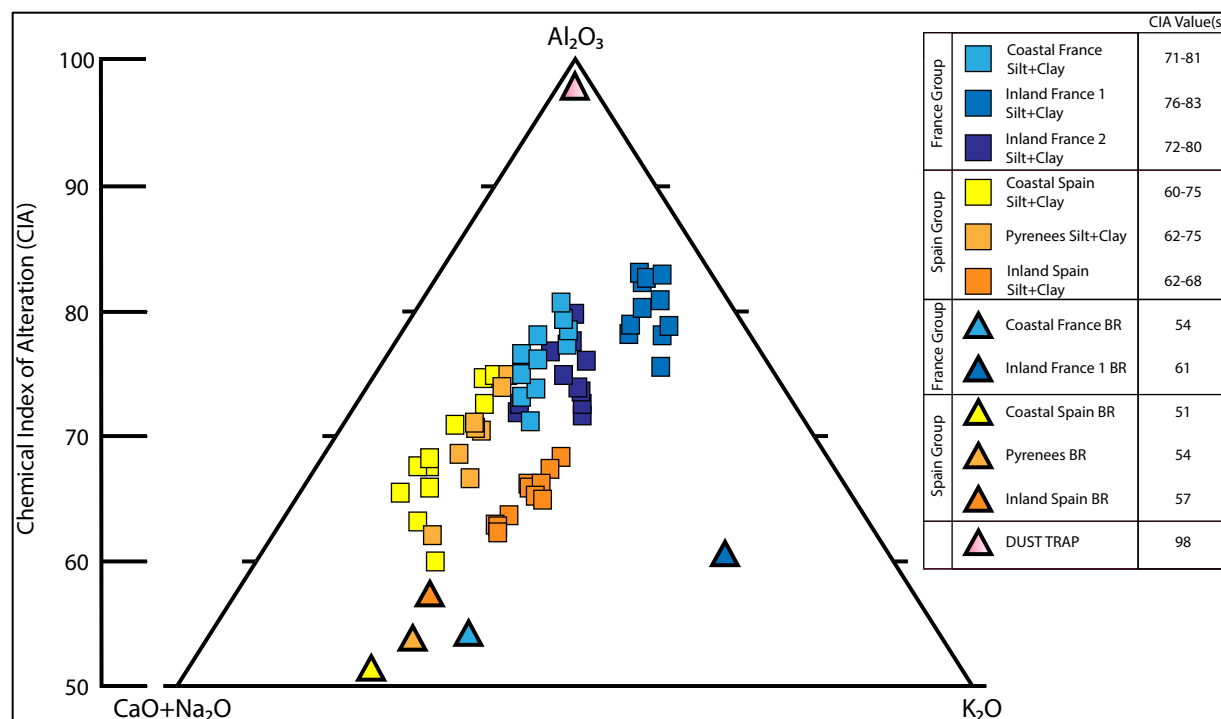


Figure 8: A-CN-K Diagram with dust trap, bedrock and mud samples plotted. CIA ranges for each sample set are also displayed.

All five bedrock samples exhibit CIA values below 61, consistent with minimal weathering.

Bedrock from the Spain Group exhibits CIA values of 51-57, while bedrock from the France

Group records CIA values of 54-61. For the Spain Group, (Coastal Spain, Inland Spain, and

Pyrenees), all mud samples exhibit moderate weathering with CIA values ranging from 60-75.

Both the bedrock and mud from the Coastal Spain site plot nearest the CN apex, likely reflecting

the higher concentration of plagioclase feldspar (35%) relative to alkali feldspar (27%) in the

bedrock here (Appendix Fig. 1). Similarly, the Inland France 1 bedrock plots nearest the K apex,

likely reflecting the higher concentration of alkali feldspar (48%) relative to plagioclase feldspar

(11%) in this bedrock (Appendix Fig. 1). The Inland Spain mud samples are the least intensely

weathered overall compared to the other mud samples in the study. This could reflect the relative

aridity at the Inland Spain site compared to the other sites (Table 1), consistent with the less

pronounced weathering here.

In general, muds from the France Group, (Coastal France, Inland France 1, and Inland France 2), exhibit more weathering than those from the Spain Group, with CIA values for France muds ranging from 71-83 and showing a greater difference in values relative to their associated bedrock (54-61). Both the bedrock and muds of the Inland France 1 profile plot nearer to the K apex than any other sample set, likely reflecting the significant alkali feldspar content (48%) in the bedrock here (Appendix Fig. 1).

Weathering distributions show all the mud fractions trending toward the A apex in A-CN-K space (Fig. 8), demonstrating the loss of soluble cations associated with feldspar leaching. The dust trap mud exhibits a CIA value of 98 which suggests a highly weathered composition; however, the grain size modes of 29.5 μm and 35 μm suggests it is predominantly quartzose silt with some aluminous clay.

CIA values vary with depth throughout each profile (Fig. 5D, Fig. 6D, Fig. 7D). Profiles in the Spain Group exhibit CIA values (60-75) that peak between ~40-60 cm. In the upper 40 cm of the Coastal Spain and Pyrenees profiles, weathering intensity increase down the profile. The Inland Spain profile on the other hand exhibits a narrower range of CIA values (62-68) that peak at 60 cm depth.

Profiles in the France Group exhibit CIA values (71-83) that peak between ~30-40 cm depth, with the exception of the Inland France 1 profile which exhibits dual peaks at 30 and 60 cm. Weathering intensity increases down the profile, from surface to 40 cm depth, much like the Coastal Spain and Pyrenees profiles from the Spain Group.

Geochemical Data: Provenance

Depth Plots

Ti/Zr ratios are commonly used to identify shifts in provenance because both elements are relatively immobile during weathering, meaning a shift in the ratio of Ti/Zr highlights an allochthonous input of material that differs from the geochemistry of the host bedrock. The Spain Group exhibits the highest-amplitude changes in Ti/Zr ratio, most notably in the Inland Spain and parts of the Coastal Spain profiles, signifying shifts in provenance (Fig. 5F and Fig. 6F). The Inland Spain profile exhibits the most erratic behavior, with Ti/Zr ratios $\sim 3\text{-}7\times$ higher in the mud fractions than the associated parent bedrock, with a major spike between 30-60 cm depth. The Coastal Spain profile exhibits a mid-profile spike in the Ti/Zr ratio, $\sim 1.5\times$ higher in the mud fractions than the associated parent bedrock, suggesting fine-grained allochthonous material may be undergoing illuviation down profile, corresponding with a relative increase in mud content at approximately the same depth. The Coastal Spain profile also exhibits a depletion in the Ti/Zr ratio in the mud fractions compared to the bedrock at 90-100 cm depth.

In the France Group, Ti/Zr ratios are more uniform, with the Inland France 2 profile exhibiting little to no change in Ti/Zr ratio between mud fractions and bedrock, and the Inland France 1 profile exhibiting only $\sim 2\times$ higher Ti/Zr ratio in the mud fractions compared to the bedrock peaking at 20-30 cm depth. These relatively invariant trends suggest minimal allochthonous input. The Coastal France profile is the exception, showing high variability throughout the profile, with $\sim 1.5\text{-}2\times$ higher Ti/Zr ratios in the mud fractions compared to bedrock at multiple depths between 10-60 cm, but a lower Ti/Zr ratios in the mud fractions compared to the bedrock between 80-100 cm depth. Overall, the Spain Group profiles show higher and variable Ti/Zr

ratios compared to the France Group, suggesting a greater contribution of allochthonous material in the Spain samples.

Similarly, Ti/Rb ratios are commonly used to identify shifts in provenance because Ti is considered an immobile element associated with more mafic material, while Rb is considered a mobile element associated with more felsic material (Pearce and Cann, 1973; Chappell and White, 1974). Although Rb can become concentrated in finer-grained weathering products (Środoń & Jewula), mud modes exhibit no significant relationship with Rb content (Appendix Fig. 2) for this sample set. All profiles in the study exhibit higher values of Ti/Rb in the mud fractions compared to the bedrock, with the Spain Group exhibiting higher amplitude (~2-6x) changes than the France Group (~2-3x) (Fig. 5E, Fig. 6E, Fig. 7E). Profiles from the Spain Group also exhibit more variation in Ti/Rb ratios than the France Group, which show relatively stable Ti/Rb values, especially throughout the Inland France 1 and Inland France 2 profiles. Most shifts in Ti/Rb track, to some degree, trends in Ti/Zr. However, some shifts in the Ti/Rb ratio also follow other geochemical trends such as shifts in Al or Fe, especially in the Spain Group.

Overall Ti/Zr and Ti/Rb variations point to more significant provenance shifts in the Spain Group compared to the France Group, where ratios are generally more stable with depth. The more pronounced shifts in the Ti/Rb ratio in the mud fractions relative to parent bedrock suggest a potential provenance shift to more mafic sources, more evident in the Spain Group profiles compared to the France Group profiles.

La-Sc-Th:

To further investigate provenance, mud fractions from all profiles and the dust traps were plotted together with their corresponding bedrock on a La-Sc-Th ternary diagram (Fig. 10). These trace

elements have long been used in provenance studies owing to their relatively low mobility (Taylor and McLennan, 1985). In addition to samples from this study, African dust collected in Barbados, originating from the Sahara/Sahel region of Africa from Muhs (2007) is also plotted for comparison, along with samples from the Rhône loess and Rhône alluvium from the Rhône River Basin of France (Bosq et al., 2020) and bedrock collected from the French Massif Central as a part of the Lotout et al. (2016) study. The profiles from the France Group exhibit trends toward the Th apex and/or the Th-Sc join for the Coastal France profile, relative to the associated parent bedrock. This trend likely reflects the influence of weathering as Th constituents remain behind while more mobile elements are removed, resulting in an enrichment of Th relative to soluble material (Liu, 2024; Wu et al., 2024). The samples from the Spain Group (Coastal Spain, Inland Spain, and Pyrenees) are more tightly clustered near the La-Th join than the samples from the France Group (Coastal France, Inland France 1, and Inland France 2).

The mud from the dust traps and two muds from the top of the Pyrenees profile (from the surface, and 10 cm depth), overlap with values of the African dust sourced from the Sahara/Sahel region from Muhs (2007), indicating the possibility of the same provenance. The Coastal France bedrock and one mud sample from the Pyrenees site overlap with bedrock from the French Massif Central (Lotout et al., 2016). The bedrock and one mud sample from the Pyrenees site, the Inland Spain bedrock, and two mud samples from the Inland France 2 profile overlap with the Rhône Alluvium (Bosq et al., 2020). The Inland Spain bedrock, and the bedrock and one mud sample from the Pyrenees sample site overlap with the Rhône loess (Bosq et al., 2020). Hence, some samples exhibit a mix of geochemical signals between African dust and more regional (French Massif Central, Rhône River), yet still allochthonous sources. Overall, the majority of mud samples in the study do not overlap with potential source areas from outside studies but also

plot significantly displaced relative to their bedrock hosts, suggesting allochthonous sources yet to be characterized or—for samples trending toward Th, the effects of weathering resulting in Th enrichment (Liu, 2024; Wu et al., 2024).

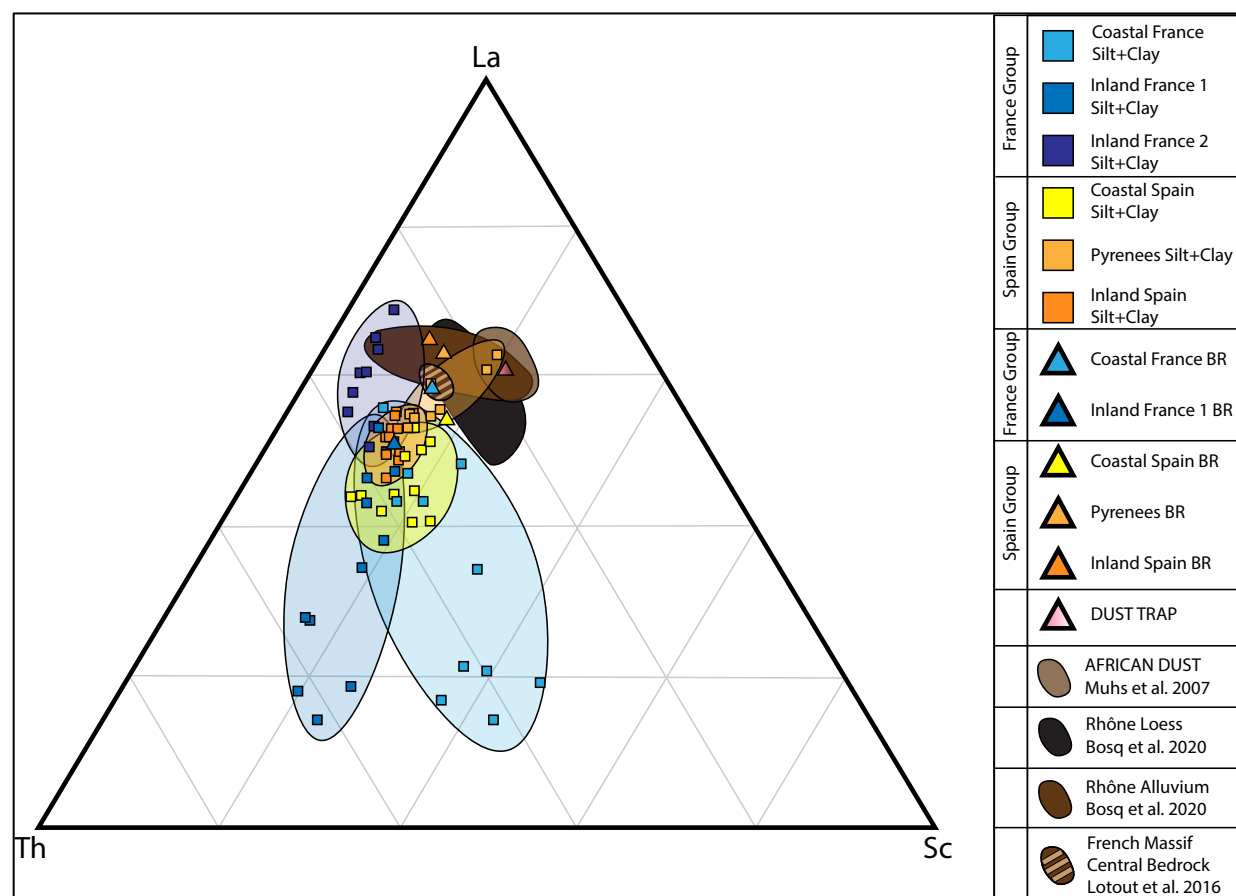


Figure 10: La-Sc-Th ternary diagram with bedrock, mud samples, dust traps, and African dust data from Muhs et al., 2007. Dust traps and mud samples PYRENEES -0.0 and PYRENEES -0.1, overlap with previously published African dust data. Bedrock samples overlap with various sources including the French Massif Central and Rhône Loess and Alluvium.

Geochemical Data: Weathering & Provenance

Cross Plots

To further investigate the weathering and provenance of the mud fractions, bedrock, and dust traps, Figure 11 illustrates cross plots of the Eu anomaly (Eu/Eu^*) with both LREE to HREE ratios ($\text{La}_\text{N}/\text{Yb}_\text{N}$) and HREE depletion ($\text{Gd}_\text{N}/\text{Yb}_\text{N}$) using chondrite normalization. All samples in the study exhibit a negative Eu anomaly ($\text{Eu}/\text{Eu}^* < 1$). The magnitude of the Eu anomaly can be an indicator of weathering intensity, with an Eu anomaly value closer to zero indicating more intense chemical weathering (Yakymchuk et al., 2023) due to the alteration of plagioclase (Condie et al., 1995; Compton et al. 2003; Babechuk et al., 2014; Joo et al., 2016). From the Spain Group, the Coastal Spain muds exhibit the most chemical weathering, with Eu anomalies ranging from 0.25-0.37 compared to bedrock sample values of 0.57 and 0.58 (Fig. 11). Mud fractions from the Inland Spain profile, have Eu anomaly values ranging from 0.38-0.47, that overlap the bedrock values of 0.41 and 0.48 and suggest less weathering intensity here. The Pyrenees profile has mud fractions with Eu anomalies ranging from 0.44-0.64 relative to associated bedrock values of 0.38 and 0.5, indicating slightly more intense weathering than the associated mud fractions.

From the France Group, the Inland France 1 mud samples exhibit the most intense chemical weathering, with Eu anomalies in muds ranging from 0.19-0.33. Similarly, muds from the Inland France 2 profile exhibit Eu anomalies ranging from 0.23-0.37. The associated bedrock with both profiles exhibits Eu anomaly values of 0.27 and 0.3, indicating that both the bedrock and mud fractions from the Inland France 1 and Inland France 2 sites appear to have sustained similar weathering intensities. The Coastal France profile has mud fractions with Eu anomalies ranging

from 0.35-0.56 relative to bedrock values of 0.44 and 0.45, indicating a similar weathering intensity of the bedrock and the associated mud fractions.

The ratio of LREE to HREE ($\text{La}_\text{N}/\text{Yb}_\text{N}$) indicates the fractionation between light and heavy REEs (the slope of a REE plot) and reflects both the chemistry of the bedrock and weathering intensity. Felsic lithologies tend to be enriched in LREEs and thus have higher ratios (White, 2013; Feitosa et al., 2020; Wu and Hseu, 2023). Furthermore, higher ratios typically indicate more intense chemical weathering. The REE spider plots (Fig. 13) illustrate these trends.

Mud fractions from the Spain Group tend to exhibit LREE to HREE ($\text{La}_\text{N}/\text{Yb}_\text{N}$) ratios with values similar to the associated bedrock. Similar ratios of LREE to HREE of mud fractions occur in the Coastal Spain site (5.1-9.1) and Inland Spain (5.4-11.6). Bedrock differences in LREE to HREE ratios between the two sites indicate a more felsic bedrock at the Coastal Spain site (6.0 and 7.0) than at the Inland Spain site (9.4 and 9.8). The LREE to HREE ratios of the Pyrenees mud fractions are slightly higher (8.9-14.0) than the ratios of the rest of the Spain Group mud fractions, but the associated bedrock also has higher LREE to HREE ratios (12.0 and 15.2) indicating a more mafic bedrock than the other bedrock samples in study, which is supported by modal mineralogy (Appendix Fig. 1).

Mud fractions from the France Group tend to show LREE to HREE ($\text{La}_\text{N}/\text{Yb}_\text{N}$) ratios that are much higher than the associated bedrock, especially in the Inland France 1 and Inland France 2 profiles. Mud fractions for the Inland France 1 profile have a slightly lower range (2.6-12.1) than mud fractions from the Inland France 2 profile (4.0-13.1), but the bedrock sample underlying both sample sites has very low LREE to HREE ratios (1.9 and 3.1), indicating much more

intense weathering in the muds relative to bedrock. The exception to this trend in the France Group is the Coastal France profile where bedrock LREE to HREE ratios (10.6 and 11.1) fall on the higher side of the range of LREE to HREE ratios in the mud fractions (1.9-13.0).

Cross plots of the Eu anomaly (Eu/Eu^*) with both LREE to HREE ratios ($\text{La}_\text{N}/\text{Yb}_\text{N}$), commonly display distinct chemical signatures for bedrock and sediments, making them a useful provenance tool. One potential source area was identified using previous data collected by Muhs et al. (2007, 2021), in similar studies that analyzed African dust collected in Barbados, Bermuda, and subsurface mooring stations in the tropical North Atlantic Ocean (Van der Does et al., 2018), as well as samples from the Bodélé Depression in Chad. Dust collected at these locations has been linked to sources in northwestern Africa and the southern Sahara, transported on trade winds via the Saharan Air Layer (Muhs et al. 2007, 2021). Most samples in our Spain and France study sites do not overlap with samples collected by Muhs et al. (2007, 2021), however the dust trap and mud samples from the Pyrenees profile do overlap with these African sources (Fig. 11). The dust trap samples specifically exhibit compositions that match with compositions of African dust collected in Barbados and dust from the Bodélé Depression in Chad.

In the cross plot of Eu/Eu^* vs. $\text{La}_\text{N}/\text{Yb}_\text{N}$, mud samples from the top 20 cm of the Pyrenees profile overlap with samples from Muhs et al. (2021), including African dust collected in Barbados, Bermuda, and in the tropical North Atlantic Ocean, as well the geochemical signatures from the Bodélé Depression. In the cross plot of Eu/Eu^* vs. $\text{Gd}_\text{N}/\text{Yb}_\text{N}$, mud samples from the top 30 cm of the Pyrenees profile also overlap with these distant sources including African dust collected in Barbados and the geochemical signatures from the Bodélé Depression (Muhs et al., 2021; Fig.

11). Additionally, both Coastal Spain bedrock samples share similar geochemical signatures with African dust collected from Barbados.

Comparisons of study site muds with previously published potential sources from the French Massif Central (Steinmann and Stille, 2008; Couzinié et al. 2017; Bosq et al., 2020), Vosges granitic rocks (Altherr et al. 2000), plutonic rocks from the Variscan Orogeny (Faul and Jäger, 1963), and river alluvium from French Massif Central and Rhône River Basin (Salminen et al. 2005) also show some overlaps in composition. Several mud samples from all three Spain Group profiles and Coastal France profile match various bedrock and sediment samples from southern Europe on the cross plot of Eu/Eu^* vs. $\text{La}_\text{N}/\text{Yb}_\text{N}$ (Fig. 12). Mud samples from the Coastal Spain, Pyrenees, and Coastal France profiles overlap with geochemical signatures from the Rhône River alluvium. Compositions of muds from the Pyrenees profile also coincide with river alluvium from the French Massif Central (the Ardèche, Cèze, Doux, Gard, and Eyrieux rivers; Salminen et al. 2005). Bedrock samples from the Inland Spain and Coastal France site as well as mud samples from the Inland Spain and Pyrenees profiles overlap with geochemical signatures from the Vosges granitic rocks. Bedrock samples from Coastal Spain and Inland Spain as well as mud samples from the Coastal Spain, Inland Spain, and Coastal France profiles match geochemical signatures of samples from the French Massif Central. However, the majority of samples from the Inland France 1 site and all samples from the Inland France 2 exhibit no correspondence with geochemical signatures from the northern Africa source areas or the southern Europe source areas.

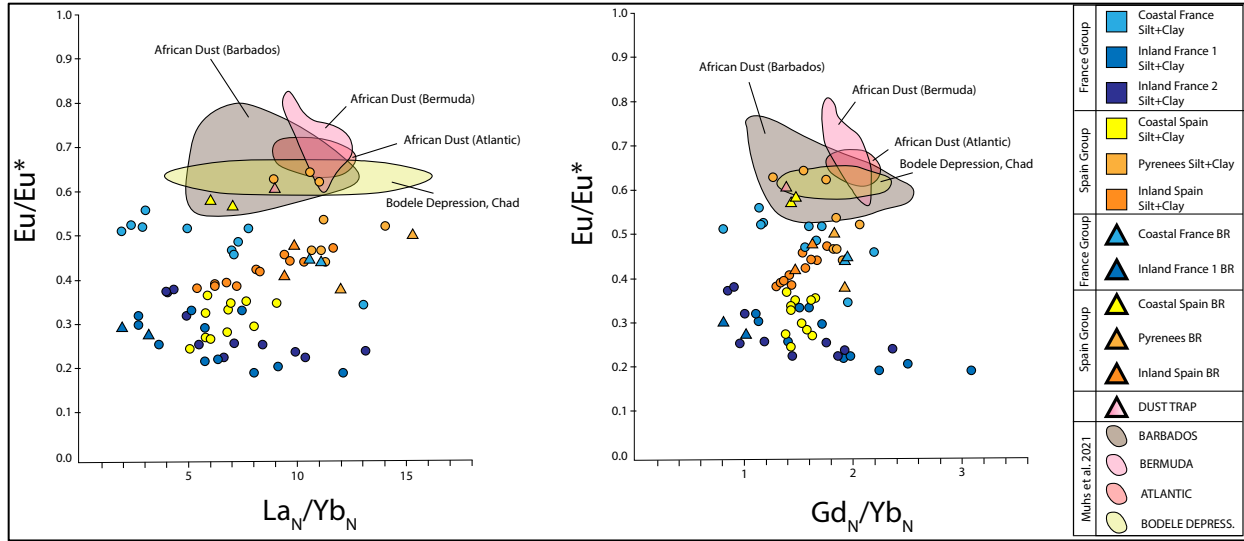


Figure 11: Cross plots of the Eu anomaly (Eu/Eu^*) with both LREE to HREE ratios (La_N/Yb_N) and HREE depletion (Gd_N/Yb_N), with previous data from Muhs et al. 2021 showing overlap of Dust Trap samples and the top of Pyrenees profile with previous published African dust data collected in Barbados, Bermuda, the Atlantic Ocean, as well as samples from the Bodèle Depression in Chad.

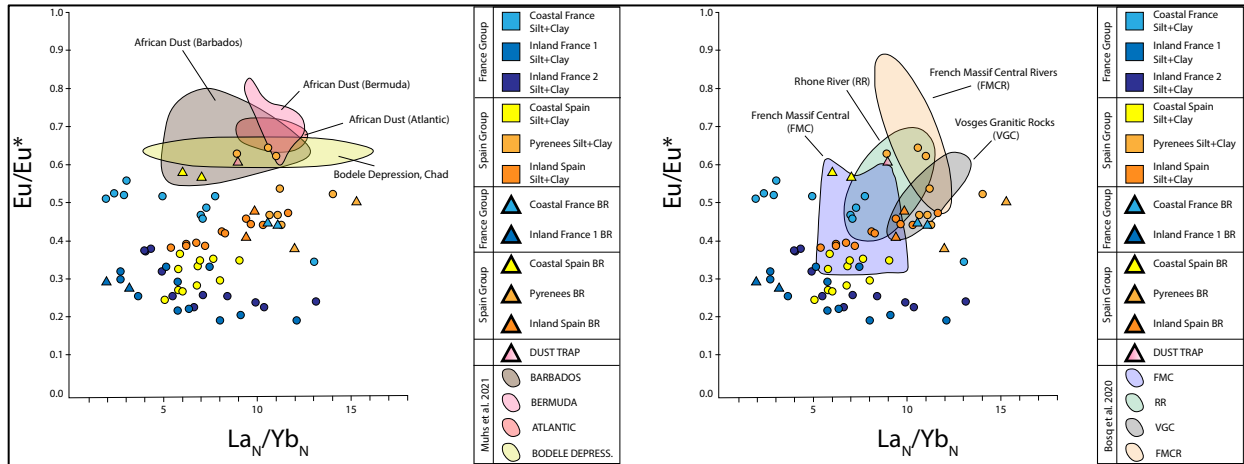


Figure 12: Cross plots of the Eu anomaly (Eu/Eu^*) with both LREE to HREE ratios (La_N/Yb_N). Cross plot of previous data from Muhs et al. 2021 from Figure 11 shown on left. Cross plot of previous data compiled by Bosq et al., 2020, shows overlap of bedrock and sediment sources with geochemical signatures from the bedrock of the French Massif Central and alluvial deposits from rivers in the French Massif Central, alluvial deposits from the Rhône River, and the Vosges granitic rocks.

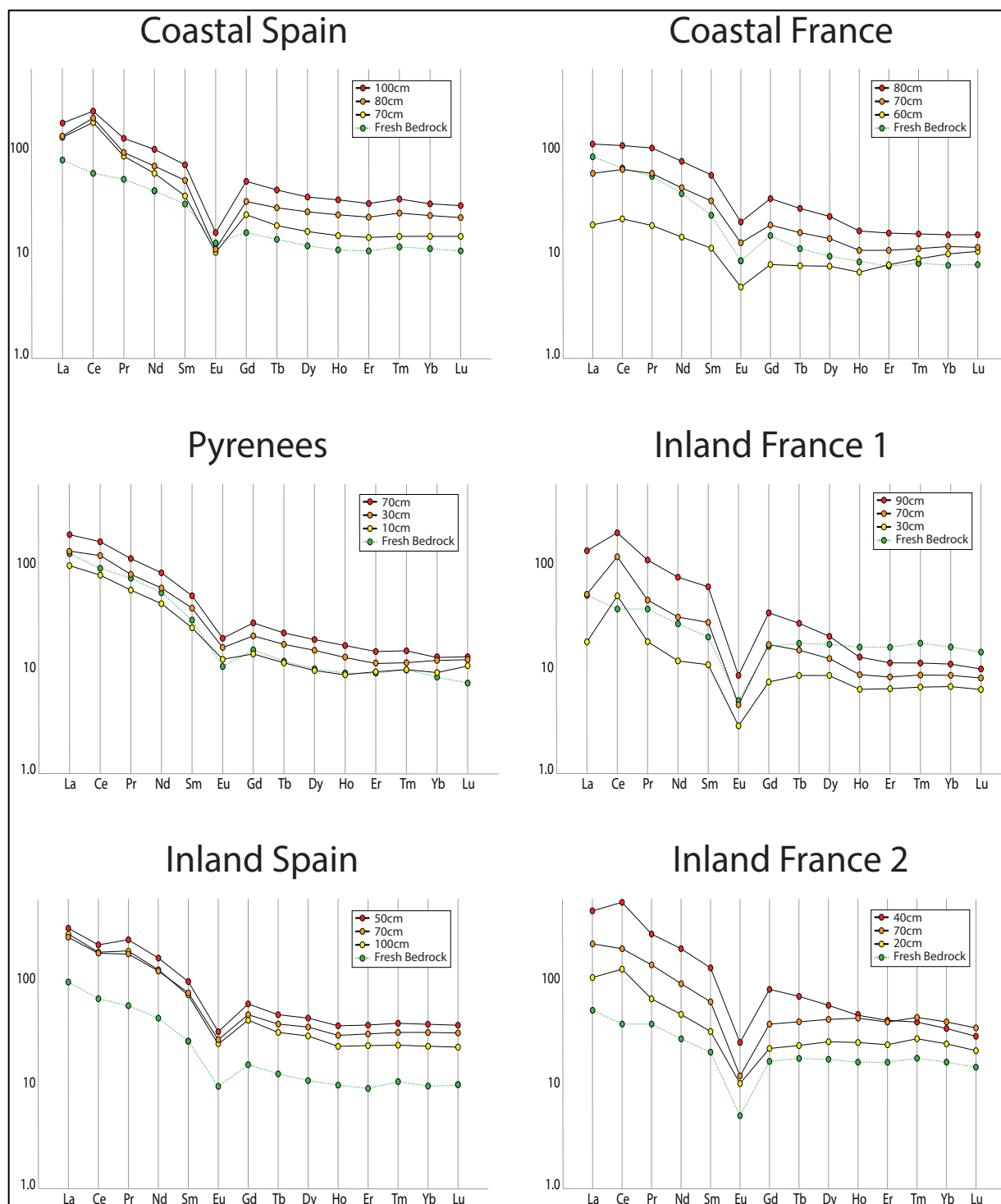


Figure 13: REE spider plots of all sites, showing slope differences of LREE and HREE and magnitude of Eu anomaly.

Discussion

Intensity of Chemical Weathering—Evidence for Autochthonous Production of Fines

Overall, metrics of weathering, from major-element trends such as profiles of Al and Fe, and derivative CIA, to REE element geochemistry including Eu anomalies and LREE/HREE values indicate that all sites record demonstrable weathering, with weathering intensities at the France sites exceeding those of the Spain sites. Key indicators of advanced weathering in the France samples include higher Al wt. % values, higher overall CIA values (71-83) and larger-magnitude differences in CIA between mud and bedrock, greater Th enrichment, larger magnitudes of the Eu anomaly, and larger ranges of LREE/HREE.

In general, the greater intensities of weathering recorded at the France sites are consistent with higher values of mean annual precipitation (MAP) at these sites relative to those in Spain. For example, the Inland France sites receive almost double (~1400-1500 mm) the mean annual precipitation (MAP) relative to the Coastal Spain and Inland Spain sites (~750-800 mm). The MAP of the Coastal France site slightly exceeds (~800-900 mm) that of the aforementioned sites but is significantly less than the Pyrenees site (~1100-1200 mm) (Meersmans et al., 2012; Andreu-Hayles et al., 2017). The likely reason for greater precipitation at the France sites is the abundant humid air and associated rains carried to the French sites by the Marin winds from the Mediterranean Sea (Millot and Wald, 1982). This increased precipitation likely enhances chemical weathering. With the exception of comparably cool (5-6° C) conditions at the Pyrenees site, temperature variations are relatively minor, from 12-13°C at the Inland France sites to 15-17°C at the coastal sites and Inland Spain site. These results are consistent with the weathering studies of Demirel et al. (2023) demonstrating water availability as the most dominant climate

control on weathering. Although differences in MAP are the simplest explanation for the observed differences in weathering, this presumes similar durations of pedogenesis for all sites.

Furthermore, Al and CIA values indicate that the upper to middle sections of profiles tend to record the most intense weathering, with mud produced from in situ weathering (autochthonous) likely undergoing illuviation. However, in some cases these “weathering” trends coincide with shifts in Ti/Zr and Ti/Rb ratios, indicating changes in provenance. Such a correlation in these data sets suggests that fines originating at least in part from outside the system (allochthonous) are being translocated down-profile.

Notably, bedrock samples from the Spain sites generally have more plagioclase feldspar relative to alkali feldspar and yet exhibit less intense chemical weathering than the more alkali-feldspar-rich France sites. Given that plagioclase feldspars are generally more weatherable than alkali feldspars (Bouabid et al., 1995; White et al., 2001), this also reflects a greater influence of chemical weathering, and attendant accumulation of Al, for example, in the France sites.

Provenance—Evidence for Allochthonous Additions of Fines

Areas of Southern Europe proximal to the Mediterranean Sea are known to receive dust from northern Africa through satellite observations and modeling (Kandler et al., 2007; Coz et al., 2009; Escudero et al., 2011; De La Campa et al., 2013; Wang et al., 2023), as well as studies from limestone-hosted terra rossa soils (Durn, 2003; Yaalon, 2009; Muhs et al., 2010).

Geochemical metrics such as immobile element ratios, La-Sc-Th plots, and REE ratios aid assessment of the possible role and significance of allochthonous eolian additions to granitoid-hosted soils in profiles in this study by comparison with geochemical data from muds, bedrock,

and dust samples collected from published studies (Altherr et al. 2000; Salminen et al. 2005; Muhs et al., 2007, 2021; Steinmann and Stille, 2008; Lotout et al., 2016; Couzinié et al. 2017; and Bosq et al., 2020). Data from these analyses indicate contributions of allochthonous material into the study sites, especially to the Spain sites. For example, the deviations of Ti/Zr and Ti/Rb values in the muds relative to bedrock in – especially—the Spain sites and the Coastal France site document the additions of allochthonous dust to these profiles. Our attempts to type these additions to sources met with mixed results. For example, the La-Th-Sc plot documents overlaps between the dust trap sample, mud samples from the Pyrenees site, and African dust documented by Muhs et al. (2007), but illustrates that other muds deviate from their bedrock sources but fail to overlap with the dust trap data.

Potential source regions for allochthonous material were selected based on data availability and proximity to the study sites and thus included sources in both northern Africa (Muhs et al., 2007; 2021) and southern Europe (Altherr et al. 2000; Salminen et al. 2005; Steinmann and Stille, 2008; Lotout et al., 2016; Couzinié et al. 2017; and Bosq et al., 2020). Several potential dust source regions occur across north Africa (Fig. 2), but uniform geochemical typing for all sites is lacking. Nevertheless, the match between the dust trap data and the Muhs et al. (2007) data suggests that African dust additions do contribute to soils in the region. Moreover, the allochthonous material captured in the dust traps (29.5-34 μm) exhibits modes that coincide with those of the mud fractions in the weathering profiles (17-52 μm).

While the geochemical signatures of many samples from the profiles in this study do not overlap with samples collected from previous studies in northern Africa, several samples from the Pyrenees, Inland Spain, Coastal Spain, and Coastal France sites exhibit compositions that

overlap with geochemical signatures of bedrock, alluvium, and loess in southern Europe, potentially indicating contributions from that region. However, several mud samples fail to match the geochemistry of any potential source for which data exist, potentially signaling the existence of other allochthonous sources yet to be identified.

Implications for Silt Generation and Loess Formation

Both mud contents and particle size distributions of the muds in these granitoid-hosted weathering profiles bear on assessment of the efficacy of silt generation in these Mediterranean sites. Critically, profiles from both the Spain and France Groups contain minimal mud—ranging from 4.8-9.7% and averaging 7.9%. While the mud modes exhibited in the profiles (17-52 μm) encompass the range of modes typical in loess deposits (20-40 μm ; Tsoar and Pye, 1987; Assallay et al. 1998), the fractions of mud exhibited in the profiles is paltry. The volumetric minor amount of mud in all of the studied profiles, despite significant evidence for chemical weathering, challenges the Nahon and Trompette (1982) hypothesis suggesting weathering in mediterranean (and tropical) soils as an efficient means to produce significant fines (especially silt) that are subsequently eroded and transported by wind to form loess deposits. Nahon and Trompette (1982) suggested silt generation proceeded through in situ chemical weathering and “splitting” of (mostly quartz) minerals, with no acknowledgement of the possible role of allochthonous additions to soils as a source for the silt. However, their work largely predated the now widespread recognition of the importance of dust additions to soils, which was emphasized in some early publications (e.g. Yaalon and Ganor, 1973), but would take years for general adoption (e.g. Muhs, 2013).

Previous studies have documented the influence of parent material on silt content and grain size (Hoskin and Sundeen, 1985; Wright, 2002). Weathering profiles studied here are hosted on granitoid bedrock, which is coarse-grained, and thus yields sediment dominated by sand and gravel with only minor mud.

Conclusion

Results documented from this study of weathering profiles in Spain and France refute the widely cited hypothesis by Nahon and Trompette (1982) that weathering in mediterranean soils is an important mechanism for the production of silt that forms loess deposits. Granulometric and geochemical data from six weathering profiles hosted on granitoid bedrock and subject to mediterranean and associated climate regimes reveal minimal mud production overall. Profiles in France exhibit more intense weathering overall than profiles in Spain, despite the similar, granitoid bedrock underlying all study sites, reflecting generally higher mean annual precipitation in the France sites compared to the Spain sites. Despite evidence for robust chemical weathering in several sites, all profiles exhibit minimal mud (especially silt) fractions, challenging the notion that chemical weathering of granitoid bedrock in mediterranean soils produces abundant silt. Provenance data indicate the influence of allochthonous additions of dust to several profiles, especially those in Spain and coastal southern France, with sources from both northern Africa and southern Europe.

References:

- Adams, S. M., & Soreghan, G. S. (2020). A test of the efficacy of sand saltation for silt production: Implications for the interpretation of loess. *Geology*, 48(11), 1105–1109. <https://doi.org/10.1130/G47282.1>
- Algeo, T.J., Hong, H., and Wang, C. (2025). The chemical index of alteration (CIA) and interpretation of ACNK diagrams. *Chemical Geology*, 671, 122474. DOI: [10.1016/j.chemgeo.2024.122474](https://doi.org/10.1016/j.chemgeo.2024.122474)
- Altherr, R., Holl, A., Hegner, E., Langer, C., Kreuzer, H., 2000. High-potassium, calc-alkaline I-type plutonism in the European Variscides: northern Vosges (France) and northern Schwarzwald (Germany). *Lithos* 50, 51–73. [https://doi.org/10.1016/S0024-4937\(99\)00052-3](https://doi.org/10.1016/S0024-4937(99)00052-3)
- André Pouclet, J. Javier Álvaro, Jacques-Marie Bardintzeff, Andrés Gil Imaz, Eric Monceret, Daniel Vizcaïno, Cambrian–early Ordovician volcanism across the South Armorican and Occitan domains of the Variscan Belt in France: Continental break-up and rifting of the northern Gondwana margin, *Geoscience Frontiers*, Volume 8, Issue 1, 2017, Pages 25-64, ISSN 1674-9871, <https://doi.org/10.1016/j.gsf.2016.03.002>.
- Assallay, A. M., Rogers, C. D. F., Smalley, I. J., & Jefferson, I. F. (1998). Silt: 2-62 μm , 9-4 ϕ . *Earth-Science Reviews*, 45(1–2), 61–88. [https://doi.org/10.1016/S0012-8252\(98\)00035-X](https://doi.org/10.1016/S0012-8252(98)00035-X)
- Avila, A., Queralt-Mitjans, I., & Alarcón, M. (1997). Mineralogical composition of African dust delivered by red rains over northeastern Spain. *Journal of Geophysical Research*, 102, 21977–21996. <https://doi.org/10.1029/97JD00485>.
- Babechuk, M., Widdowson, M. and Kamber, B. (2014) Quantifying chemical weathering intensity and trace element release from two contrasting basalt profiles, Deccan Traps, India. *Chem. Geol.*, 363, 56–75.
- Belhadj-Khedher, C., El-Melki, T., & Mouillot, F. (2020). Saharan Hot and Dry Sirocco Winds Drive Extreme Fire Events in Mediterranean Tunisia (North Africa). *Atmosphere*, 11(6), 590. <https://doi.org/10.3390/atmos11060590>
- Blatt, Harvey. “Original Characteristics of Clastic Quartz Grains.” *Journal of Sedimentary Research* 37 (1967): 401-424.
- Bonar, A. L., Soreghan, G. S., & Elwood Madden, M. E. (2023). Assessing weathering, pedogenesis, and silt generation in granitoid-hosted soils from contrasting hydroclimates. *Journal of Geophysical Research: Earth Surface*, 128, e2023JF007095. <https://doi.org/10.1029/2023JF007095>
- Bosq, M., Bertran, P., Degeai, J.-P., Queffelec, A., & Moine, O. (2020). Geochemical signature of sources, recycling and weathering in the Last Glacial loess from the Rhône Valley (southeast France) and comparison with other European regions. *Aeolian Research*, 2020, 42, pp.100561.

Bouabid, R., Nater, E. A., & Bloom, P. R. (1995). Characterization of the weathering status of feldspar minerals in sandy soils of Minnesota using SEM and EDX. *Geoderma*, 66(1-2), 137-149.

Chappell, B.W. and White, A.J.R. (1974) Two Contrasting Granite Types. *Pacific Geology*, 8, 173-174.

Compton, J.S., White, R.A. and Smith, M. (2003) Rare earth element behavior in soils and salt pan sediments of a semi-arid granitic terrain in the Western Cape, South Africa. *Chem. Geol.*, 201, 239–255.

Condie, K.C., Dengate, J. and Cullers, R.L. (1995) Behavior of rare earth elements in a paleoweathering profile on granodiorite in the Front Range, Colorado, USA. *Geochim. Cosmochim. Acta*, 59, 279–294.

Couzinié, S., Laurent, O., Poujol, M., Mintrone, M., Chelle-Michou, C., Moyen, J.-F., Bouilhol, P., Vezinet, A., Marko, L., 2017. Cadomian S-type granites as basement rocks of the Variscan belt (Massif Central, France): Implications for the crustal evolution of the north Gondwana margin. *Lithos* 286–287, 16–34. <https://doi.org/10.1016/j.lithos.2017.06.001>

Coz, E., Gómez-Moreno, F., Pujadas, M., Casuccio, G., Lersch, T., & Artíñano, B. (2009). Individual particle characteristics of North African dust under different long-range transport scenarios. *Atmospheric Environment*, 43, 1850-1863. <https://doi.org/10.1016/J.ATMOSENV.2008.12.045>.

Crouvi, O., Amit, R., Enzel, Y., Porat, N., & Sandler, A. (2008). Sand dunes as a major proximal dust source for late Pleistocene loess in the Negev Desert, Israel. *Quaternary Research*, 70(2), 275–282. <https://doi.org/10.1016/j.yqres.2008.04.011>

De La Campa, A., García-Salamanca, A., Solano, J., De La Rosa, J., & Ramos, J. (2013). Chemical and microbiological characterization of atmospheric particulate matter during an intense African dust event in Southern Spain.. *Environmental science & technology*, 47 8, 3630-8 . <https://doi.org/10.1021/es3051235>.

Demirel-Floyd, Cansu & Soreghan, Gerilyn & Webb, Nina & Roche, Autumn & Joo, Young Ji & Hall, Brenda & Levy, Joseph & Elwood Madden, Andrew & Madden, Megan. (2023). Investigating weathering signatures in terrestrial muds: Can climatic signatures be separated from provenance?. *Geological Society of America Bulletin*. 10.1130/B36888.1.

Durn, Goran. (2003). Terra Rossa in the Mediterranean Region: Parent Materials, Composition and Origin. *Geologia Croatica*. 56. 83-100. 10.4154/GC.2003.06.

Escudero, M., Stein, A., Draxler, R., Querol, X., Alastuey, A., Castillo, S., & Avila, A. (2011). Source apportionment for African dust outbreaks over the Western Mediterranean using the HYSPLIT model. *Atmospheric Research*, 99, 518-527. <https://doi.org/10.1016/J.ATMOSRES.2010.12.002>.

Faul, H., and E. Jäger (1963), Ages of some granitic rocks in the Vosges, the Schwarzwald, and the Massif Central, *J. Geophys. Res.*, 68(10), 3293–3300, doi:10.1029/JZ068i010p03293.

Faure, M., Lardeaux, J. M., & Ledru, P. (2009). A review of the pre-Permian geology of the Variscan French Massif Central. *Comptes Rendus Geoscience*, 341(2–3), 202–213.
<https://doi.org/10.1016/j.crte.2008.12.001>

Feitosa, M. M., Biondi, C. M., Nascimento, C. W. A., da Silva, Y. J. A. B., & Souza Junior, V. S. (2020). Rare Earth elements in rocks and soil profiles of a tropical volcanic archipelago in the Southern Atlantic. *CATENA*, 194, 104674. DOI:10.1016/j.catena.2020.104674

Glaccum, R. A., & Prospero, J. M. (1980). Saharan aerosols over the tropical north Atlantic—Mineralogy. *Marine Geology*, 37(3–4), 295–321. [https://doi.org/10.1016/0025-3227\(80\)90107-3](https://doi.org/10.1016/0025-3227(80)90107-3)

Harrell, J., & Blatt, H. (1978). Polycrystallinity: Effect on the Durability of Detrital Quartz. *Journal of Sedimentary Petrology*, 48(1), 25–30.

Hoskin, C. M., and Sundeen, D. A. (1975) Relationship Between Grain Size of Source Rock and Derived Sediment, Biorka Island Tonalite, Southeastern Alaska: *The Journal of Geology*, v. 83, no. 5, p. 567-578

Hoskin, C. M., & Sundeen, D. A. (1985). “Grain size of granite and derived grus, Enchanted Rock pluton, Texas.” *Sedimentary Geology*, 44(3-4), 281-29

Joo, Y.J., Elwood Madden, M.E. and Soreghan, G.S. (2016), Chemical and physical weathering in a hot-arid, tectonically active alluvial system of Anza Borrego Desert, California. *Sedimentology*, 63: 1065-1083. <https://doi.org/10.1111/sed.12249>

Kandler, K., Benker, N., Bundke, U., Cuevas, E., Ebert, M., Knippertz, P., Rodríguez, S., Schütz, L., & Weinbruch, S. (2007). Chemical composition and complex refractive index of Saharan Mineral Dust at Izaña, Tenerife (Spain) derived by electron microscopy. *Atmospheric Environment*, 41, 8058-8074. <https://doi.org/10.1016/J.ATMOSENV.2007.06.047>.

Liu, R.; Chi, Y.; Xie, Y.; Kang, C.; Sun, L.; Wu, P.; Wei, Z. Characteristics and Influencing Factors of the Granite Weathering Profile: A Case Study of a High Latitude Area in Northeastern China. *Minerals* 2024, 14, 17. <https://doi.org/10.3390/min14010017>

Lotout, C., Paquette, J. L., Lardeaux, J. M., & Goncalves, P. (2016). Timing and duration of Variscan high-pressure metamorphism in the French Massif Central: A multimethod geochronological study from the Najac Massif. *Lithos*, 308, 172-186. doi.org

Millot, Claude & Wald, Lucien. (1982). Upwelling in the Gulf of Lions. *Coastal Upwelling*. 34. 10.1016/S0422-9894(08)71241-8. Muhs, D. R., & Budahn, J. R. (2009). Geochemical evidence for African dust and volcanic ash inputs to terra rossa soils on carbonate reef terraces, northern Jamaica, West Indies. *Quaternary International*, 196(1–2), 13–35.
<https://doi.org/10.1016/j.quaint.2007.10.026> 21699011

- Muhs, D. R., Budahn, J. R., Prospero, J. M., & Carey, S. N. (2007). Geochemical evidence for African dust inputs to soils of western Atlantic islands: Barbados, the Bahamas, and Florida. *Journal of Geophysical Research*, 112(2), 1–26. <https://doi.org/10.1029/2005JF000445>
- Muhs, D. R., Budahn, J., Avila, A., Skipp, G., Freeman, J. & Patterson, D. (2010). The role of African dust in the formation of Quaternary soils on Mallorca, Spain and implications for the genesis of Red Mediterranean soils. *Quaternary Science Reviews*, 29(19–20), 2518–2543.
- Muhs, Daniel R.; Meco, Joaquín; Budahn, James R.; Skipp, Gary L.; Simmons, Kathleen R.; Baddock, Matthew C.; Betancourt, Juan F.; and Lomoschitz, Alejandro, "Long-term African dust delivery to the eastern Atlantic Ocean from the Sahara and Sahel regions: Evidence from Quaternary paleosols on the Canary Islands, Spain" (2021). USGS Staff -- Published Research. 1269. <https://digitalcommons.unl.edu/usgsstaffpub/1269>
- Nahon, D., & Trompette, R. (1982). Origin of siltstones: Glacial grinding versus weathering. *Sedimentology*, 29(1), 25–35. <https://doi.org/10.1111/j.1365-3091.1982.tb01706.x>
- Nesbitt, H. W., & Young, G. M. (1982). Early Proterozoic climates and plate motions inferred from major element chemistry of lutites. *Nature*, 299(5885), 715–717. <https://doi.org/10.1038/299715a0>
- Nesbitt, H. W., & Young, G. M. (1984). Prediction of some weathering trends of plutonic and volcanic rocks based on thermodynamic and kinetic considerations. *Geochimica et Cosmochimica Acta*, 48(7), 1523–1534. [https://doi.org/10.1016/0016-7037\(84\)90408-3](https://doi.org/10.1016/0016-7037(84)90408-3)
- Nesbitt, H. W., & Young, G. M. (1989). Formation and diagenesis of weathering profiles. *The Journal of Geology*, 97(2), 129–147. <https://doi.org/10.1086/629290>
- Obermann, A., Bastin, S., Belamari, S. *et al.* Mistral and Tramontane wind speed and wind direction patterns in regional climate simulations. *Clim Dyn* 51, 1059–1076 (2018). <https://doi.org/10.1007/s00382-016-3053-3>
- Orlić, M., Kuzmić, M., & Pasarić, M. (1994). Response of the Adriatic Sea to the bora and sirocco forcing. *Continental Shelf Research*, 14(1), 91–116.
- Özsoy, Türkan & Ornektekin, Sermin. (2009). Characteristics of Red Rain in the Cilician Basin, Northeastern Mediterranean.
- Pearce, Julian & Cann, Johnson. (1973). Tectonic Setting of Basic Volcanic Rocks determined using Trace Element Analyses. *Earth and Planetary Science Letters*. 19. 290–300. 10.1016/0012-821X(73)90129-5.
- Pin, C. (1981). Old inherited zircons in two synkinematic variscan granitoids: the 'granite du Pinet' and the 'Orthogneiss de Marvejols' (Southern French Massif Central). *Neues Jahrb. Mineral., Abh.*, 142(1), 27–48.

Prospero, J. M., Bonatti, E., Schubert, C., & Carlson, T. N. (1970). Dust in the Caribbean atmosphere traced to an African dust storm. *Earth and Planetary Science Letters*, 9(3), 287–293. [https://doi.org/10.1016/0012-821X\(70\)90039-7](https://doi.org/10.1016/0012-821X(70)90039-7)

Pye, K., & Sperling, C. H. B. (1983). Experimental investigation of silt formation by static breakage processes: The effect of temperature, moisture and salt on quartz dune sand and granitic regolith. *Sedimentology*, 30(1), 49–62. <https://doi.org/10.1111/j.1365-3091.1983.tb00649.x>

Pye, K. (1995). The nature, origin and accumulation of loess. *Quaternary Science Reviews*, 14(7–8), 653–667. [https://doi.org/10.1016/0277-3791\(95\)00047-X](https://doi.org/10.1016/0277-3791(95)00047-X)

Raviglione, M., & Barberis, L. (2018). Snow with Saharan sand. Hazard evaluation at a local scale. In *International Snow Science Workshop Proceedings 2018* (pp. 1024–1027). Innsbruck, Austria.

Reheis, M. C., & Kihl, R. (1995). Dust deposition in southern Nevada and California, USA 1984–1989: Relations to climate, source area and source lithology. *Journal of Geophysical Research*, 100(D5), 8893–8918. <https://doi.org/10.1029/94JD03245>

Salminen, R., Batista, M.J., Bidovec, M., Demetriades, A., De Vivo, B., De Vos, W., Duris, M., Gilucis, A., Gregorauskiene, V., Halamic, J., 2005. FOREGS Geochemical Atlas of Europe Part 1. Background Information, Methodology and Maps. Geological Survey of Finland, Espoo

Smalley, I.J. (1966). The properties of glacial loess and the formation of loess deposits. *Journal of Sedimentary Petrology* 36, 669–676.

Środoń, J., & Jewuła, K. (2025). Controls over cesium and rubidium contents of sedimentary rocks. *Chemical Geology*, 683, 122745. <https://doi.org/10.1016/j.chemgeo.2025.122745>

Steinmann, M., Stille, P., 2008. Controls on transport and fractionation of the rare earth elements in stream water of a mixed basaltic–granitic catchment basin (Massif Central, France). *Chemical Geology* 254, 1–18. <https://doi.org/10.1016/j.chemgeo.2008.04.004>

Swet, N., Elperin, T., Kok, J. F., Martin, R. L., Yizhaq, H., & Katra, I. (2019). Can active sands generate dust particles by wind-induced processes? *Earth and Planetary Science Letters*, 506, 371–380. <https://doi.org/10.1016/j.epsl.2018.11.013>

Tatlock, John S. P. (October 1914), "Some Mediaeval Cases of Blood-Rain", *Classical Philology*, 9 (4), The University of Chicago Press: 442–447

Taylor, S. R., & McLennan, S. M. (1985). *The continental crust: Its composition and evolution*. Blackwell Scientific.

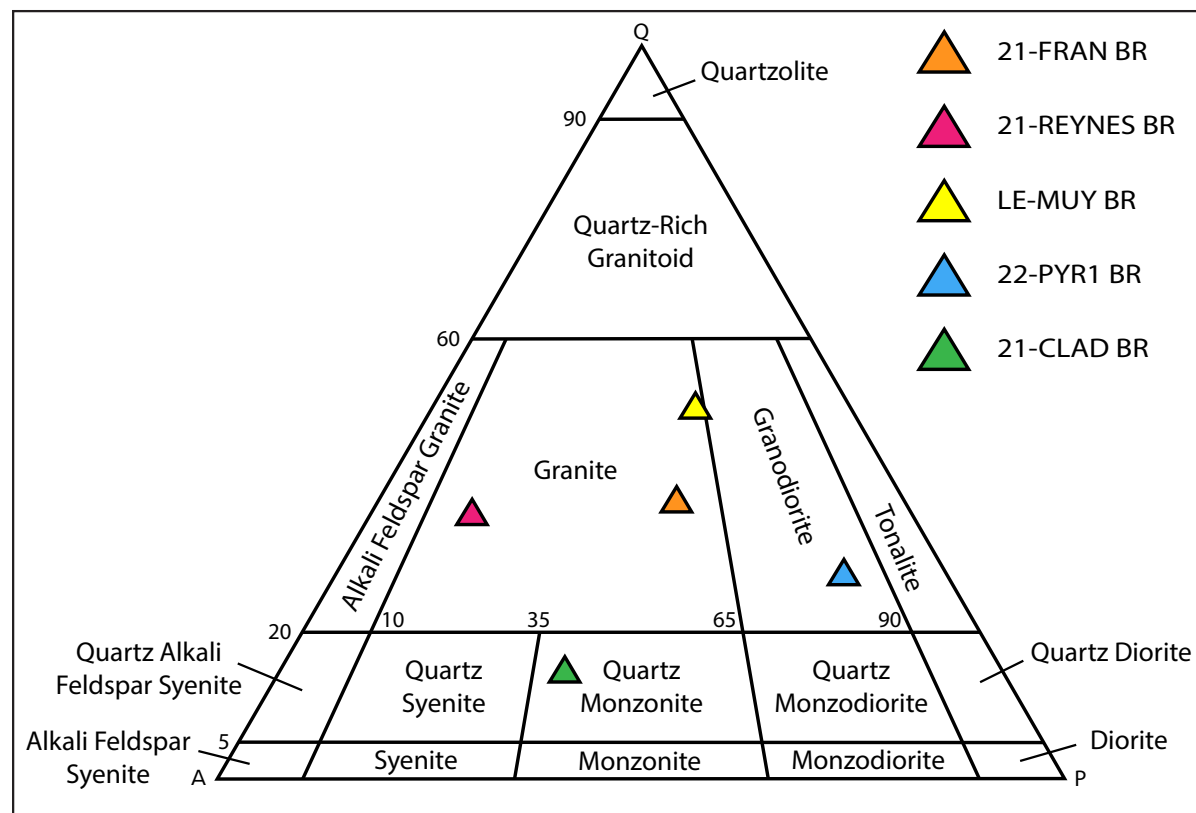
Tsoar, H., & Pye, K. (1987). Dust transport and the question of desert loess formation. *Sedimentology*, 34(1), 139–153. <https://doi.org/10.1111/j.1365-3091.1987.tb00566.x>

- Van der Does, M., Pourmand, A., Sharifi, A., & Stuut, J.-B. W. (2018). North African mineral dust across the tropical Atlantic Ocean: Insights from dust particle size, radiogenic Sr-Nd-Hf isotopes and rare earth elements (REE). *Aeolian Research*, 33, 106–116. <https://doi.org/10.1016/j.aeolia.2018.06.001>
- Wang, X., Wang, Q., Prass, M., Pöhlker, C., Moran-Zuloaga, D., Artaxo, P., Gu, J., Yang, N., Yang, X., Tao, J., Hong, J., Ma, N., Cheng, Y., Su, H., and Andreae, M. O.: The export of African mineral dust across the Atlantic and its impact over the Amazon Basin, *Atmos. Chem. Phys.*, 23, 9993–10014, <https://doi.org/10.5194/acp-23-9993-2023>, 2023.
- Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. *The Journal of Geology*, 30(5), 377–392. <https://doi.org/10.1086/622910>
- White, A. F., Bullen, T. D., Schulz, M. S., Blum, A. E., Huntington, T. G., & Peters, N. E. (2001). Differential rates of feldspar weathering in granitic regoliths. *Geochimica et Cosmochimica Acta*, 65(6), 847–869. [https://doi.org/10.1016/S0016-7037\(00\)00577-9](https://doi.org/10.1016/S0016-7037(00)00577-9)
- White, J. R., Cervený, R. S., & Balling, R. C. (2012). Seasonality in European Red Dust/“Blood” Rain Events. *BAMS*, 93(4), 471–476. <https://doi.org/10.1175/BAMS-D-11-00142.1>
- White, W.M. (2013) *Geochemistry*. Wiley-Blackwell, Amsterdam, 660 p.
- Wright, J. S., & Smith, B. (1993). Fluvial comminution and the production of loess-sized quartz silt: A simulation study. *Geografiska Annaler - Series A: Physical Geography*, 75(1/2), 25–34. <https://doi.org/10.2307/521050>
- Wright, J. S. (2001). Making loess-sized quartz silt: Data from laboratory simulations and implications for sediment transport pathways and the formation of “desert” loess deposits associated with the Sahara. *Quaternary International*, 76(77), 7–19. [https://doi.org/10.1016/S1040-6182\(00\)00085-9](https://doi.org/10.1016/S1040-6182(00)00085-9)
- Wright, J. S. (2002). Granitoid weathering profiles as a source of loessic silt. *Transactions - Japanese Geomorphological Union*, 23(5), 769–793.
- Wright, J. S. (2007). An overview of the role of weathering in the production of quartz silt. *Sedimentary Geology*, 202(3), 337–351. <https://doi.org/10.1016/j.sedgeo.2007.03.024>
- Wu, C. Y., & Hseu, Z. Y. (2023). Pechochemical behaviors of rare earth elements in soil profiles along a lithosequence in eastern Taiwan. *Catena*, 225, 107047.
- Wu, J., Gong, Z., Jin, Q., Zhang, M., & Huang, C. (2024). Enhanced enrichment of rare earth elements during pedogenesis under subtropical climate. *Geochemistry: Exploration, Environment, Analysis*, 24(4), geochem2024-024. <https://doi.org/10.1144/geochem2024-024>
- Yakymchuk, C., Holder, R. M., Kendrick, J., & Moyon, J.-F. (2023). Europium anomalies in zircon: A signal of crustal depth? *Earth and Planetary Science Letters*, 622, 118405.

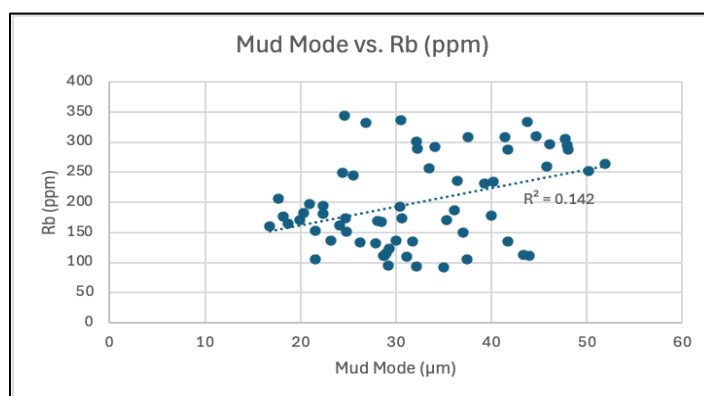
Yaalon, D. H., & Ganor, E. (1973). The influence of dust on soils during the Quaternary. *Soil Science*, 116(3), 146–155. <https://doi.org/10.1097/00010694-197309000-00003>

Yaalon, Dan. (2009). Brief comments on red Mediterranean soils. *Catena*. 76. 224-224. 10.1016/j.catena.2008.11.004.

Appendix:



Appendix 1: Q-A-P diagram showing igneous rock classification of bedrock.



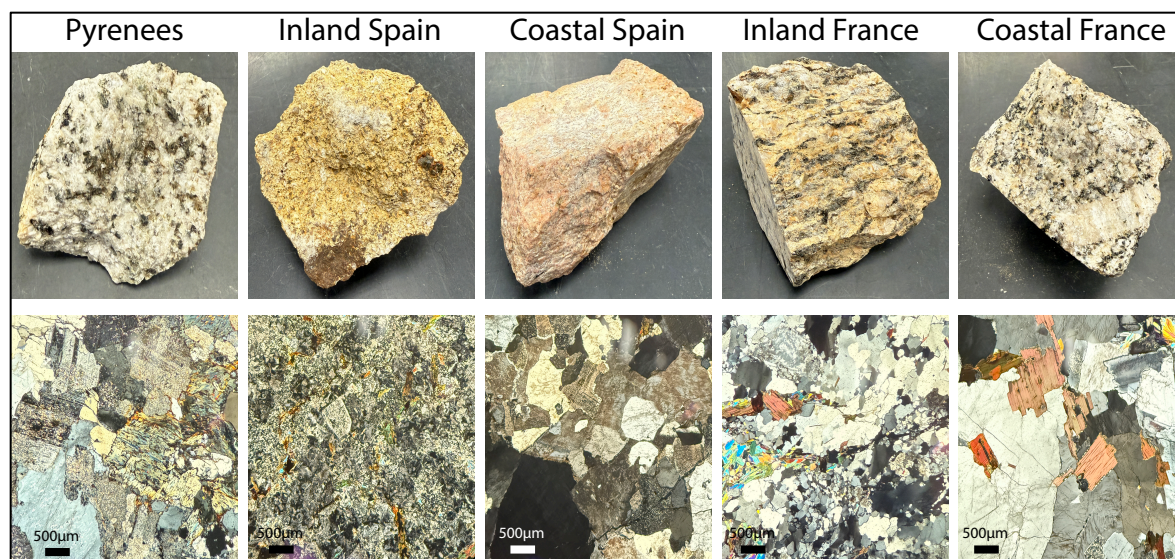
Appendix 2: Cross plot of Mud Modes vs. Rb content (ppm). R^2 value equal to 0.142 indicating a weak correlation between mud modes and Rb content.

Sample Depth	WEATHERING			PROVENANCE						
	Weight %			PPM						
	Al Wt. %	Fe Wt. %	CIA Value	Ti/Zr	Ti/Rb	La	Sc	Th	Eu Anomaly	LaN/YbN
Pyrenees										
0.0m	8.39	2.98	62.09	11.28	37.12	36.00	11.00	9.96	0.63	8.88
0.1m	9.50	5.01	68.59	18.28	58.80	35.30	11.00	11.30	0.64	10.55
0.2m	9.92	5.95	71.10	14.14	59.35	47.30	14.00	23.10	0.62	10.98
0.3m	10.03	5.39	70.62	13.56	54.31	48.30	14.00	25.30	0.54	11.22
0.4m	10.96	4.69	73.87	12.10	44.41	56.90	15.00	34.30	0.44	11.24
0.5m	11.01	4.01	70.39	10.88	39.96	59.50	15.00	33.30	0.47	10.67
0.6m	11.11	4.92	74.86	17.70	45.66	52.70	13.00	29.60	0.47	11.09
0.7m	10.03	4.66	66.68	16.47	41.73	68.40	16.00	30.70	0.52	14.01
BEDROCK: FRESH	7.54	3.34	54.00	14.20	20.56	46.80	8.00	15.95	0.50	15.28
BEDROCK: WEATHERED	8.26	5.15	54.00	13.85	22.06	50.70	13.00	19.95	0.38	11.98
Coastal Spain										
0.0m	9.00	4.60	59.98	10.41	50.95	56.30	16.00	32.90	0.30	8.01
0.1m	9.84	4.43	63.17	12.90	47.45	56.60	18.00	38.90	0.35	6.95
0.2m	10.48	5.22	65.87	13.93	47.26	64.80	22.00	38.30	0.34	6.86
0.3m	10.90	5.99	72.58	18.85	56.24	69.60	24.00	43.90	0.36	7.67
0.4m	11.38	6.25	74.90	29.70	58.43	46.40	26.00	40.10	0.37	5.89
0.5m	12.07	6.65	74.63	32.85	64.69	48.50	25.00	44.70	0.33	5.81
0.6m	9.87	5.02	67.50	18.69	50.51	49.10	21.00	38.50	0.28	6.79
0.7m	9.92	5.06	65.55	22.15	48.55	49.20	19.00	41.70	0.35	9.06
0.8m	10.74	5.46	70.95	20.70	45.23	50.20	20.00	47.80	0.27	5.81
0.9m	10.80	4.88	67.52	12.05	39.47	58.50	18.00	54.70	0.25	5.07
1.0m	10.80	5.64	68.27	10.72	36.86	66.80	19.00	64.50	0.27	6.01
BEDROCK: FRESH	8.23	4.01	51.00	19.59	27.49	29.40	9.00	13.95	0.57	7.05
BEDROCK: WEATHERED	8.60	4.08	51.00	19.43	26.69	27.70	10.00	14.65	0.58	6.04
Inland Spain										
0.0m	10.05	6.43	64.94	50.08	32.76	73.60	23.20	52.80	0.40	6.72
0.1m	9.95	5.65	62.32	32.36	37.37	67.80	22.00	54.40	0.38	5.38
0.2m	9.94	6.03	63.70	40.63	42.78	73.50	22.00	50.10	0.39	6.21
0.3m	9.67	5.08	62.80	27.57	46.37	82.40	22.40	59.30	0.39	6.18
0.4m	10.10	4.90	62.95	34.27	49.43	99.50	23.50	63.30	0.39	7.19
0.5m	10.35	5.74	66.20	46.38	50.80	109.00	26.50	72.40	0.42	8.09
0.6m	10.10	6.58	68.32	71.07	43.68	99.50	24.90	54.90	0.44	9.63
0.7m	10.15	5.47	66.19	36.36	55.01	92.70	22.70	58.00	0.42	8.24
0.8m	10.00	4.68	65.14	40.64	50.84	88.30	21.10	58.80	0.46	9.37
0.9m	10.50	4.87	65.94	42.66	45.09	97.30	21.00	57.40	0.44	10.27
1.0m	10.50	4.84	67.37	42.69	47.51	96.50	20.70	56.40	0.47	11.62
BEDROCK: FRESH	7.17	1.93	57.00	10.39	11.85	38.70	5.00	14.45	0.48	9.85
BEDROCK: WEATHERED	7.36	3.77	57.00	14.62	18.58	34.10	7.00	12.20	0.41	9.37
Coastal France										
0.0m	11.60	3.64	71.14	11.05	18.96	65.60	11.60	39.00	0.35	13.00
0.1m	12.50	4.08	73.83	20.00	21.89	29.20	13.95	23.50	0.47	6.97
0.2m	12.35	5.09	77.27	13.59	24.42	9.19	19.30	24.70	0.51	1.90
0.3m	12.80	4.94	80.66	31.25	26.72	10.00	18.50	18.70	0.56	3.03
0.4m	12.40	4.98	78.29	15.02	23.98	12.40	20.70	23.60	0.52	2.87
0.5m	12.60	5.17	79.26	18.44	27.52	9.37	22.00	16.30	0.53	2.35
0.6m	11.75	5.19	76.15	21.05	32.96	6.62	19.65	19.00	0.51	1.90
0.7m	12.60	4.10	78.02	13.61	19.88	20.50	18.65	20.00	0.52	4.91
0.8m	12.35	3.74	76.50	11.49	19.13	37.70	17.55	22.10	0.46	7.06
0.9m	12.40	3.44	75.04	8.39	18.07	36.10	14.75	31.70	0.49	7.28
1.0m	12.40	3.39	73.10	7.37	16.19	41.20	15.15	30.40	0.52	7.73
BEDROCK: FRESH	7.62	3.43	54.00	14.53	10.51	28.90	7.00	13.35	0.45	10.56
BEDROCK: WEATHERED	7.20	4.83	54.00	13.62	11.87	27.90	7.00	12.65	0.44	11.09
Inland France 1										
0.0m	11.50	3.11	75.52	18.87	9.24	30.60	9.99	23.40	0.33	7.41
0.1m	11.70	3.38	78.03	19.53	9.97	20.80	10.25	23.00	0.33	5.09
0.2m	12.05	4.25	78.78	23.68	8.40	18.80	9.95	25.10	0.30	5.72
0.3m	13.15	4.04	82.94	23.33	8.41	6.51	10.60	27.80	0.32	2.66
0.4m	13.15	3.45	80.72	19.07	7.99	8.23	10.75	24.20	0.30	2.65
0.5m	13.85	2.96	82.59	16.91	7.40	9.83	10.40	33.00	0.26	3.59
0.6m	14.10	2.61	83.05	15.07	7.05	19.30	10.55	38.60	0.22	6.30
0.7m	13.85	2.63	82.25	13.84	6.66	17.70	10.30	35.60	0.22	5.72
0.8m	13.55	2.00	80.19	11.99	5.68	29.00	9.69	27.90	0.19	7.93
0.9m	13.35	2.13	78.95	11.64	5.26	47.50	9.76	31.70	0.19	12.07
1.0m	13.65	2.09	78.16	11.56	5.11	33.70	9.39	28.70	0.21	9.07
BEDROCK: FRESH	6.48	2.59	61.00	8.97	3.73	18.10	4.00	11.40	0.27	3.14
BEDROCK: WEATHERED	6.40	1.78	61.00	8.56	3.17	9.20	3.00	6.72	0.30	1.93
Inland France 2										
0.0m	11.75	3.41	71.71	11.29	14.14	38.50	10.00	25.40	0.37	4.01
0.1m	12.12	3.63	73.63	9.89	14.31	40.80	9.00	30.20	0.37	4.04
0.2m	11.70	3.40	72.49	11.78	13.75	37.50	10.00	26.80	0.38	4.29
0.3m	12.33	3.79	73.80	9.09	14.41	52.50	10.00	34.80	0.32	4.87
0.4m	14.55	4.49	79.73	10.12	17.79	158.00	11.00	71.40	0.24	13.12
0.5m	14.13	3.74	76.73	9.44	15.21	114.50	11.00	61.70	0.23	10.34
0.6m	13.71	3.12	72.45	6.52	13.39	99.20	10.00	60.70	0.26	7.08
0.7m	13.65	3.10	71.83	7.73	13.32	77.00	9.00	52.40	0.25	5.47
0.8m	13.34	4.36	74.95	7.04	13.77	103.00	9.00	48.30	0.23	6.63
0.9m	13.13	4.67	76.03	9.77	13.46	113.50	8.00	42.30	0.24	9.88
1.0m	14.18	4.34	77.46	8.96	16.60	102.00	9.00	56.70	0.25	8.42
BEDROCK: FRESH	6.48	2.59	61.00	8.97	3.73	18.10	4.00	11.40	0.27	3.14
BEDROCK: WEATHERED	6.40	1.78	61.00	8.56	3.17	9.20	3.00	6.72	0.30	1.93
DUST TRAP			98.00			8.70	3.00	2.46	0.61	8.91

Appendix Table 1: Table of Values

Sample Name	Mud %	Grain Size Mode
22-PYR1-0.0	9.688581315	26.2
22-PYR1-0.1	12.64332197	21.6
22-PYR1-0.2	6.948033305	32.1
22-PYR1-0.3	6.556872403	29.2
22-PYR1-0.4	12.26218787	28.7
22-PYR1-0.5	9.428339203	31.1
22-PYR1-0.6	11.70110524	29
22-PYR1-0.7	11.5451641	29.3
LE-BESSE-0.0	5.487723065	32.1
LE-BESSE-0.1	7.277559803	32.2
LE-BESSE-0.2	4.353296427	34.1
LE-BESSE-0.3	5.274592637	41.7
LE-BESSE-0.4	8.425448293	33.5
LE-BESSE-0.5	9.637344711	45.8
LE-BESSE-0.6	5.868367016	51.9
LE-BESSE-0.7	7.856896353	50.2
LE-BESSE-0.8	12.15301754	40.2
LE-BESSE-0.9	10.93498452	36.4
LE-BESSE-1.0	5.476475062	39.3
21-FRAN-0.0	3.1269741	37
21-FRAN-0.1	6.08	27.9
21-FRAN-0.2	5.866717296	31.7
21-FRAN-0.3	8.104978773	23.2
21-FRAN-0.4	5.702364395	30
21-FRAN-0.5	4.818789229	41.7
21-FRAN-0.6	5.292273649	43.4
21-FRAN-0.7	4.673826571	35
21-FRAN-0.8	2.392638037	28.8
21-FRAN-0.9	3.692389428	37.4
21-FRAN-1.0	2.62295082	44
21-REYNES-0.0	13.19702602	24.6
21-REYNES-0.1	16.77079266	26.9
21-REYNES-0.2	11.02529446	30.5
21-REYNES-0.3	12.34988349	37.5
21-REYNES-0.4	8.54862708	43.8
21-REYNES-0.5	8.232081911	46.1
21-REYNES-0.6	8.231273142	47.9
21-REYNES-0.7	7.54307421	48
21-REYNES-0.8	6.618287373	41.4
21-REYNES-0.9	7.883044288	44.7
21-REYNES-1.0	4.6875	47.7
LE-MUY-0.0	11.47659845	24.4
LE-MUY-0.1	10.12915482	25.5
LE-MUY-0.2	6.198977198	17.7
LE-MUY-0.3	7.970075754	20.3
LE-MUY-0.4	5.651196738	30.4
LE-MUY-0.5	6.486417467	28.5
LE-MUY-0.6	6.529762122	19.9
LE-MUY-0.7	6.516290727	35.3
LE-MUY-0.8	6.398717791	16.8
LE-MUY-0.9	8.043421397	18.2
LE-MUY-1.0	5.136348702	20.9
21-CLAD-0.0	3.979114152	30.6
21-CLAD-0.1	6.300151651	18.7
21-CLAD-0.2	4.967184558	24.1
21-CLAD-0.3	4.956571088	24.8
21-CLAD-0.4	6.961391852	21.6
21-CLAD-0.5	9.206443032	28.1
21-CLAD-0.6	9.860061123	40
21-CLAD-0.7	12.89662231	24.7
21-CLAD-0.8	15.01375416	22.4
21-CLAD-0.9	8.191449111	36.1
21-CLAD-1.0	12.23388306	22.4

Appendix Table 2: Granulometric Data



Appendix 3: Bedrock and associated thin section photos from each sample site.

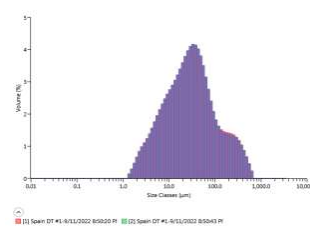
Appendix 4:

[illegible]

Appendix 5:

Result	Size (µm)	% Volume In
Concentrat	0.02%	0.01
Uniformity	1.84	0.0114
Specific Su 452.8 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.19%	0.0167
D [3,2]	13.3 µm	0.0189
D [3,3]	28.8 µm	0.0215
D [4,3]	65.5 µm	0.0244
Span	6.222	0.0278
Mode	34.0 µm	0.0315
Dx (10)	5.05 µm	0.0358
Dx (50)	28.7 µm	0.0407
Dx (90)	184 µm	0.0463
Skew [3]	2.765	0.0526
Kurtosis [3]	8.282	0.0597
Result in R	0.00%	0.0679
Result in R	2.65%	0.0771
Result in R	7.22%	0.0876
Result in R	12.34%	0.0995
Result in R	66.73%	0.113
Result in R	51.82%	0.128
Result in R	11.90%	0.146
Result in R	7.81%	0.166
Result in R	5.78%	0.188
Result in R	0.85%	0.214
Result Belc	73.47%	0.243
Result Belc	22.21%	0.276
Result Belc	39.13%	0.314
Result Abo	0.00%	0.357
Dx (5)	3.29 µm	0.405
Dx (16)	7.30 µm	0.46
Dx (84)	111 µm	0.523
Dx (95)	293 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64

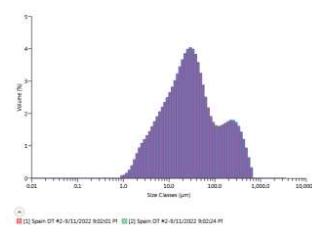
8.68	2.61
9.86	2.75
11.2	2.89
12.7	3.04
14.5	3.21
16.4	3.39
18.7	3.58
21.2	3.77
24.1	3.95
27.4	4.07
31.1	4.11
35.3	4.11
40.1	3.98
45.6	3.76
51.8	3.46
58.9	3.11
66.9	2.73
76	2.37
86.4	2.06
98.1	1.81
111	1.63
127	1.52
144	1.45
163	1.43
186	1.41
211	1.39
240	1.35
272	1.28
310	1.18
352	1.04
400	0.87
454	0.67
516	0.46
586	0.23
666	0
756	0
859	0
976	0
1110	0
1260	0
1430	0
1630	0
1850	0
2100	0
2390	0
2710	0
3080	0
3500	0



Coarse Silt	Medium Si	Fine Silt	Very Fine S Clay
4.11	3.98	2.61	0.84
4.11	3.58	2.75	0.98
3.98	3.77	2.89	1.11
3.76	3.95	3.04	1.23
3.46	4.07	3.21	1.39
3.11			1.56
			1.76
			1.95
			2.14
			2.31
			2.47
22.55	18.76	14.5	17.74
			1.56

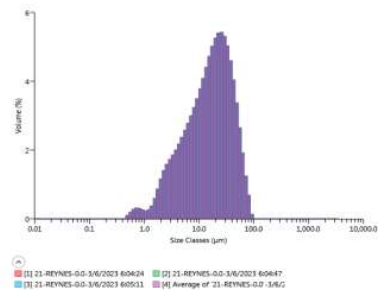
Result	Size (µm)	% Volume In
Concentrat	0.02%	0.01
Uniformity	2.196	0.0114
Specific Su 484.9 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.64%	0.0167
D [3,2]	12.4 µm	0.0189
D [3,3]	29.8 µm	0.0215
D [4,3]	74.6 µm	0.0244
Span	8.03	0.0278
Mode	29.5 µm	0.0315
Dx (10)	4.65 µm	0.0358
Dx (50)	28.3 µm	0.0407
Dx (90)	232 µm	0.0463
Skew [3]	2.382	0.0526
Kurtosis [3]	5.634	0.0597
Result in R	0.08%	0.0679
Result in R	3.40%	0.0771
Result in R	7.53%	0.0876
Result in R	11.81%	0.0995
Result in R	63.73%	0.113
Result in R	48.42%	0.128
Result in R	10.07%	0.146
Result in R	9.24%	0.166
Result in R	7.79%	0.188
Result in R	1.18%	0.214
Result Belc	71.57%	0.243
Result Belc	22.81%	0.276
Result Belc	39.52%	0.314
Result Abo	0.00%	0.357
Dx (5)	2.97 µm	0.405
Dx (16)	6.92 µm	0.46
Dx (84)	149 µm	0.523
Dx (95)	338 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03

4.58	1.74
5.21	1.9
5.92	2.05
6.72	2.19
7.64	2.36
8.68	2.48
9.86	2.64
11.2	2.8
12.7	2.99
14.5	3.2
16.4	3.41
18.7	3.62
21.2	3.81
24.1	3.94
27.4	4
31.1	3.96
35.3	3.81
40.1	3.57
45.6	3.25
51.8	2.88
58.9	2.51
66.9	2.18
76	1.91
86.4	1.73
98.1	1.63
111	1.6
127	1.61
144	1.65
163	1.7
186	1.75
211	1.77
240	1.76
272	1.7
310	1.59
352	1.42
400	1.19
454	0.93
516	0.63
586	0.32
666	0
756	0
859	0
976	0
1110	0
1260	0
1430	0
1630	0
1850	0
2100	0
2390	0
2710	0
3080	0
3500	0



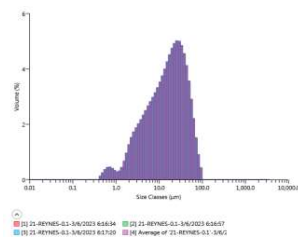
Coarse Silt	Medium Si	Fine Silt	Very Fine S Clay
3.96	3.41	2.48	0.93
3.81	3.62	2.64	1.07
3.57	3.81	2.8	1.19
3.25	3.94	2.99	1.31
2.88	4	3.2	1.44
2.51			1.59
			1.74
			1.9
			2.05
			2.19
			2.36
19.98	18.78	14.11	17.75
			2.28

Result	Size (µm)	% Volume In		
Concentr	0.01%	0.01	0	8.68 3.49
Uniformity	0.804	0.0114	0	9.86 3.77
Specific Su 795.6 m²/g	0.0129	0	11.2	4.08
Result Unit Volume	0.0147	0	12.7	4.4
Laser Obsc	11.95%	0.0167	0	14.5 4.71
D [3,2]	7.54 µm	0.0189	0	16.4 5.01
D [3,3]	13.9 µm	0.0215	0	18.7 5.24
D [4,3]	20.9 µm	0.0244	0	21.2 5.39
Span	2.581	0.0278	0	24.1 5.41
Mode	24.7 µm	0.0315	0	27.4 5.3
Dx (10)	3.21 µm	0.0358	0	31.1 5.02
Dx (50)	16.4 µm	0.0407	0	35.3 4.6
Dx (90)	45.5 µm	0.0463	0	40.1 4.03
Skew [3]	1.174	0.0526	0	45.6 3.36
Kurtosis [3]	1.094	0.0597	0	51.8 2.63
Result In R	1.45%	0.0679	0	58.9 1.9
Result In R	5.26%	0.0771	0	66.9 1.23
Result In R	10.57%	0.0876	0	76 0.68
Result In R	16.25%	0.0995	0	86.4 0.13
Result In R	84.00%	0.1113	0	98.1 0
Result In R	42.09%	0.128	0	111 0
Result In R	2.93%	0.146	0	127 0
Result In R	0.00%	0.166	0	144 0
Result In R	0.00%	0.188	0	163 0
Result In R	0.00%	0.214	0	186 0
Result Belk	96.95%	0.243	0	211 0
Result Belk	33.53%	0.276	0	240 0
Result Belk	57.91%	0.314	0	272 0
Result Abc	0.00%	0.357	0	310 0
Dx (5)	2.15 µm	0.405	0	352 0
Dx (16)	4.67 µm	0.46	0	400 0
Dx (84)	37.9 µm	0.523	0.19	454 0
Dx (95)	55.9 µm	0.594	0.27	516 0
		0.675	0.31	586 0
		0.767	0.3	666 0
		0.872	0.26	756 0
		0.991	0.23	859 0
		1.13	0.25	976 0
		1.28	0.38	1110 0
		1.45	0.59	1260 0
		1.65	0.87	1430 0
		1.88	1.16	1630 0
		2.13	1.4	1850 0
		2.42	1.59	2100 0
		2.75	1.73	2390 0
		3.12	1.85	2710 0
		3.55	2	3080 0
		4.03	2.18	3500
		4.58	2.37	
		5.21	2.58	
		5.92	2.78	
		6.72	3	
		7.64	3.23	



Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
5.02	5.01	3.49		0.1
4.6	5.24	3.77		0.19
4.03	5.39	4.08		0.27
3.36	5.41	4.4		0.31
2.63	5.3	4.71		0.3
1.9				0.26
			2.18	0.23
			2.37	0.25
			2.58	0.38
			2.78	0.59
			3.23	0.87
				1.16
	21.54	26.35	20.45	16.14
				1.4
				1.59
				1.73
				1.85
				2
				13.48

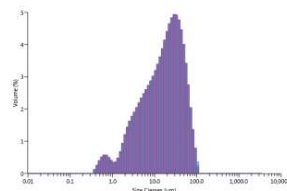
Result	Size (µm)	% Volume In		
Concentr	0.01%	0.01	0	6.72 2.97
Uniformity	0.883	0.0114	0	7.64 3.13
Specific Su 912.9 m²/g	0.0129	0	8.68	3.91
Result Unit Volume	0.0147	0	9.86	3.56
Laser Obsc	12.14%	0.0167	0	11.2 3.73
D [3,2]	6.58 µm	0.0189	0	12.7 3.98
D [3,3]	13.4 µm	0.0215	0	14.5 4.24
D [4,3]	21.3 µm	0.0244	0	16.4 4.49
Span	2.827	0.0278	0	18.7 4.73
Mode	27.0 µm	0.0315	0	21.2 4.91
Dx (10)	2.84 µm	0.0358	0	24.1 5.01
Dx (50)	16.1 µm	0.0407	0	27.4 5
Dx (90)	48.2 µm	0.0463	0	31.1 4.85
Skew [3]	1.212	0.0526	0	35.3 4.56
Kurtosis [3]	1.137	0.0597	0	40.1 4.13
Result In R	5.86%	0.0771	0	45.6 3.57
Result In R	11.39%	0.0876	0	51.8 2.91
Result In R	16.08%	0.0995	0	58.9 2.21
Result In R	80.94%	0.113	0	66.9 1.52
Result In R	42.19%	0.128	0	76 0.91
Result In R	3.91%	0.146	0	86.4 0.44
Result In R	0.00%	0.166	0	98.1 0
Result In R	0.00%	0.188	0	111 0
Result In R	0.00%	0.214	0	127 0
Result Belk	95.95%	0.243	0	144 0
Result Belk	35.70%	0.276	0	163 0
Result Belk	57.81%	0.314	0	186 0
Result Abc	0.00%	0.357	0	211 0
Dx (5)	1.87 µm	0.405	0	240 0
Dx (16)	4.13 µm	0.46	0.15	272 0
Dx (84)	39.8 µm	0.523	0.36	310 0
Dx (95)	59.2 µm	0.594	0.45	352 0
		0.675	0.45	400 0
		0.767	0.4	454 0
		0.872	0.33	516 0
		0.991	0.28	586 0
		1.13	0.31	666 0
		1.28	0.44	756 0
		1.45	0.67	859 0
		1.65	0.96	976 0
		1.88	1.24	1110 0
		2.13	1.52	1260 0
		2.42	1.72	1430 0
		2.75	1.88	1630 0
		3.12	2.02	1850 0
		3.55	2.17	2100 0
		4.03	2.33	2390 0
		4.58	2.5	2710 0
		5.21	2.66	3080 0
		5.92	2.82	3500



Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
4.85	4.49	3.91		0.13
4.56	4.73	3.51		0.24
4.13	4.91	3.73		0.36
3.57	5.01	3.98		0.43
2.91	5	4.24		0.45
2.24				0.44
			2.33	0.4
			2.5	0.33
			2.66	0.28
			2.82	0.31
			2.97	0.44
			3.13	0.67
				0.96
				1.24
	22.23	24.14	18.77	16.41
				1.52
				1.72
				1.88
				2.02
				2.17
				15.57

Result	Size (µm)	% Volume In
Concentrat	0.01%	0
Uniformity	0.91	0.0114
Specific Su 995.9 m³/y	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.14%	0.0167
D [3.2]	6.02 µm	0.0189
D [3.3]	13.8 µm	0.0215
D [4.3]	23.0 µm	0.0244
Span	2.9	0.0278
Mode	30.6 µm	0.0315
Dx (10)	2.66 µm	0.0358
Dx (50)	17.2 µm	0.0407
Dx (90)	52.6 µm	0.0463
Skew [3]	1.175	0.0526
Kurtosis [3]	0.989	0.0597
Result In R	1.37%	0.0679
Result In R	5.84%	0.0771
Result In R	10.75%	0.0876
Result In R	14.82%	0.0995
Result In R	78.67%	0.113
Result In R	45.02%	0.128
Result In R	5.54%	0.146
Result In R	0.00%	0.166
Result In R	0.00%	0.188
Result In R	0.00%	0.214
Result Belc	94.29%	0.243
Result Belc	34.76%	0.276
Result Belc	54.98%	0.314
Result Abo	0.00%	0.357
Dx (5)	1.59 µm	0.405
Dx (16)	3.99 µm	0.46
Dx (84)	43.6 µm	0.523
Dx (95)	64.6 µm	0.594

8.68	3.02
9.86	3.18
11.2	3.38
12.7	3.61
14.5	3.87
16.4	4.14
18.7	4.41
21.2	4.65
24.1	4.84
27.4	4.96
31.1	4.92
35.3	4.77
40.1	4.46
45.6	4.01
51.8	3.42
58.9	2.73
66.9	2.01
76	1.33
86.4	0.75
98.1	0.17
111	0
127	0
144	0
163	0
186	0
211	0
240	0
272	0
310	0
352	0
400	0
454	0
516	0
586	0
666	0
756	0
859	0
976	0
1110	0
1260	0
1450	0
1630	0
1850	0
2100	0
2390	0
2710	0
3080	0
3500	0

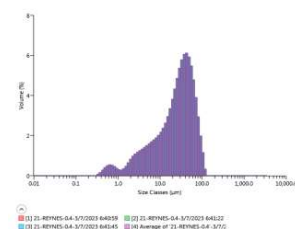


Legend: (1) 25-REYNES-02-04/02/2023 826302 (2) 25-REYNES-02-04/02/2023 827105 (3) 25-REYNES-02-04/02/2023 827108 (4) Average of (1)-REYNES-02-04/02-2023

Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
4.91	4.54	3.98	3.19	0.13
4.77	4.41	3.38	2.74	0.26
4.46	4.65	3.38	2.45	0.4
4.01	4.84	3.61	2.61	0.55
3.42	4.94	3.87	2.87	0.57
2.73			2.2	0.57
			2.34	0.5
			2.45	0.45
			2.61	0.39
			2.74	0.36
			2.87	0.46
			2.99	0.68
			3.11	0.94
			3.31	1.24
			3.57	1.63
			4.01	1.78
			4.51	1.93
			5.01	2.05
			5.5	2.16
			6.02	2.28
			6.54	2.41
			7.07	2.55
			7.61	2.7
			8.16	2.85
			8.72	3.01
			9.29	3.18
			9.86	3.36
			10.44	3.54
			11.02	3.73
			11.61	3.92
			12.2	4.11
			12.8	4.31
			13.4	4.51
			14.0	4.71
			14.6	4.91
			15.2	5.11
			15.8	5.31
			16.4	5.51
			17.0	5.71
			17.6	5.91
			18.2	6.11
			18.8	6.31
			19.4	6.51
			20.0	6.71
			20.6	6.91
			21.2	7.11
			21.8	7.31
			22.4	7.51
			23.0	7.71
			23.6	7.91
			24.2	8.11
			24.8	8.31
			25.4	8.51
			26.0	8.71
			26.6	8.91
			27.2	9.11
			27.8	9.31
			28.4	9.51
			29.0	9.71
			29.6	9.91
			30.2	10.11
			30.8	10.31
			31.4	10.51
			32.0	10.71
			32.6	10.91
			33.2	11.11
			33.8	11.31
			34.4	11.51
			35.0	11.71
			35.6	11.91
			36.2	12.11
			36.8	12.31
			37.4	12.51
			38.0	12.71
			38.6	12.91
			39.2	13.11
			39.8	13.31
			40.4	13.51
			41.0	13.71
			41.6	13.91
			42.2	14.11
			42.8	14.31
			43.4	14.51
			44.0	14.71
			44.6	14.91
			45.2	15.11
			45.8	15.31
			46.4	15.51
			47.0	15.71
			47.6	15.91
			48.2	16.11
			48.8	16.31
			49.4	16.51
			50.0	16.71
			50.6	16.91
			51.2	17.11
			51.8	17.31
			52.4	17.51
			53.0	17.71
			53.6	17.91
			54.2	18.11
			54.8	18.31
			55.4	18.51
			56.0	18.71
			56.6	18.91
			57.2	19.11
			57.8	19.31
			58.4	19.51
			59.0	19.71
			59.6	19.91
			60.2	20.11
			60.8	20.31
			61.4	20.51
			62.0	20.71
			62.6	20.91
			63.2	21.11
			63.8	21.31
			64.4	21.51
			65.0	21.71
			65.6	21.91
			66.2	22.11
			66.8	22.31
			67.4	22.51
			68.0	22.71
			68.6	22.91
			69.2	23.11
			69.8	23.31
			70.4	23.51
			71.0	23.71
			71.6	23.91
			72.2	24.11
			72.8	24.31
			73.4	24.51
			74.0	24.71
			74.6	24.91
			75.2	25.11
			75.8	25.31
			76.4	25.51
			77.0	25.71
			77.6	25.91
			78.2	26.11
			78.8	26.31
			79.4	26.51
			80.0	26.71
			80.6	26.91
			81.2	27.11
			81.8	27.31
			82.4	27.51
			83.0	27.71
			83.6	27.91
			84.2	28.11
			84.8	28.31
			85.4	28.51
			86.0	28.71
			86.6	28.91
			87.2	29.11
			87.8	29.31
			88.4	29.51
			89.0	29.71
			89.6	29.91
			90.2	30.11
			90.8	30.31
			91.4	30.51
			92.0	30.71
			92.6	30.91
			93.2	31.11
			93.8	31.31
			94.4	31.51
			95.0	31.71
			95.6	31.91
			96.2	32.11
			96.8	32.31
			97.4	32.51
			98.0	32.71
			98.6	32.91
			99.2	33.11
			99.8	33.31
			100.0	33.51

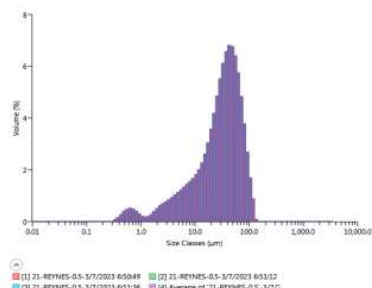
Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
4.85	4.49	3.31	2.33	0.13
4.36	4.79	3.51	2.66	0.24
4.13	4.91	3.73	2.87	0.36
3.57	5.01	3.98	2.99	0.45
2.91	5	4.24	3.11	0.67
2.21			3.31	0.96
			3.57	1.24
			3.83	1.52
			4.09	1.79
			4.35	2.02
			4.61	2.17
			4.87	2.32
			5.13	2.47
			5.39	2.62
			5.65	2.77
			5.91	2.92
			6.17	3.07
			6.43	3.22
			6.69	3.37
			6.95	3.52
			7.21	3.67
			7.47	3.82
			7.73	3.97
			7.99	4.12
			8.25	4.27
			8.51	4.42
			8.77	4.57
			9.03	4.72
			9.29	4.87
			9.55	5.02
			9.81	5.17
			10.07	5.32
			10.33	5.47
			10.59	5.62
			10.85	5.77
			11.11	5.92
			11.37	6.07
			11.63	6.22
			11.89	6.37
			12.15	6.52
			12.41	6.67
			12.67	6.82
			12.93	6.97
			13.19	7.12
			13.45	7.27
			13.71	7.42
			13.97	7.57
			14.23	7.72
			14.49	7.87
			14.75	8.02
			15.01	8.17
			15.27	8.32
			15.53	8.47
			15.79	8.62
			16.05	8.77
			16.31	8.92
			16.57	9.07
			16.83	9.22
			17.09	9.37
			17.35	9.52
			17.61	9.67
			17.87	9.82
			18.13	9.97
			18.39	10.12
			18.65	10.27
			18.91	10.42
			19.17	10.57
			19.43	10.72
			19.69	10.87
			19.95	11.02
			20.21	11.17
			20.47	11.32
			20.73	11.47
			20.99	11.62
			21.25	11.77
			21.51	11.92
			21.77	12.07
			22.03	12.22
			22.29	12.37
			22.55	12.52
			22.81	12.67

Result	Size (µm)	% Volume In	8.68	2.01
Concentrat	0.02%	0	9.86	2.16
Uniformity	0.718	0	11.2	2.06
Specific Su 831.7 m ² /g	0.0129	0	12.7	2.63
Result Unit Volume	0.0147	0	14.5	2.94
Laser Obsc	13.64%	0	16.4	3.02
D [3,2]	7.21 µm	0.0189	18.7	3.8
D [3,3]	19.6 µm	0.0215	21.2	4.31
D [4,3]	31.8 µm	0.0244	24.1	4.84
Span	2.362	0.0278	27.4	5.95
Mode	41.5 µm	0.0315	31.1	5.77
Dx (10)	3.32 µm	0.0358	35.3	6.04
Dx (50)	27.2 µm	0.0407	40.1	6.11
Dx (90)	67.6 µm	0.0463	45.6	5.93
Skew [3]	0.854	0.0526	51.8	5.48
Kurtosis [3]	0.215	0.0597	58.9	4.79
Result In R	3.31%	0.0679	66.9	1.91
Result In R	4.11%	0.0771	76	2.94
Result In R	7.00%	0.0876	86.4	1.99
Result In R	9.69%	0.0995	98.1	1.15
Result In R	75.51%	0.113	111	0.32
Result In R	60.67%	0.128	127	0
Result In R	12.53%	0.146	144	0
Result In R	0.03%	0.166	163	0
Result In R	0.00%	0.188	186	0
Result In R	0.00%	0.214	211	0
Result Belc	87.14%	0.243	240	0
Result Belc	24.11%	0.276	272	0
Result Belc	39.33%	0.314	310	0
Result Abc	0.00%	0.357	352	0
Dx (5)	1.75 µm	0.405	400	0
Dx (16)	5.68 µm	0.46	454	0
Dx (84)	57.7 µm	0.523	516	0
Dx (95)	80.8 µm	0.594	586	0
		0.675	666	0
		0.767	756	0
		0.872	859	0
		0.991	976	0
		1.13	1110	0
		1.28	1260	0
		1.45	1430	0
		1.65	1630	0
		1.88	1850	0
		2.13	2100	0
		2.42	2390	0
		2.75	2710	0
		3.12	3080	0
		3.55	3500	0
		4.03		
		4.58		
		5.21		
		5.92		
		6.72		
		7.64		



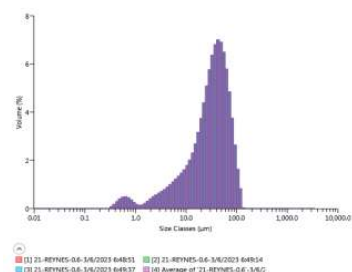
Coarse Silt	Medium Silt	Fine Silt	Very Fine Clay	Clay
5.97	3.93	2.81	0.96	0.06
6.04	3.8	2.36	0.16	0.16
6.11	4.31	2.36	0.28	0.28
5.89	4.84	2.61	0.4	0.4
5.48	5.35	2.94	0.5	0.5
4.79			1.42	0.54
			1.51	0.51
			1.6	0.46
			1.69	0.37
			1.78	0.3
			1.89	0.28
			0.35	0.35
			0.48	0.48
			0.65	0.65
			0.84	0.84
			0.97	0.97
			1.09	1.09
			1.17	1.17
			1.25	1.25
			1.31	1.31
			12	12

Result	Size (µm)	% Volume In	8.68	1.67
Concentrat	0.02%	0	9.86	1.82
Uniformity	0.653	0	11.2	2.01
Specific Su 702.8 m ² /g	0.0129	0	12.7	2.26
Result Unit Volume	0.0147	0	14.5	2.6
Laser Obsc	12.18%	0	16.4	3.02
D [3,2]	8.54 µm	0.0189	18.7	3.55
D [3,3]	24.0 µm	0.0215	21.2	4.16
D [4,3]	36.7 µm	0.0244	24.1	4.82
Span	2.132	0.0278	27.4	5.48
Mode	44.8 µm	0.0315	31.1	6.09
Dx (10)	4.75 µm	0.0358	35.3	6.54
Dx (50)	32.6 µm	0.0407	40.1	6.78
Dx (90)	74.3 µm	0.0463	45.6	6.74
Skew [3]	0.767	0.0526	51.8	6.39
Kurtosis [3]	0.144	0.0597	58.9	5.74
Result In R	3.07%	0	66.9	4.84
Result In R	2.51%	0.0771	76	3.78
Result In R	4.87%	0.0876	86.4	2.69
Result In R	7.79%	0.0995	98.1	1.69
Result In R	74.57%	0.113	111	0.88
Result In R	68.34%	0.128	127	0.08
Result In R	16.49%	0.146	144	0
Result In R	0.17%	0.166	163	0
Result In R	0.00%	0.188	186	0
Result In R	0.00%	0.214	211	0
Result Belc	82.98%	0.243	240	0
Result Belc	18.24%	0.276	272	0
Result Belc	31.66%	0.314	310	0
Result Abc	0.00%	0.357	352	0
Dx (5)	2.23 µm	0.405	400	0
Dx (16)	8.42 µm	0.46	454	0
Dx (84)	63.9 µm	0.523	516	0
Dx (95)	87.8 µm	0.594	586	0
		0.675	666	0
		0.767	756	0
		0.872	859	0
		0.991	976	0
		1.13	1110	0
		1.28	1260	0
		1.45	1430	0
		1.65	1630	0
		1.88	1850	0
		2.13	2100	0
		2.42	2390	0
		2.75	2710	0
		3.12	3080	0
		3.55	3500	0
		4.03		
		4.58		
		5.21		
		5.92		
		6.72		
		7.64		



Coarse Silt	Medium Silt	Fine Silt	Very Fine Clay	Clay
6.09	3.02	1.67	0.07	0.07
6.54	3.55	1.82	0.16	0.16
6.78	4.16	2.01	0.27	0.27
6.74	4.82	2.26	0.39	0.39
6.39	5.48	2.6	0.48	0.48
5.74			1.02	0.51
			1.13	0.48
			1.23	0.4
			1.34	0.3
			1.44	0.21
			1.55	0.17
			0.19	0.19
			0.27	0.27
			0.39	0.39
			0.51	0.51
			0.62	0.62
			0.7	0.7
			0.78	0.78
			0.85	0.85
			0.93	0.93
			8.68	8.68

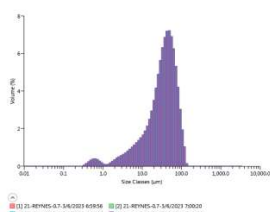
Result	Size (µm)	% Volume In
Concentra	0.02%	0
Uniformity	0.626	0.0114
Specific Su 665.3 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.58%	0
D [3.2]	9.02 µm	0.0189
D [3.3]	24.9 µm	0.0215
D [4.3]	36.9 µm	0.0244
Span	2.061	0.0278
Mode	43.8 µm	0.0315
Dx [10]	5.57 µm	0.0358
Dx [50]	33.0 µm	0.0407
Dx [90]	73.6 µm	0.0463
Skew [3]	0.753	0.0526
Kurtosis [3]	0.145	0.0597
Result In R	2.95%	0.0679
Result In R	2.00%	0.0771
Result In R	4.14%	0.0876
Result In R	7.27%	0.0995
Result In R	76.00%	0.113
Result In R	69.91%	0.128
Result In R	16.22%	0.146
Result In R	0.11%	0.166
Result In R	0.00%	0.188
Result In R	0.00%	0.214
Result Belc	83.32%	0.243
Result Belc	16.36%	0.276
Result Belc	30.09%	0.314
Result Abc	0.00%	0.357
Dx [5]	2.53 µm	0.405
Dx [16]	9.73 µm	0.46
Dx [84]	63.5 µm	0.623
Dx [95]	86.6 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64



Coarse Silt	Medium Si	Fine Silt	Very Fine S Clay
6.37	3.15	1.61	0.08
6.81	3.73	1.78	0.17
7.01	4.38	2	0.28
6.91	5.08	2.29	0.38
6.5	5.77	2.67	0.47
5.78			0.49
			1
			1.11
			1.22
			1.34
			1.47
			0.15
			0.21
			0.31
			0.41
			0.5
			0.57
			0.64
			0.71
			0.79
			7.53

39.38	22.11	10.35	7.03
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Result	Size (µm)	% Volume In
Concentra	0.02%	0
Uniformity	0.605	0.0114
Specific Su 679.9 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.23%	0
D [3.2]	10.3 µm	0.0189
D [3.3]	27.2 µm	0.0215
D [4.3]	39.2 µm	0.0244
Span	1.986	0.0278
Mode	46.1 µm	0.0315
Dx [10]	6.59 µm	0.0358
Dx [50]	35.4 µm	0.0407
Dx [90]	76.8 µm	0.0463
Skew [3]	0.724	0.0526
Kurtosis [3]	0.114	0.0597
Result In R	2.38%	0.0679
Result In R	1.88%	0.0771
Result In R	3.70%	0.0876
Result In R	6.77%	0.0995
Result In R	74.25%	0.113
Result In R	72.64%	0.128
Result In R	18.38%	0.146
Result In R	0.25%	0.166
Result In R	0.00%	0.188
Result In R	0.00%	0.214
Result Belc	80.98%	0.243
Result Belc	14.51%	0.276
Result Belc	27.36%	0.314
Result Abc	0.00%	0.357
Dx [5]	3.14 µm	0.405
Dx [16]	11.2 µm	0.46
Dx [84]	64.5 µm	0.623
Dx [95]	90.6 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64

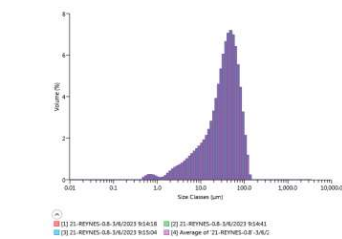


Coarse Silt	Medium Si	Fine Silt	Very Fine S Clay
6.37	3.15	1.61	0.08
6.81	3.73	1.78	0.17
7.18	4.16	1.88	0.28
7.21	4.88	2.35	0.38
6.9	5.62	2.5	0.47
6.25			0.49
			1
			1.02
			1.13
			1.25
			1.38
			0.11
			0.18
			0.26
			0.31
			0.44
			0.57
			0.61
			0.71
			6.32

40.69	21.11	9.71	6.49
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Result	Size (µm)	% Volume In
Concentrat	0.02%	0
Uniformity	0.611	0
Specific Su 463.1 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.32%	0
D [3.2]	13.0 µm	0
D [3.2]	28.1 µm	0
D [4.3]	40.0 µm	0
Span	2.002	0
Mode	47.8 µm	0
Dx (10)	6.60 µm	0
Dx (50)	36.1 µm	0
Dx (90)	78.8 µm	0
Skew [3]	0.718	0
Kurtosis [3]	0.061	0
Result in R	1.22%	0
Result in R	1.98%	0
Result in R	4.23%	0
Result in R	7.45%	0
Result in R	74.17%	0
Result in R	72.44%	0
Result in R	19.45%	0
Result in R	0.35%	0
Result in R	0.00%	0
Result in R	0.00%	0
Result Belc	79.80%	0
Result Belc	14.89%	0
Result Belc	27.56%	0
Result Abo	0.00%	0
Dx (5)	3.53 µm	0
Dx (16)	10.8 µm	0
Dx (84)	68.1 µm	0
Dx (95)	92.6 µm	0

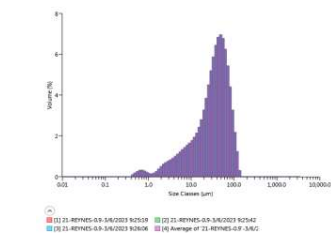
8.68	1.63
9.86	1.76
11.2	1.93
12.7	2.14
14.5	2.43
16.4	2.82
18.7	3.26
21.2	3.91
24.1	4.6
27.4	5.33
31.1	6.04
35.3	6.65
40.1	7.05
45.6	7.18
51.8	6.97
58.9	6.41
66.9	5.54
76	4.45
86.4	3.26
98.1	2.13
111	1.18
127	0.23
144	0
163	0
186	0
211	0
240	0
272	0
310	0
352	0
400	0
454	0
516	0
586	0
666	0
756	0
859	0
976	0
1110	0
1260	0
1430	0
1630	0
1850	0
2100	0
2390	0
2710	0
3080	0
3500	0



Coarse Silt	Medium Si	Fine Silt	Very Fine Clay
6.64	2.82	1.03	0.32
6.65	3.91	1.76	0.38
7.05	3.91	1.93	0.34
7.18	4.6	2.14	0.36
6.97	5.33	2.43	0.35
6.41			0.18
		0.9	0.12
		1.02	0.1
		1.14	0.1
		1.26	0.15
		1.39	0.21
		1.51	0.31
		0.48	0.61
40.3	19.97	9.89	7.22
			0.6
			0.67
			0.79
			0.8
			5.85

Result	Size (µm)	% Volume In
Concentra	0.02%	0
Uniformity	0.636	0
Specific Su 530.6 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.63%	0
D [3.2]	11.3 µm	0
D [3.2]	26.8 µm	0
D [4.3]	39.4 µm	0
Span	2.078	0
Mode	48.0 µm	0
Dx (10)	5.70 µm	0
Dx (50)	35.3 µm	0
Dx (90)	79.1 µm	0
Skew [3]	0.741	0
Kurtosis [3]	0.083	0
Result in R	1.65%	0
Result in R	2.36%	0
Result in R	4.77%	0
Result in R	7.73%	0
Result in R	73.10%	0
Result in R	70.86%	0
Result in R	19.29%	0
Result in R	0.43%	0
Result in R	0.00%	0
Result in R	0.00%	0
Result Belc	79.89%	0
Result Belc	16.52%	0
Result Belc	29.14%	0
Result Abo	0.00%	0
Dx (5)	2.97 µm	0
Dx (16)	9.62 µm	0
Dx (84)	68.2 µm	0
Dx (95)	93.3 µm	0

8.68	1.63
9.86	1.76
11.2	1.93
12.7	2.14
14.5	2.43
16.4	2.79
18.7	3.26
21.2	3.84
24.1	4.48
27.4	5.19
31.1	5.86
35.3	6.49
40.1	6.82
45.6	6.95
51.8	6.76
58.9	6.24
66.9	5.42
76	4.39
86.4	3.27
98.1	2.17
111	1.23
127	0.3
144	0
163	0
186	0
211	0
240	0
272	0
310	0
352	0
400	0
454	0
516	0
586	0
666	0
756	0
859	0
976	0
1110	0
1260	0
1430	0
1630	0
1850	0
2100	0
2390	0
2710	0
3080	0
3500	0



Coarse Silt	Medium Si	Fine Silt	Very Fine Clay
5.86	2.79	1.05	0.08
6.43	3.26	1.78	0.17
6.82	3.94	1.93	0.26
6.95	4.49	2.14	0.31
6.76	5.19	2.42	0.33
6.24			0.28
		1	0.28
		1.11	0.23
		1.22	0.18
		1.33	0.13
		1.44	0.1
		1.54	0.26
		0.38	0.38
39.06	19.57	9.92	7.64
			0.61
			0.68
			0.76
			0.82
			0.91
			0.91
			7.03

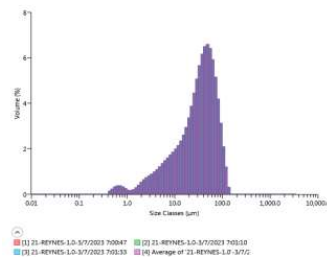
Result	Size (µm)	% Volume In
Concentra	0.02%	0.01
Uniformity	0.673	0.0114
Specific Su 588.6 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.15%	0.0167
D [3.2]	10.2 µm	0.0189
D [3.3]	25.1 µm	0.0215
D [4.3]	38.0 µm	0.0244
Span	2.179	0.0278
Mode	47.6 µm	0.0315
Dx (10)	5.14 µm	0.0358
Dx (50)	33.4 µm	0.0407
Dx (90)	77.9 µm	0.0463
Skew [3]	0.794	0.0526
Kurtosis [3]	0.144	0.0597
Result In R	2.00%	0.0679
Result In R	2.59%	0.0771
Result In R	5.15%	0.0876
Result In R	8.61%	0.0995
Result In R	73.37%	0.113
Result In R	68.08%	0.128
Result In R	18.28%	0.146
Result In R	0.42%	0.166
Result In R	0.00%	0.188
Result In R	0.00%	0.214
Result Belc	80.93%	0.243
Result Belc	18.35%	0.276
Result Belc	31.92%	0.314
Result Abo	0.00%	0.357

Dx (5)	2.69 µm	0.405	0.13
Dx (16)	8.50 µm	0.46	0.23
Dx (84)	66.8 µm	0.523	0.32
Dx (95)	92.4 µm	0.594	0.37
		0.675	0.37
		0.767	0.32
		0.872	0.25
		0.991	0.18
		1.13	0.16
		1.28	0.2
		1.45	0.29
		1.65	0.41
		1.88	0.53
		2.13	0.64
		2.42	0.73
		2.75	0.81
		3.12	0.89
		3.55	0.98
		4.03	1.09
		4.58	1.22
		5.21	1.35
		5.92	1.48
		6.72	1.6
		7.64	1.73

8.68	1.85
9.86	1.99
11.2	2.14
12.7	2.34
14.5	2.59
16.4	2.93
18.7	3.36
21.2	3.87
24.1	4.45
27.4	5.07
31.1	5.66
35.3	6.17
40.1	6.5
45.6	6.59
51.8	6.4
58.9	5.9

66.9	5.13
76	4.16
86.4	3.1
98.1	2.07
111	1.18
127	0.3
144	0
163	0
186	0
211	0
240	0
272	0
310	0
352	0

400	0	Coarse Silt	Medium Si	Fine Silt	Very Fine t Clay
454	0	5.66	2.93	2.85	0.33
516	0	6.17	3.36	1.98	0.23
586	0	6.5	3.87	2.14	0.32
666	0	6.59	4.45	2.34	0.37
756	0	6.4	5.07	2.59	0.37
859	0	5.9			0.33
976	0			1.09	0.25
1110	0			1.22	0.25
1260	0			1.35	0.18
1430	0			1.48	0.16
1630	0			1.6	0.2
1850	0			1.73	0.28
2100	0				0.41
2390	0				0.53
2710	0	37.22	19.68	10.9	8.47
3080	0				0.64
3500	0				0.73
					0.83
					0.83
					0.98
					7.81



Result	Size (µm)	% Volume In
Concentrat	0.02%	0.01
Uniformity	0.96	0.0114
Specific Su 577.0 m ² /g	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.17%	0.0167
D [3.2]	10.4 µm	0.0189
D [3.3]	17.3 µm	0.0215
D [4.3]	26.9 µm	0.0244
Span	3.056	0.0278
Mode	26.3 µm	0.0315
Dx (10)	4.24 µm	0.0358
Dx (50)	18.6 µm	0.0407
Dx (90)	61.2 µm	0.0463
Skew [3]	1.823	0.0526
Kurtosis [3]	4.148	0.0597
Result In R	0.00%	0.0679
Result In R	3.27%	0.0771
Result In R	9.64%	0.0876
Result In R	16.87%	0.0995
Result In R	81.78%	0.113
Result In R	47.47%	0.128
Result In R	8.57%	0.146
Result In R	0.78%	0.166
Result In R	0.00%	0.188
Result In R	0.00%	0.214
Result Belc	90.47%	0.243
Result Belc	29.78%	0.276
Result Belc	52.53%	0.314
Result Abo	0.00%	0.357
Dx (5)	2.94 µm	0.405
Dx (16)	5.83 µm	0.46
Dx (84)	48.8 µm	0.523
Dx (95)	79.3 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64

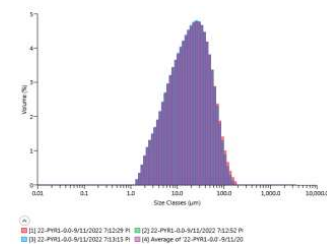
1.28	0.15
1.45	0.33
1.65	0.47
1.88	0.63
2.13	1.07
2.42	1.28
2.75	1.46
3.12	1.64
3.55	1.86
4.03	2.11
4.58	2.38
5.21	2.65
5.92	2.91
6.72	3.15
7.64	3.38

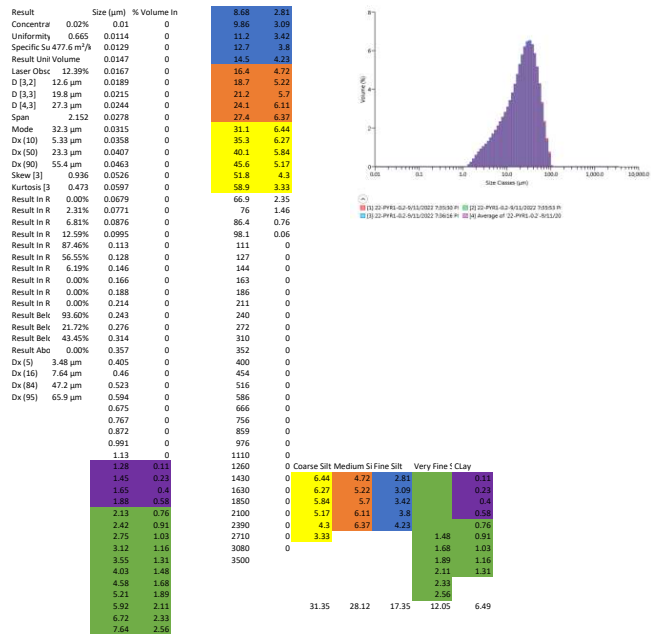
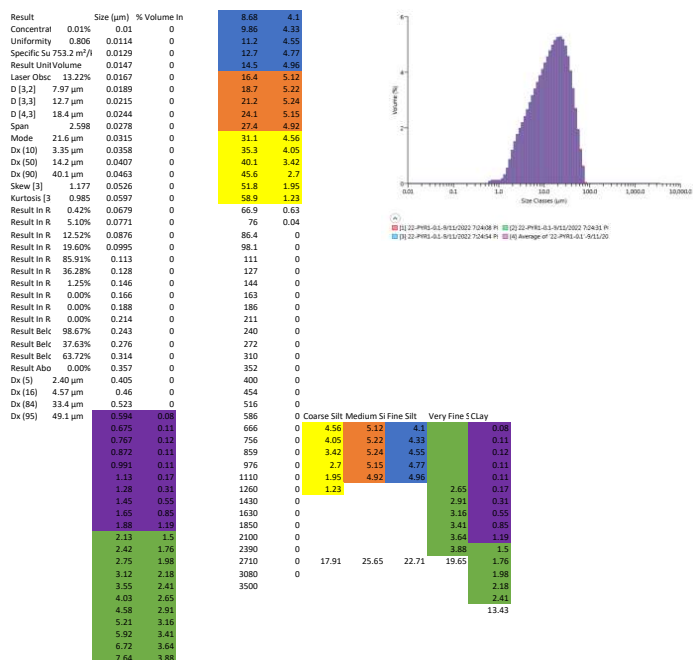
8.68	3.59
9.86	3.79
11.2	3.97
12.7	4.15
14.5	4.31
16.4	4.46
18.7	4.6
21.2	4.69
24.1	4.74
27.4	4.79
31.1	4.82
35.3	4.43
40.1	4.15
45.6	3.79
51.8	3.36
58.9	2.88

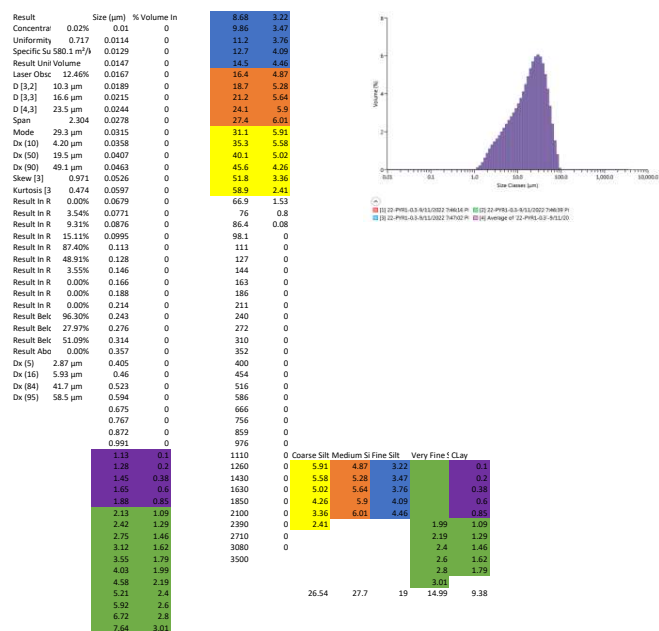
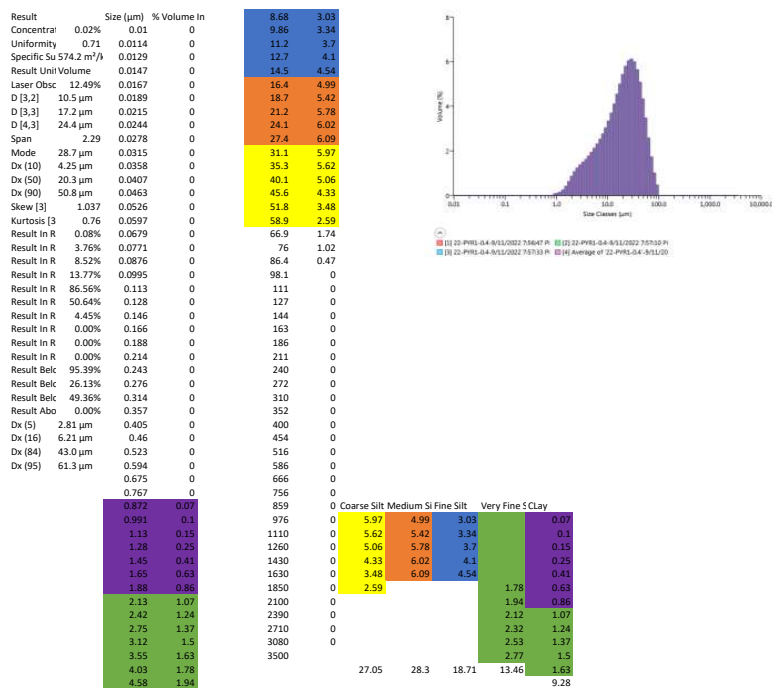
66.9	2.37
76	1.87
86.4	1.4
98.1	0.99
111	0.66
127	0.4
144	0.21
163	0.09
186	0
211	0
240	0
272	0
310	0
352	0
400	0
454	0
516	0
586	0
666	0
756	0
859	0
976	0
1110	0
1260	0
1430	0
1630	0
1850	0
2100	0
2390	0
2710	0
3080	0
3500	0

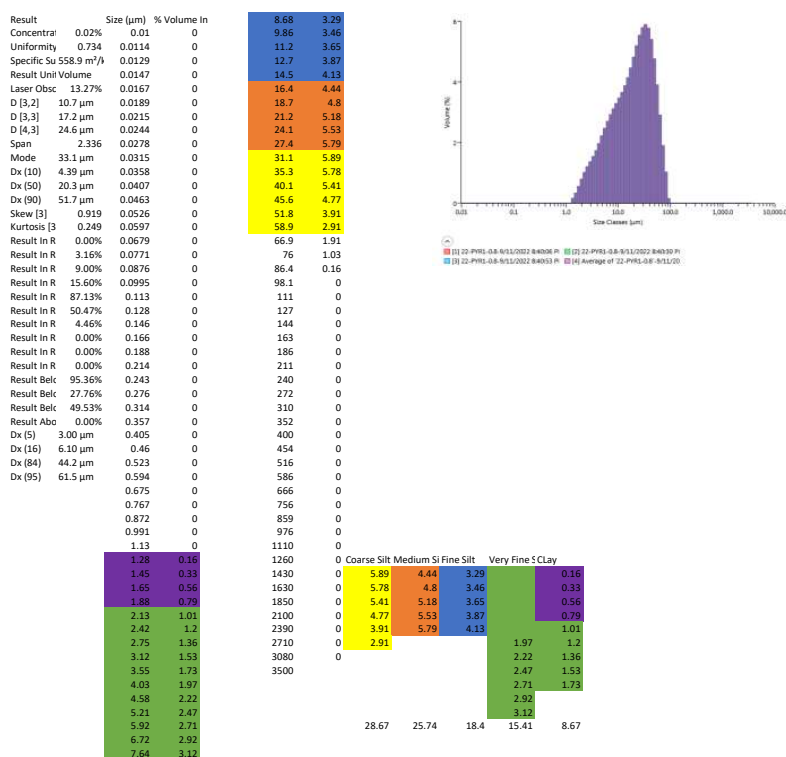
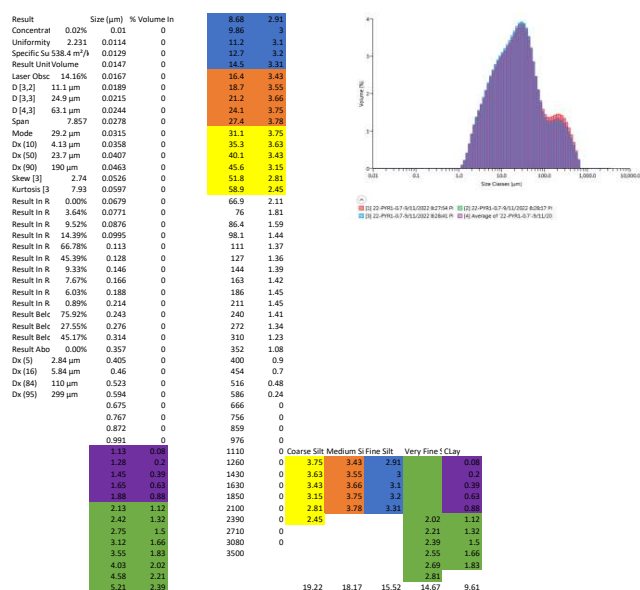
4.62	4.46	3.59	0.15
4.43	4.6	3.79	0.33
4.15	4.69	3.97	0.57
3.79	4.74	4.15	0.83
3.36	4.72	4.31	1.07
2.88			1.28
			1.46
			1.64
			1.86
			2.11
			2.38
			2.65
			2.91
			3.15
			3.38

23.23 23.21 19.81 16.58 9.19

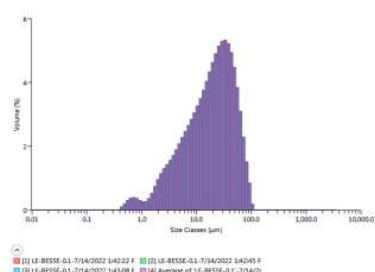






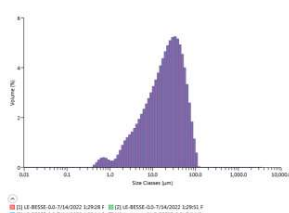


Result	Size (µm)	% Volume In	8.68	3.05
Concentration	0.01%	0	9.86	3.26
Uniformity	0.82	0	11.2	3.49
Specific Surface	781.1 m ² /g	0	12.7	3.75
Result Unit Volume	0.0147	0	14.5	4.03
Laser Obsc	12.91%	0	16.4	4.32
D [3,2]	7.68 µm	0	18.7	4.62
D [3,3]	15.9 µm	0	21.2	4.9
D [4,3]	24.9 µm	0	24.1	5.14
Span	2.634	0	27.4	5.3
Mode	32.2 µm	0	31.1	5.34
Dx (10)	3.40 µm	0	35.3	5.23
Dx (50)	19.5 µm	0	40.1	4.94
Dx (90)	54.8 µm	0	45.6	4.48
Skew [3]	1.077	0	51.8	3.84
Kurtosis [3]	0.724	0	58.9	3.09
Result In R	2.02%	0	66.9	2.28
Result In R	4.55%	0	76	1.5
Result In R	8.97%	0	86.4	0.83
Result In R	14.31%	0	98.1	0.17
Result In R	81.80%	0	111	0
Result In R	49.15%	0	127	0
Result In R	6.23%	0	144	0
Result In R	0.00%	0	163	0
Result In R	0.00%	0	186	0
Result In R	0.00%	0	211	0
Result Belk	93.58%	0	240	0
Result Belk	29.86%	0	272	0
Result Belk	50.85%	0	310	0
Result Abo	0.00%	0	352	0
Dx (5)	2.10 µm	0	400	0
Dx (16)	5.14 µm	0	454	0
Dx (84)	45.9 µm	0	516	0
Dx (95)	66.3 µm	0	586	0
		0	666	0
		0	756	0
		0	859	0
		0	976	0
		0	1110	0
		0	1260	0
		0	1430	0
		0	1630	0
		0	1850	0
		0	2100	0
		0	2390	0
		0	2710	0
		0	3080	0
		0	3500	0



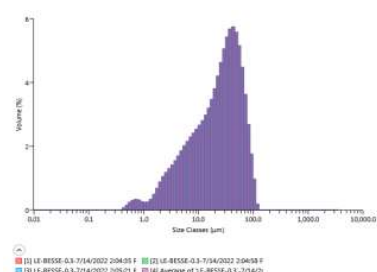
	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
0	5.34	4.32	3.05	0.09	0.09
1	5.23	4.62	3.26	0.19	0.19
2	4.94	4.9	3.49	0.29	0.29
3	4.48	5.14	3.75	0.37	0.37
4	3.84	5.3	4.03	0.39	0.39
5	3.09			1.89	0.36
6				2.08	0.3
7				2.28	0.25
8				2.47	0.27
9				2.65	0.36
10				2.85	0.53
11					0.74
12					0.85
13					1.15
14					1.3
15					1.43
16					1.56
17					1.71
18					12.24

Result	Size (µm)	% Volume In	8.68	3
Concentration	0.01%	0	9.86	3.25
Uniformity	0.83	0	11.2	3.51
Specific Surface	754.9 m ² /g	0	12.7	3.79
Result Unit Volume	0.0147	0	14.5	4.08
Laser Obsc	12.88%	0	16.4	4.37
D [3,2]	7.95 µm	0	18.7	4.64
D [3,3]	16.7 µm	0	21.2	4.88
D [4,3]	26.2 µm	0	24.1	5.08
Span	2.675	0	27.4	5.2
Mode	32.1 µm	0	31.1	5.14
Dx (10)	3.57 µm	0	35.3	5.14
Dx (50)	20.3 µm	0	40.1	4.91
Dx (90)	57.9 µm	0	45.6	4.52
Skew [3]	1.139	0	51.8	3.99
Kurtosis [3]	0.926	0	58.9	3.32
Result In R	2.01%	0	66.9	2.58
Result In R	4.27%	0	76	1.83
Result In R	8.25%	0	86.4	1.14
Result In R	13.75%	0	98.1	0.58
Result In R	81.00%	0	111	0.03
Result In R	50.57%	0	127	0
Result In R	7.72%	0	144	0
Result In R	0.00%	0	163	0
Result In R	0.00%	0	186	0
Result In R	0.00%	0	211	0
Result Belk	92.07%	0	240	0
Result Belk	28.28%	0	272	0
Result Belk	49.43%	0	310	0
Result Abo	0.00%	0	352	0
Dx (5)	2.15 µm	0	400	0
Dx (16)	5.46 µm	0	454	0
Dx (84)	48.3 µm	0	516	0
Dx (95)	70.8 µm	0	586	0
		0	666	0
		0	756	0
		0	859	0
		0	976	0
		0	1110	0
		0	1260	0
		0	1430	0
		0	1630	0
		0	1850	0
		0	2100	0
		0	2390	0
		0	2710	0
		0	3080	0
		0	3500	0

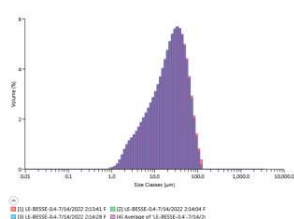


	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
0	5.23	4.37	3	0.09	0.09
1	5.14	4.64	3.25	0.19	0.19
2	4.91	4.88	3.51	0.29	0.29
3	4.52	5.08	3.79	0.37	0.37
4	3.99	5.2	4.08	0.39	0.39
5	3.32			1.74	0.36
6				1.99	0.3
7				2.13	0.25
8				2.33	0.26
9				2.54	0.34
10				2.72	0.48
11					0.69
12					0.85
13					1.07
14					1.2
15					1.31
16					1.43
17					1.56
18					11.48

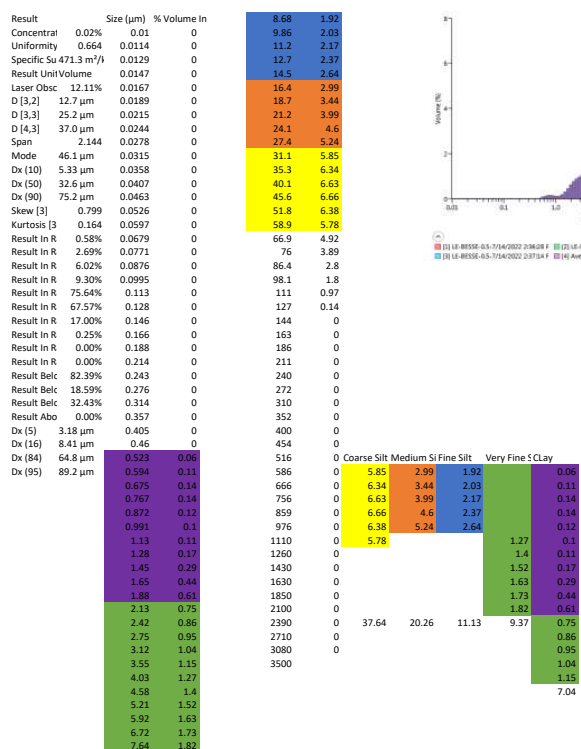
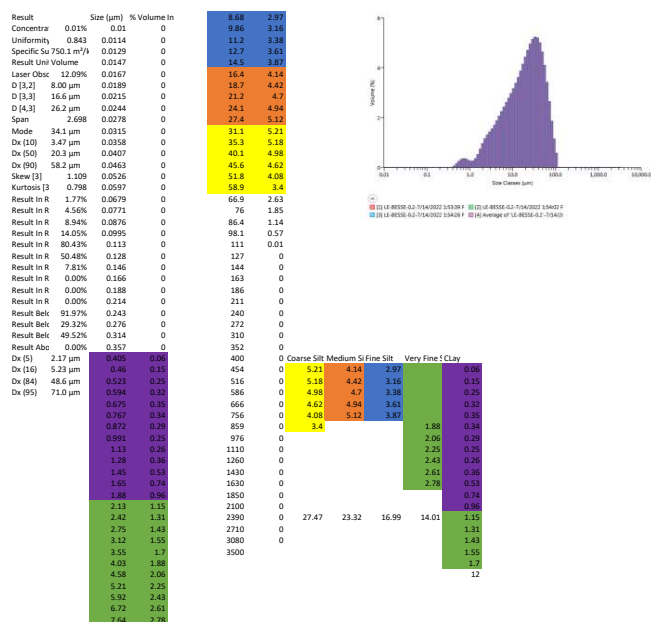
Result	Size (µm)	% Volume In	8.68	2.53
Concentr	0.01%	0	9.86	2.65
Uniformity	0.787	0	11.2	2.8
Specific Su 693.1 m ² /g	0.0129	0	12.7	2.97
Result Unit Volume	0.0147	0	14.5	3.19
Laser Obsc	12.36%	0	16.4	3.47
D [3,2]	8.66 µm	0	18.7	3.81
D [3,3]	19.0 µm	0	21.2	4.2
D [4,3]	30.1 µm	0	24.1	4.63
Span	2.492	0	27.4	5.06
Mode	41.7 µm	0	31.1	5.43
Dx (10)	3.71 µm	0	35.3	5.68
Dx (50)	24.7 µm	0	40.1	5.75
Dx (90)	65.3 µm	0	45.6	5.59
Skew [3]	0.921	0	51.8	5.16
Kurtosis [3]	0.285	0	58.9	4.48
Result In R	1.68%	0	66.9	3.62
Result In R	4.20%	0	76	2.67
Result In R	8.09%	0	86.4	1.74
Result In R	12.28%	0	98.1	0.95
Result In R	77.84%	0	111	0.17
Result In R	56.89%	0	127	0
Result In R	11.25%	0	144	0
Result In R	0.02%	0	163	0
Result In R	0.00%	0	186	0
Result In R	0.00%	0	211	0
Result Belc	88.45%	0	240	0
Result Belc	26.25%	0	272	0
Result Belc	43.11%	0	310	0
Result Abc	0.00%	0	352	0
Dx (5)	2.25 µm	0.405	0	0
Dx (16)	5.70 µm	0.46	0.15	0
Dx (84)	55.5 µm	0.523	0.24	0
Dx (95)	78.0 µm	0.594	0.3	0
		0.675	0.33	0
		0.767	0.31	0
		0.872	0.27	0
		0.991	0.24	0
		1.13	0.25	0
		1.28	0.34	0
		1.45	0.49	0
		1.65	0.68	0
		1.88	0.88	0
		2.13	1.05	0
		2.42	1.18	0
		2.75	1.3	0
		3.12	1.41	0
		3.55	1.54	0
		4.03	1.69	0
		4.58	1.86	0
		5.21	2.01	0
		5.92	2.15	0
		6.72	2.29	0
		7.64	2.41	0



Result	Size (µm)	% Volume In	8.68	2.81
Concentr	0.02%	0	9.86	3.04
Uniformity	0.769	0	11.2	3.31
Specific Su 224.6 m ² /g	0.0129	0	12.7	3.61
Result Unit Volume	0.0147	0	14.5	3.95
Laser Obsc	13.76%	0	16.4	4.3
D [3,2]	11.4 µm	0	18.7	4.67
D [3,3]	19.6 µm	0	21.2	5.03
D [4,3]	28.8 µm	0	24.1	5.33
Span	2.474	0	27.4	5.66
Mode	33.9 µm	0	31.1	5.66
Dx (10)	4.60 µm	0	35.3	5.61
Dx (50)	23.1 µm	0	40.1	5.39
Dx (90)	61.7 µm	0	45.6	4.98
Skew [3]	1.154	0	51.8	4.41
Kurtosis [3]	1.108	0	58.9	3.7
Result In R	0.01%	0	66.9	2.92
Result In R	3.35%	0	76	2.13
Result In R	7.83%	0	86.4	1.41
Result In R	12.95%	0	98.1	0.81
Result In R	82.51%	0	111	0.37
Result In R	55.45%	0	127	0
Result In R	9.34%	0	144	0
Result In R	0.04%	0	163	0
Result In R	0.00%	0	186	0
Result In R	0.00%	0	211	0
Result Belc	90.39%	0	240	0
Result Belc	24.14%	0	272	0
Result Belc	44.55%	0	310	0
Result Abc	0.00%	0	352	0
Dx (5)	2.99 µm	0.405	0	0
Dx (16)	6.72 µm	0.46	0	0
Dx (84)	51.5 µm	0.523	0	0
Dx (95)	75.1 µm	0.594	0	0
		0.675	0	0
		0.767	0	0
		0.872	0	0
		0.991	0.07	0
		1.13	0.13	0
		1.28	0.21	0
		1.45	0.37	0
		1.65	0.57	0
		1.88	0.78	0
		2.13	0.97	0
		2.42	1.12	0
		2.75	1.24	0
		3.12	1.35	0
		3.55	1.49	0
		4.03	1.66	0
		4.58	1.84	0
		5.21	2.02	0
		5.92	2.21	0
		6.72	2.4	0
		7.64	2.59	0

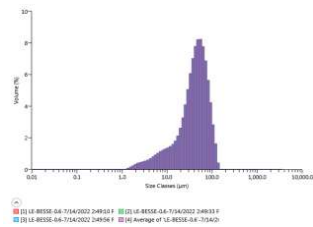


0	Coarse Silt	Medium Si	Fine Silt	Very Fine S	Clay
29.75	24.89	16.72	12.72	8.28	



Result	Size (µm)	% Volume In
Concentrat	0.03%	0
Uniformity	0.525	0
Specific Su 287.8 m ² /g	0.0129	0
Result Uni Volume	0.0147	0
Laser Obsc	12.32%	0
D [3,2]	20.8 µm	0
D [3,3]	34.9 µm	0
D [4,3]	45.7 µm	0
Span	1.76	0
Mode	52.0 µm	0
Dx [10]	9.68 µm	0
Dx [50]	42.6 µm	0
Dx [90]	84.6 µm	0
Skew [3]	0.576	0
Kurtosis [3]	-0.089	0
Result In R	0.00%	0
Result In R	1.27%	0
Result In R	3.13%	0
Result In R	5.94%	0
Result In R	71.23%	0
Result In R	80.16%	0
Result In R	24.67%	0
Result In R	0.58%	0
Result In R	0.00%	0
Result In R	0.00%	0
Result Belc	74.26%	0
Result Belc	10.34%	0
Result Belc	19.84%	0
Result Abo	0.00%	0
Dx [5]	5.47 µm	0
Dx [16]	16.0 µm	0
Dx [84]	74.2 µm	0
Dx [95]	97.7 µm	0
	0.675	0
	0.767	0
	0.872	0
	0.991	0
	1.13	0
	1.38	0.08
	1.45	0.14
	1.65	0.23
	1.88	0.33
	2.13	0.39
	2.42	0.44
	2.75	0.48
	3.12	0.52
	3.55	0.58
	4.03	0.68
	4.58	0.79
	5.21	0.91
	5.92	1.02
	6.72	1.12
	7.64	1.23

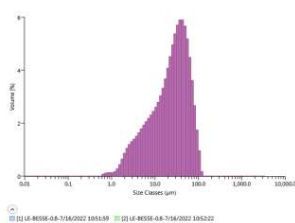
8.68	1.28
9.86	1.35
11.2	1.44
12.7	1.57
14.5	1.78
16.4	2.11
18.7	2.59
21.2	3.24
24.1	4.07
27.4	5.03
31.1	6.05
35.3	7.01
40.1	7.77
45.6	8.22
51.8	8.23
58.9	7.77



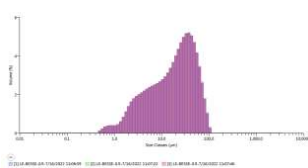
Coarse Silt	Medium Si	Fine Silt	Very Fine S Clay
1260	0	6.05	2.13
1430	0	7.01	2.59
1630	0	7.77	3.24
1850	0	8.22	4.07
2100	0	8.43	5.03
2390	0	7.77	6.05
2710	0	7.77	7.01
3080	0		8.22
3500	0		8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68
			0.79
			0.91
			1.02
			1.12
			1.23
			1.28
			1.35
			1.44
			1.57
			1.78
			2.11
			2.59
			3.24
			4.07
			5.03
			6.05
			7.01
			8.22
			8.23
			0.68

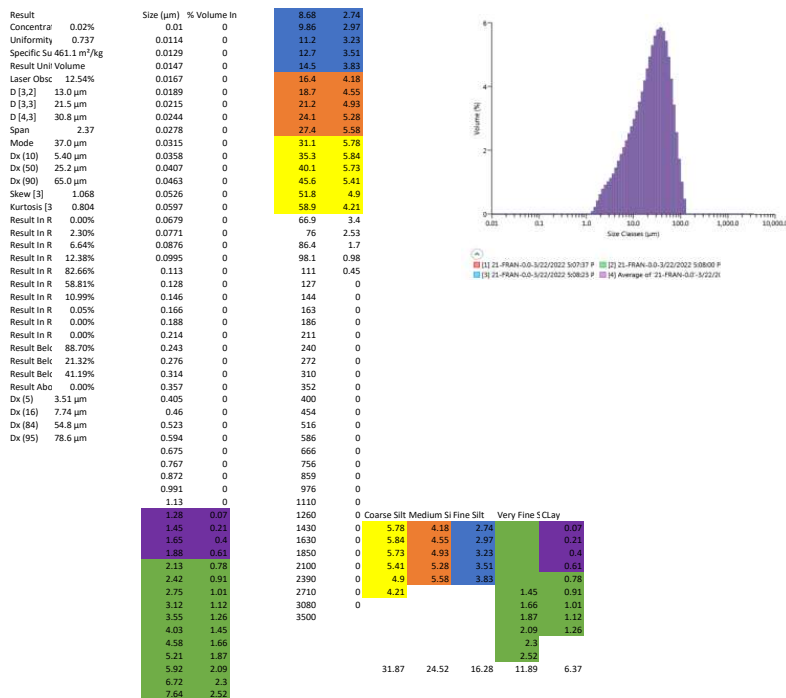
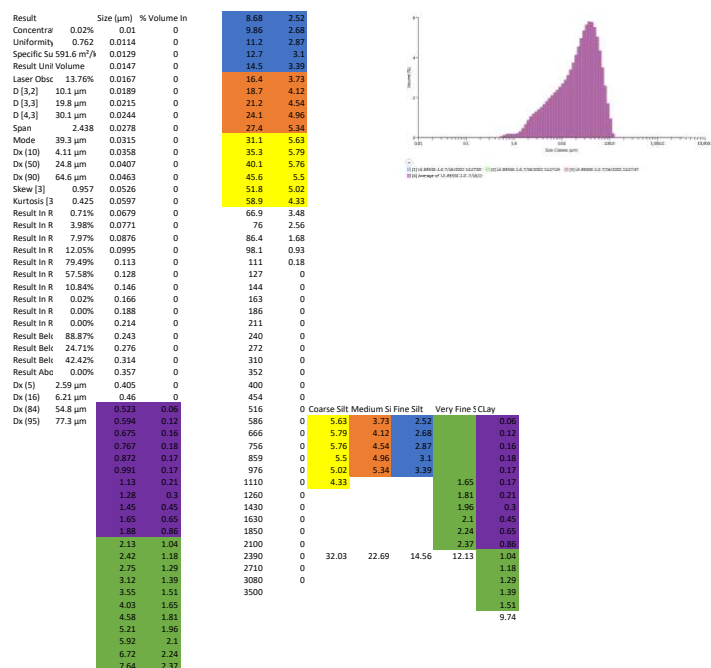
Result	Size	% Volume
Concraet	0.021	0.01
Uniformity	0.748	0.014
Specific Sur. 50.0 m/s	0.014	0
Result Unit Volume	0.0147	0
Laser D30	13.18%	0.0167
[L]31	50.7 mm	0.0189
[L]31	20.3 mm	0.0215
[L]41	30.7 mm	0.0244
Span	2.396	0.078
Mode	80.2 mm	0.0155
Dx (10)	42.1 mm	0.0358
Dx (50)	25.5 mm	0.0407
Dx (90)	65.4 mm	0.0163
Skew (3)	1.926	0.0526
Kurtosis (3)	0.945	0.0597
Result in R	0.44%	0.0679
Result in R	3.88%	0.0771
Result in R	7.98%	0.0876
Result in R	11.77%	0.0995
Result in R	79.35%	0.113
Result in R	58.63%	0.128
Result in R	11.31%	0.146
Result in R	0.026%	0.166
Result in R	0.00%	0.188
Result in R	0.00%	0.214
Result in R	88.39%	0.24
Result in R	24.07%	0.276
Result in R	41.37%	0.314
Result Also	0.00%	0.357
Result in R	1.61%	0.405
D (16)	6.38 mm	0.46
D (84)	56.6 mm	0.523
D (95)	78.2 mm	0.57
	0.675	0.11
	0.675	0.18
	0.675	0.25
	0.991	0.14
	1.131	0.27
	1.28	0.27
	1.46	0.31
	1.65	0.65
	1.98	0.69
	2.24	0.72
	2.42	1.2
	2.75	1.51
	3.05	1.6
	4.03	1.74
	4.58	1.79
	5.1	2.05
	5.52	2.05
	6.72	2.4
	7.62	2.4

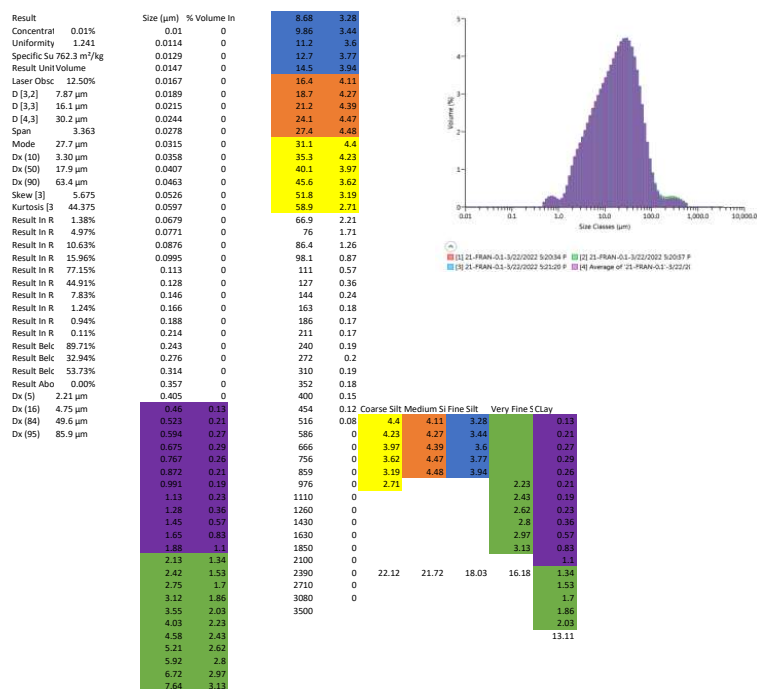
	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
666	5.68	3.60	7.44		0.07
756	5.87	4.08	2.6		0.13
859	8.88	4.5	2.79		0.13
976	5.65	4.94	3.02		0.13
1130	5.18	5.35	3.31		0.14
1240	4.49			1.64	0.27
1430				1.79	0.27
1630				1.92	0.44
1850				2.05	0.65
2100				2.18	0.86
2390				2.31	1.06
2710	32.75	22.51	14.16	11.89	1.2
3080					1.4
3500					1.51

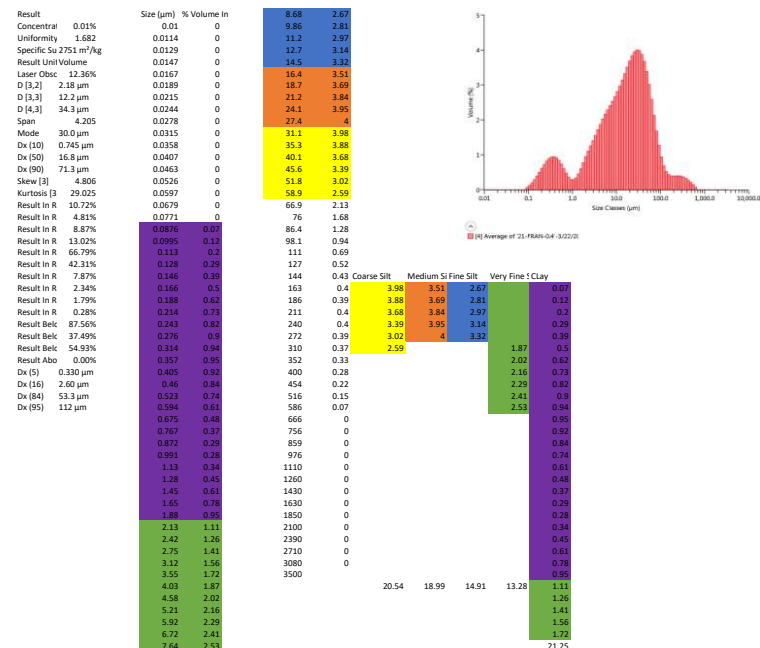
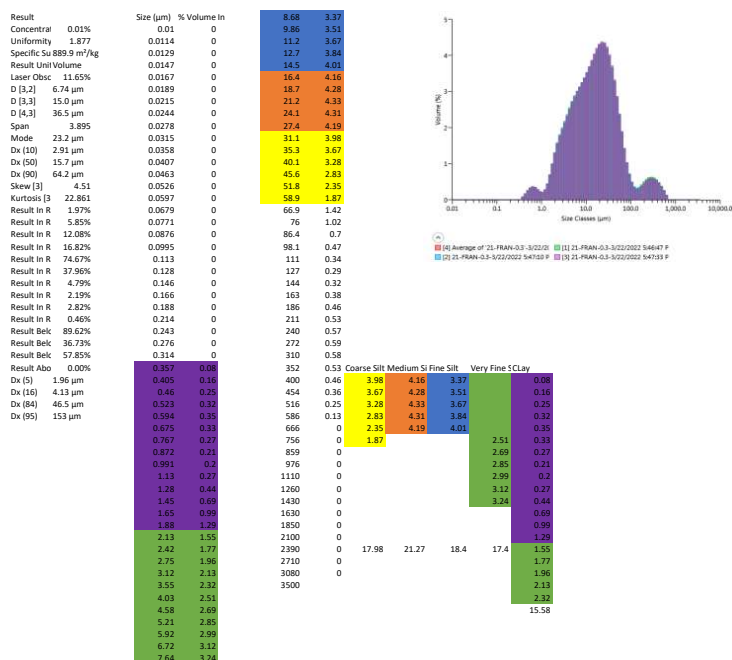


Result	Conc	Size	Unit	% Volume
Concetrat	0.01	0.01	0	
Uniformity	0.89	0.0124		
Specific Surf Area of m ² /g	0.08	0.019		
Result Unit Volume	0.04	0.0247		
DLaver 0.28	12.51%	0.0167		
L13(2)	7.09 µm	0.0189		
D13(3)	15.2 µm	0.0205		
D14(3)	25.3 µm	0.0244		
Span	2.81	0.0278		
Mean	36.6 µm	0.0315		
D(10)	2.76 µm	0.0308		
D(50)	15.9 µm	0.0407		
D(90)	57.6 µm	0.0463		
Skew [S]	1.03	0.0266		
Kurtosis [K]	0.484	0.0207		
Result n R	1.83%	0.0679		
Result n R	6.77%	0.0771		
Result n R	11.02%	0.0876		
Result n R	13.32%	0.0966		
Result n R	76.98%	0.113		
Result n R	49.24%	0.128		
Result n R	7.45%	0.146		
Result n R	0.00%	0.166		
Result n R	0.00%	0.184		
Result n R	0.00%	0.214		
Result n R	92.33%	0.243		
Result n R	33.14%	0.276		
Result n R	50.76%	0.314		
Result n R	0.00%	0.347		
Result n R	92.33%	0.605		
Result n R	0.767	0.87		
Result n R	1.11	0.82		
Result n R	1.28	0.59		
Result n R	1.45	0.82		
Result n R	1.67	0.71		
Result n R	1.98	1.38		
Result n R	2.13	1.61		
Result n R	2.42	1.78		
Result n R	2.76	1.99		
Result n R	3.15	2.28		
Result n R	4.01	2.15		
Result n R	4.52	2.17		
Result n R	5.01	2.42		
Result n R	6.92	2.42		
Result n R	7.62	2.49		

[illegible]





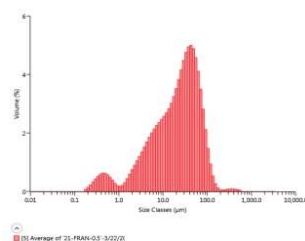


Result	Size (µm)	% Volume in
Concentrational	0.01	0
Uniformity	0.0114	0
Specific Surface Area	0.0129	0
Result Unit Volume	0.0147	0
Laser Obsc	12.06%	0
D [3.2]	4.53 µm	0.0189
D [3.3]	17.2 µm	0.0215
D [4.3]	33.3 µm	0.0244
Span	2.98	0
Mode	41.7 µm	0.0315
Dx [10]	2.76 µm	0.0358
Dx [50]	23.6 µm	0.0407
Dx [90]	73.2 µm	0.0463
Skew [3]	4.787	0.0526
Kurtosis [3]	42.984	0.0597
Result in R	5.52%	0.0679
Result in R	3.65%	0.0771
Result in R	7.84%	0.0876
Result in R	12.12%	0.0995
Result in R	71.70%	0.113
Result in R	54.27%	0.128
Result in R	12.72%	0.146
Result in R	1.18%	0.188
Result in R	0.43%	0.214
Result in R	0.06%	0.243
Result Belc	85.35%	0.275
Result Belc	29.13%	0.314
Result Belc	45.14%	0.357
Result Abo	0.00%	0.405
Dx [5]	0.761 µm	0.446
Dx [16]	4.66 µm	0.523
Dx [84]	59.9 µm	0.594
Dx [95]	92.4 µm	0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64

8.68	3.87
9.86	2.57
11.2	2.69
12.7	2.84
14.5	3.02
16.4	3.25
18.7	3.52
21.2	3.83
24.1	4.17
27.4	4.49
31.1	4.77
35.3	4.96
40.1	5
45.6	4.89
51.8	4.59
58.8	4.11

66.9	3.51
76	2.82
86.4	2.12
98.1	1.48
111	0.95
127	0.54
144	0.27

Coarse Silt	Medium Si Fine Silt	Very Fine S Clay
163	0.13	0.08
186	0.07	0.14
211	0.05	0.23
240	0.07	0.31
272	0.08	0.43
310	0.09	0.52
352	0.09	0.63
400	0.08	0.76
454	0.06	0.91
516	0.04	1.05
586	0	1.2
666	0	1.36
756	0	1.52
859	0	1.69
976	0	1.86
1110	0	2.01
1260	0	2.14
1430	0	2.26
1630	0	2.37
1850	0	2.48
2100	0	2.59
2390	0	2.7
2710	0	2.8
3080	0	2.9
3500	0	3

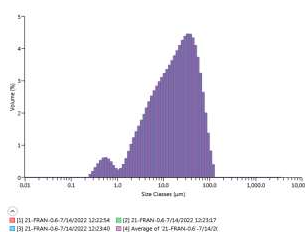


Result	Size (µm)	% Volume in
Concentration	0.01%	1/0/1900 0.14
Uniformity	1.019	1/0/1900 0.16
Specific Surface Area	1158 m ² /kg	1/0/1900 0.18
Result Units	Volume	1/0/1900 0.21
Laser Obscuration	11.84%	0.0167
D [3.2]	5.18 µm	0.0189
D [3.3]	14.2 µm	0.0215
D [4.3]	25.2 µm	0.0244
Span	3.265	0
Mode	35.1 µm	0.0315
Dx [10]	2.64 µm	0.0358
Dx [50]	17.5 µm	0.0407
Dx [90]	59.7 µm	0.0463
Skew [3]	1.303	0.0526
Kurtosis [3]	1.369	0.0597
Result in Range (0.1)	4.47%	0.0679
Result in Range (1.2)	4.92%	0.0771
Result in Range (2.5)	10.16%	0.0876
Result in Range (5.1)	15.25%	0.0995
Result in Range (3.5)	75.88%	0.113
Result in Range (20)	45.93%	0.128
Result in Range (63)	8.61%	0.146
Result in Range (12)	0.04%	0.166
Result in Range (25)	0.00%	0.188
Result in Range (50)	0.00%	0.214
Result Below (62.5)	91.15%	0.243
Result Below (10)	34.81%	0.275
Result Below (20)	54.07%	0.314
Result Above (1000)	0.00%	0.357
Dx [5]	1.29 µm	0.405
Dx [16]	4.08 µm	0.446
Dx [84]	48.8 µm	0.523
Dx [95]	74.2 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64

8.68	3.11
9.86	3.33
11.2	3.36
12.7	3.49
14.5	3.68
16.4	3.78
18.7	3.84
21.2	4.1
24.1	4.25
27.4	4.37
31.1	4.44
35.3	4.44
40.1	4.33
45.6	4.1
51.8	3.73
58.8	3.23

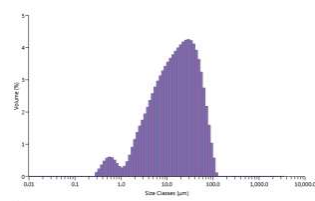
66.9	2.63
76	1.98
86.4	1.35
98.1	0.79
111	0.37
127	0
144	0
163	0
186	0
211	0

Coarse Silt	Medium Si Fine Silt	Very Fine S Clay
240	0	0.08
272	0	0.15
310	0	0.3
352	0	0.42
400	0	0.53
454	0	0.6
516	0	0.61
586	0	0.61
666	0	0.57
756	0	0.48
859	0	0.37
976	0	0.28
1110	0	0.24
1260	0	0.26
1430	0	0.4
1630	0	0.59
1850	0	0.81
2100	0	1.03
2390	0	1.23
2710	0	1.42
3080	0	1.6
3500	0	1.77



Result	Size (µm)	% Volume In
Concentra	0.01%	0.01
Uniformity	1.05	0.0114
Specific Su	1139 m ² /h	0.0129
Result Uni Volume	0.0147	0
Laser Obsc	12.01%	0.0167
D [3.2]	5.27 µm	0.0189
D [3.3]	13.0 µm	0.0215
D [4.3]	22.8 µm	0.0244
Span	3.403	0.0278
Mode	28.9 µm	0.0315
Dx (10)	2.58 µm	0.0358
Dx (50)	15.4 µm	0.0407
Dx (90)	54.9 µm	0.0463
Skew [3]	1.393	0.0526
Kurtosis [3]	1.661	0.0597
Result In R	4.13%	0.0679
Result In R	5.49%	0.0771
Result In R	11.10%	0.0876
Result In R	16.78%	0.0995
Result In R	77.00%	0.113
Result In R	41.80%	0.128
Result In R	6.77%	0.146
Result In R	0.01%	0.166
Result In R	0.00%	0.188
Result In R	0.00%	0.214
Result Belk	93.05%	0.243
Result Belc	37.51%	0.276
Result Belc	58.20%	0.314
Result Abc	0.00%	0.357
Dx (5)	1.39 µm	0.405
Dx (16)	3.89 µm	0.46
Dx (84)	44.3 µm	0.523
Dx (95)	68.8 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64

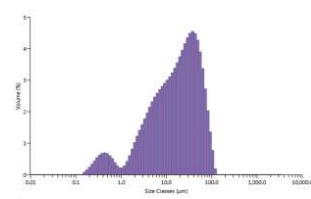
8.68	3.42
9.86	3.55
11.2	3.67
12.7	3.78
14.5	3.89
16.4	3.99
18.7	4.08
21.2	4.15
24.1	4.21
27.4	4.23
31.1	4.2
35.3	4.11
40.1	3.92
45.6	3.64
51.8	3.24
58.9	2.75



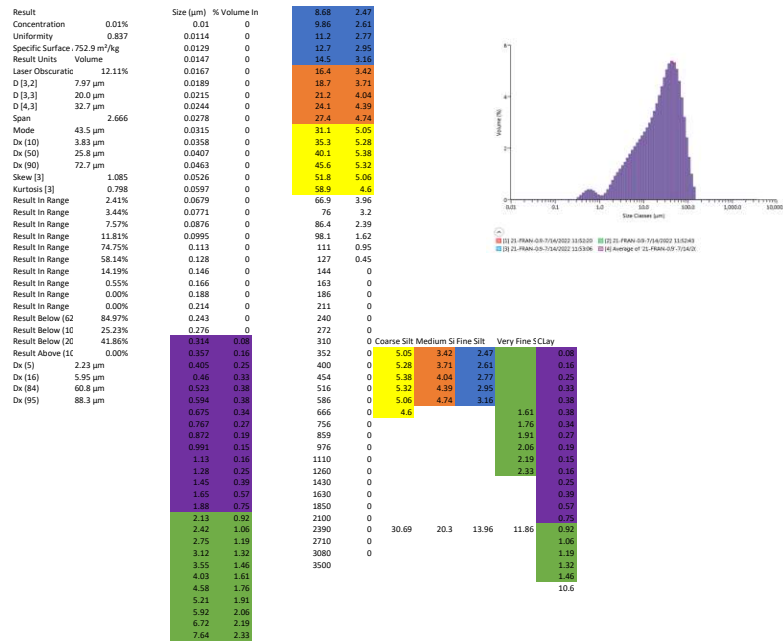
	Coarse Silt	Medium Si	Fine Silt	Very Fine S Clay
272	0	4.2	1.99	3.42
310	0	4.11	4.08	3.55
352	0	3.92	4.15	3.67
400	0	3.64	4.21	3.78
454	0	3.24	4.23	3.89
516	0	2.75		
586	0			2.36
666	0			2.57
756	0			2.77
859	0			2.96
976	0			3.13
1110	0			3.28
1260	0			0.32
1430	0			0.46
1630	0			0.66
1850	0			0.9
2100	0			1.14
2390	21.86	20.66	18.31	17.07
2710	0			1.37
3080	0			1.56
3500	0			1.75
				1.94
				2.14
				16.62

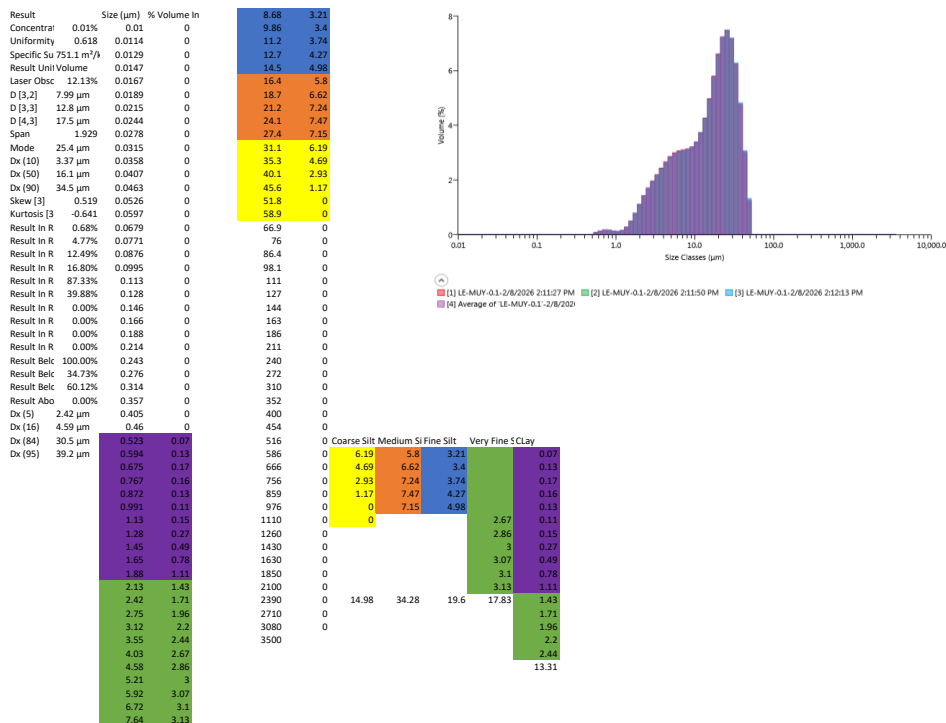
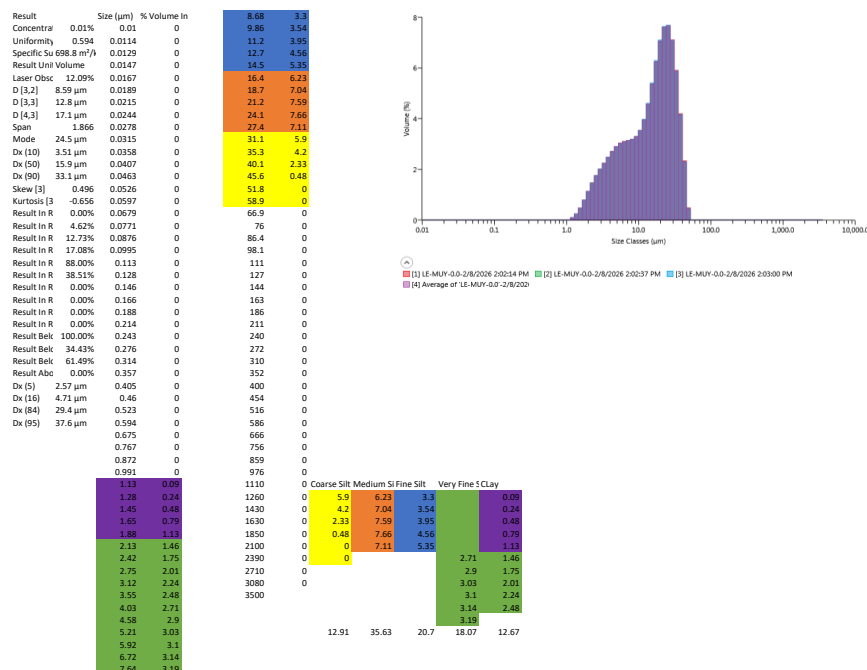
Result	Size (µm)	% Volume In
Concentra	0.01%	0.01
Uniformity	1.036	0.0114
Specific Su	1635 m ² /h	0.0129
Result Uni Volume	0.0147	0
Laser Obsc	12.08%	0.0167
D [3.2]	3.67 µm	0.0189
D [3.3]	13.2 µm	0.0215
D [4.3]	25.0 µm	0.0244
Span	3.301	0.0278
Mode	37.4 µm	0.0315
Dx (10)	2.19 µm	0.0358
Dx (50)	17.4 µm	0.0407
Dx (90)	59.7 µm	0.0463
Skew [3]	1.213	0.0526
Kurtosis [3]	1.018	0.0597
Result In R	6.42%	0.0679
Result In R	4.90%	0.0771
Result In R	10.09%	0.0876
Result In R	14.54%	0.0995
Result In R	74.01%	0.113
Result In R	46.07%	0.128
Result In R	8.58%	0.146
Result In R	0.02%	0.166
Result In R	0.00%	0.188
Result In R	0.00%	0.214
Result Belc	91.19%	0.243
Result Belk	35.96%	0.276
Result Belc	53.93%	0.314
Result Abc	0.00%	0.357
Dx (5)	0.592 µm	0.405
Dx (16)	3.61 µm	0.46
Dx (84)	49.2 µm	0.523
Dx (95)	73.6 µm	0.594
		0.675
		0.767
		0.872
		0.991
		1.13
		1.28
		1.45
		1.65
		1.88
		2.13
		2.42
		2.75
		3.12
		3.55
		4.03
		4.58
		5.21
		5.92
		6.72
		7.64

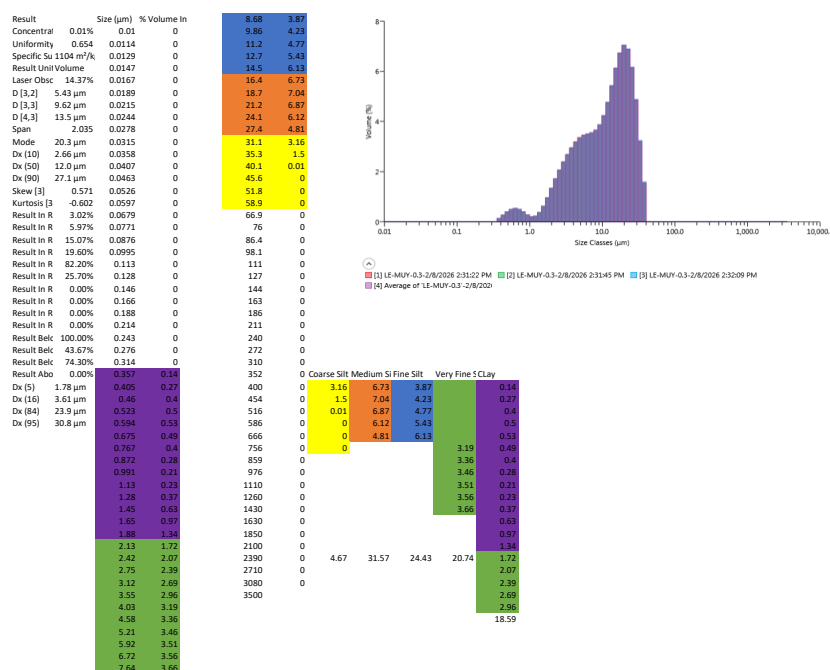
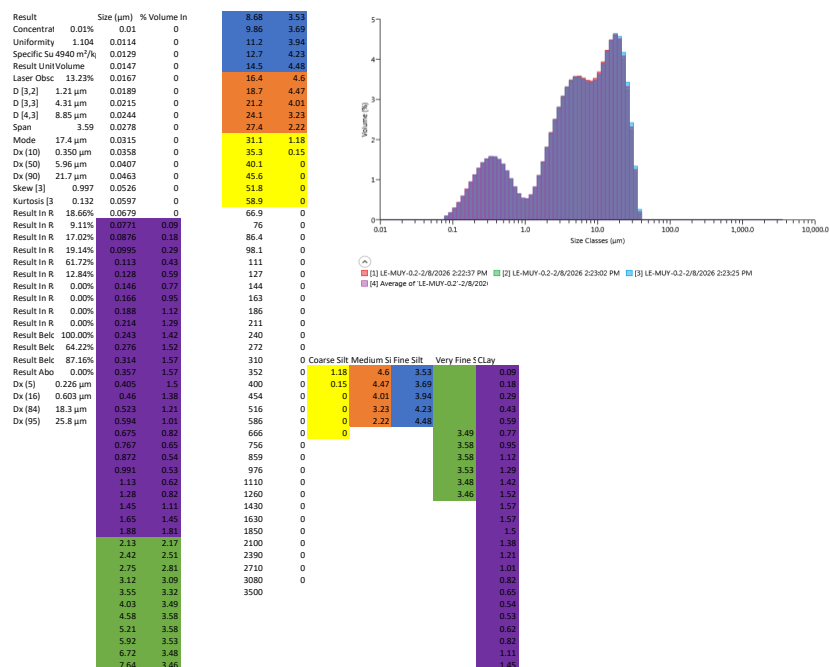
8.68	2.9
9.86	3
11.2	3.11
12.7	3.24
14.5	3.38
16.4	3.55
18.7	3.74
21.2	3.94
24.1	4.15
27.4	4.33
31.1	4.47
35.3	4.52
40.1	4.45
45.6	4.24
51.8	3.87
58.9	3.35

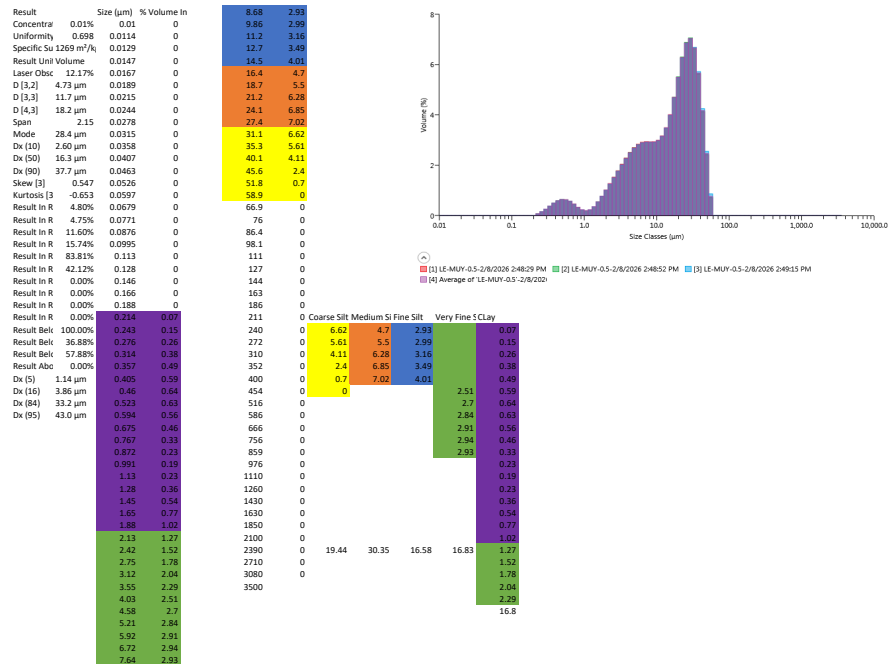
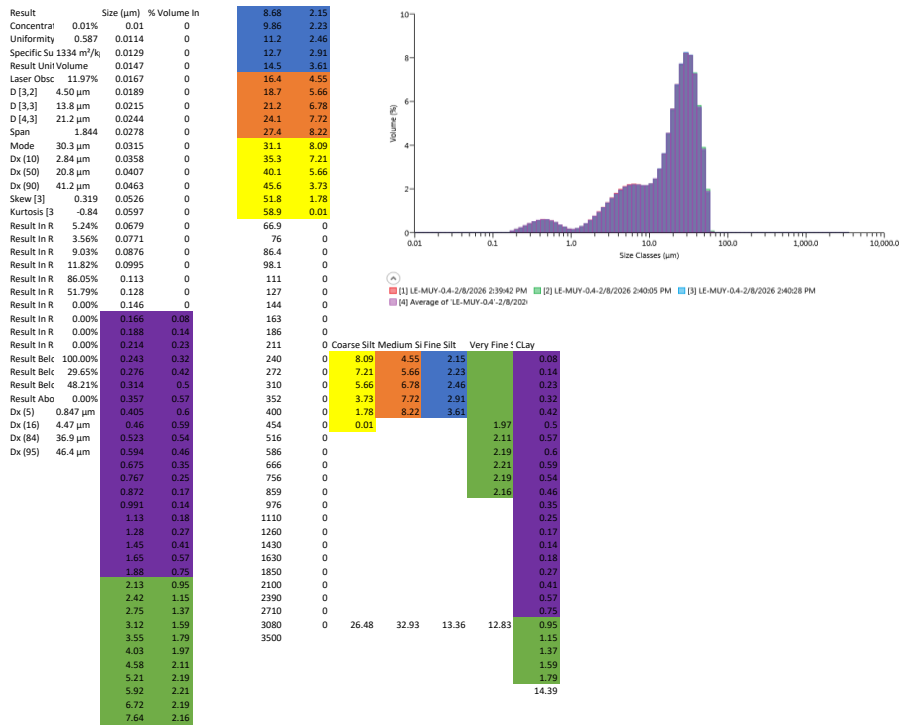


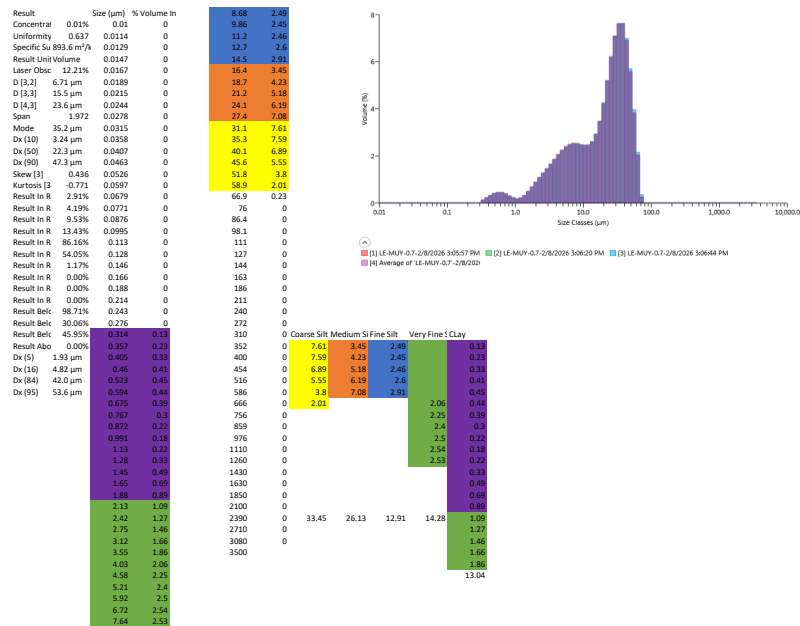
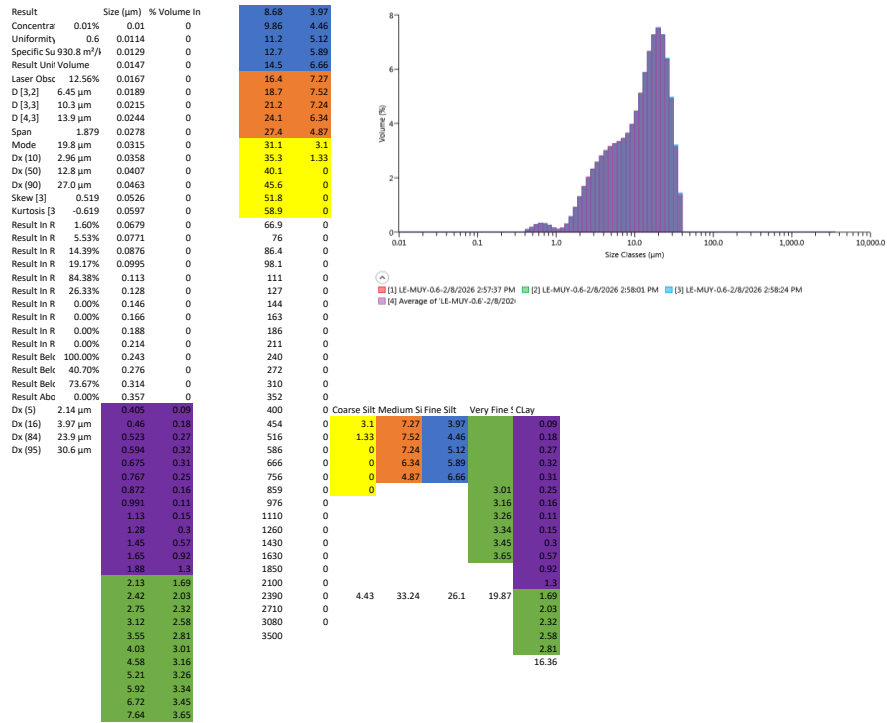
	Coarse Silt	Medium Si	Fine Silt	Very Fine S Clay
144	0	4.47	3.55	2.9
163	0	4.52	3.74	3
186	0	4.45	3.94	3.11
211	0	4.24	4.15	3.24
240	0	3.87	4.33	3.38
272	0	3.35		
310	0			2.14
352	0			2.31
400	0			2.46
454	0			2.59
516	0			2.7
586	0			2.8
666	0			0.5
756	0			0.38
859	0			0.28
976	0			0.31
1110	0			0.31
1260	0			0.28
1430	0			0.42
1630	0			0.6
1850	0			0.81
2100	0			1.02
2390	24.9	19.71	15.63	15
2710	0			1.22
3080	0			1.41
3500	0			1.59
				1.77
				1.96
				17.69



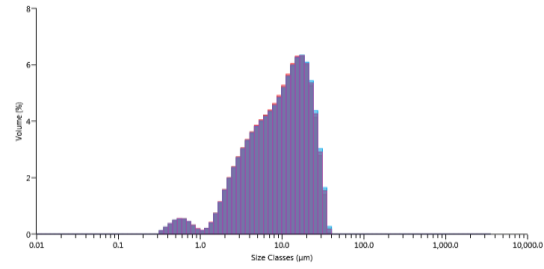








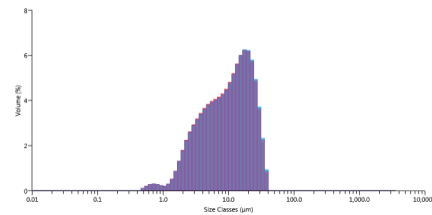
Result	Size (µm)	% Volume In	
Concentra	0.01%	0.01	0
Uniformity	0.675	0.0114	0
Specific Su 1247 m ² /kg	0.0129	0	0
Result Uni Volume	0.0147	0	0
Laser Obsc	12.28%	0.0167	0
D [3.2]	4.81 µm	0.0189	0
D [3.3]	8.22 µm	0.0215	0
D [4.3]	11.4 µm	0.0244	0
Span	2.139	0.0278	0
Mode	16.6 µm	0.0315	0
Dx [10]	2.48 µm	0.0358	0
Dx [50]	9.67 µm	0.0407	0
Dx [90]	23.2 µm	0.0463	0
Skew [3]	0.722	0.0526	0
Kurtosis [3]	-0.294	0.0597	0
Result In R	3.30%	0.0679	0
Result In R	6.83%	0.0771	0
Result In R	17.19%	0.0876	0
Result In R	24.02%	0.0995	0
Result In R	79.81%	0.113	0
Result In R	16.39%	0.128	0
Result In R	0.00%	0.146	0
Result In R	0.00%	0.166	0
Result In R	0.00%	0.188	0
Result In R	0.00%	0.214	0
Result Belc	100.00%	0.243	0
Result Belc	51.34%	0.276	0
Result Belc	83.61%	0.314	0.12
Result Abo	0.00%	0.357	0.24
Dx [5]	1.69 µm	0.405	0.38
Dx [16]	3.30 µm	0.46	0.49
Dx [84]	20.2 µm	0.523	0.55
Dx [95]	26.7 µm	0.584	0.54
		0.675	0.45
		0.767	0.32
		0.872	0.19
		0.991	0.14
		1.13	0.21
		1.28	0.42
		1.45	0.76
		1.65	1.15
		1.88	1.58
		2.13	2
		2.42	2.39
		2.75	2.74
		3.12	3.06
		3.55	3.35
		4.03	3.62
		4.58	3.85
		5.21	4.05
		5.92	4.22
		6.72	4.4
		7.64	4.62



[1] LE-MUY-0.8-2/8/2026 3:14:32 PM [2] LE-MUY-0.8-2/8/2026 3:14:55 PM [3] LE-MUY-0.8-2/8/2026 3:15:19 PM
 [4] Average of LE-MUY-0.8-2/8/2026

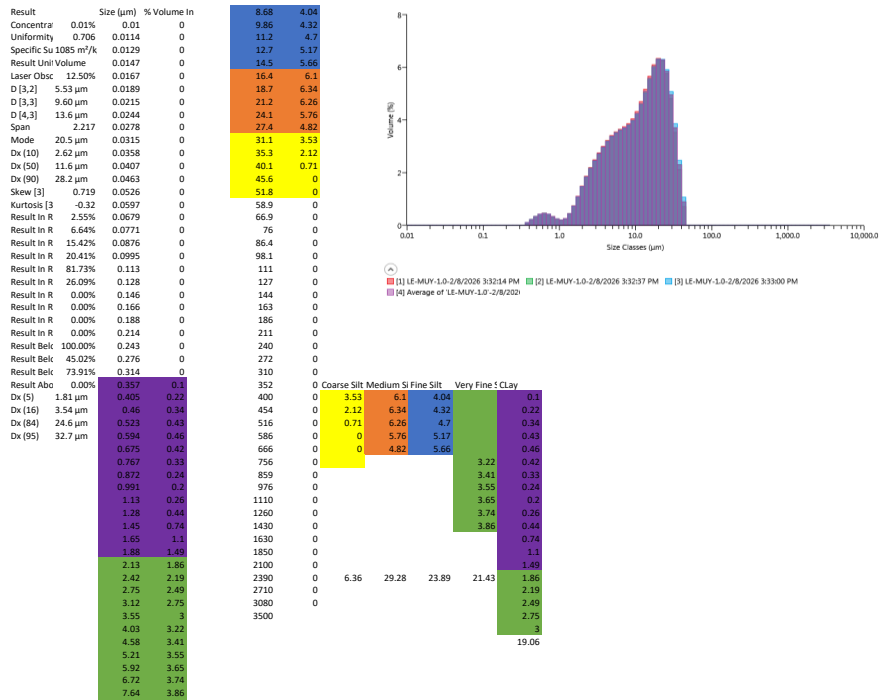
	Coarse Silt	Medium Si	Fine Silt	Very Fine S	Clay
0	1.41	6.33	4.91	0.12	
0	0.05	6	5.27	0.24	
0	0	5.26	5.67	0.38	
0	0	4.14	6.04	0.49	
0	0	2.78	6.3	0.55	
0				3.62	0.54
0				3.85	0.45
0				4.05	0.32
0				4.22	0.19
0				4.4	0.14
0				4.62	0.21
0					0.42
0					0.74
0					1.15
0					1.58
1.46	24.51	28.19	24.76	2	
0				2.39	
0				2.74	
0				3.06	
0				3.35	
0				3.62	
0				3.85	
0				4.05	
0				4.22	
0				4.4	
0				4.62	
0					21.06

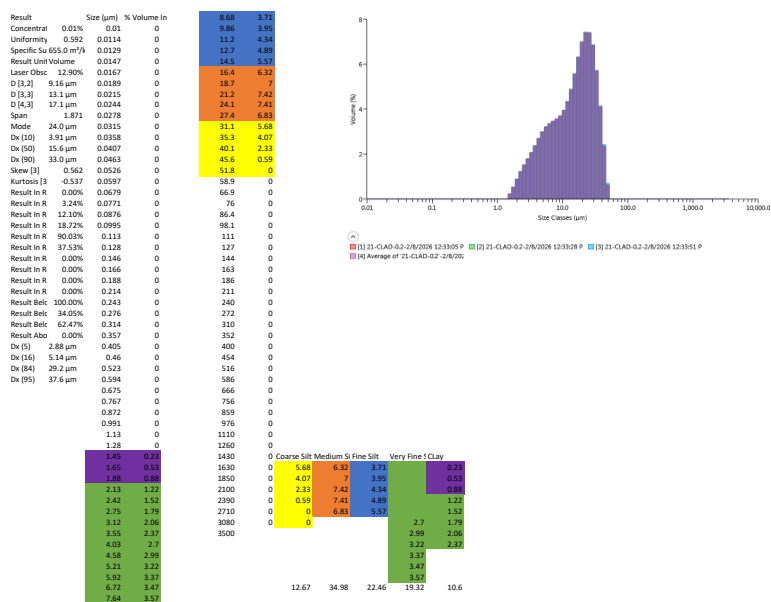
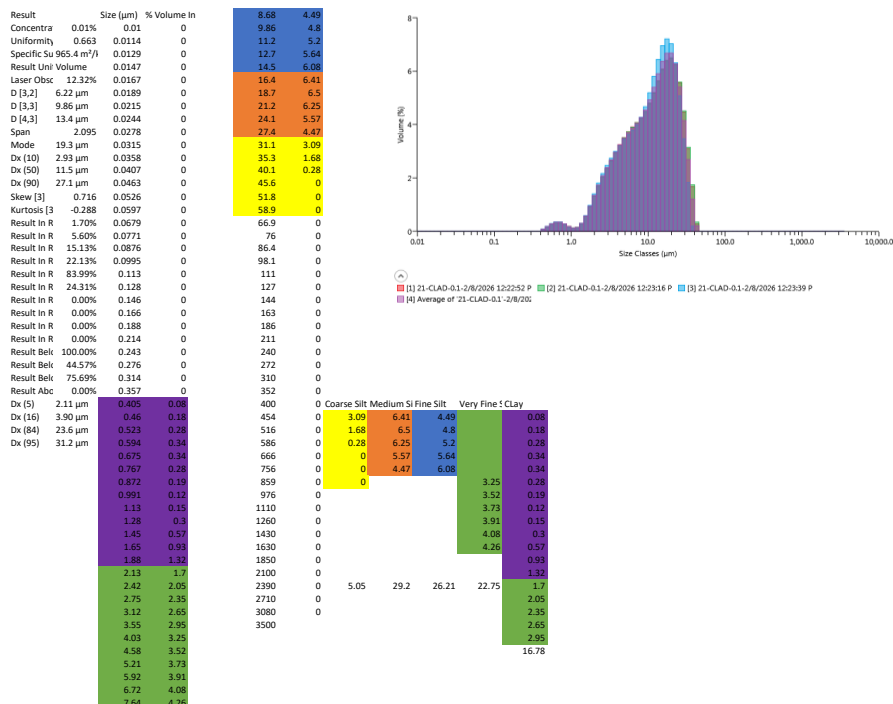
Result	Size (µm)	% Volume In	
Concentra	0.01%	0.01	0
Uniformity	0.703	0.0114	0
Specific Su 1250 m ² /kg	0.0129	0	0
Result Uni Volume	0.0147	0	0
Laser Obsc	11.96%	0.0167	0
D [3.2]	5.72 µm	0.0189	0
D [3.3]	8.78 µm	0.0215	0
D [4.3]	12.0 µm	0.0244	0
Span	2.21	0.0278	0
Mode	18.0 µm	0.0315	0
Dx [10]	2.59 µm	0.0358	0
Dx [50]	10.1 µm	0.0407	0
Dx [90]	24.8 µm	0.0463	0
Skew [3]	0.765	0.0526	0
Kurtosis [3]	-0.245	0.0597	0
Result In R	1.41%	0.0679	0
Result In R	7.88%	0.0771	0
Result In R	17.76%	0.0876	0
Result In R	22.72%	0.0995	0
Result In R	80.13%	0.113	0
Result In R	19.60%	0.128	0
Result In R	0.00%	0.146	0
Result In R	0.00%	0.166	0
Result In R	0.00%	0.188	0
Result In R	0.00%	0.214	0
Result Belc	100.00%	0.243	0
Result Belc	49.76%	0.276	0
Result Belc	80.40%	0.314	0
Result Abo	0.00%	0.357	0
Dx [5]	1.93 µm	0.405	0
Dx [16]	3.36 µm	0.46	0.11
Dx [84]	21.6 µm	0.523	0.2
Dx [95]	28.8 µm	0.584	0.28
		0.675	0.3
		0.767	0.17
		0.872	0.22
		0.991	0.21
		1.13	0.28
		1.28	0.51
		1.45	0.87
		1.65	1.32
		1.88	1.79
		2.13	2.34
		2.42	2.82
		2.75	3.3
		3.12	3.79
		3.55	4.3
		4.03	4.85
		4.58	5.38
		5.21	5.96
		5.92	6.56
		6.72	7.15
		7.64	7.78

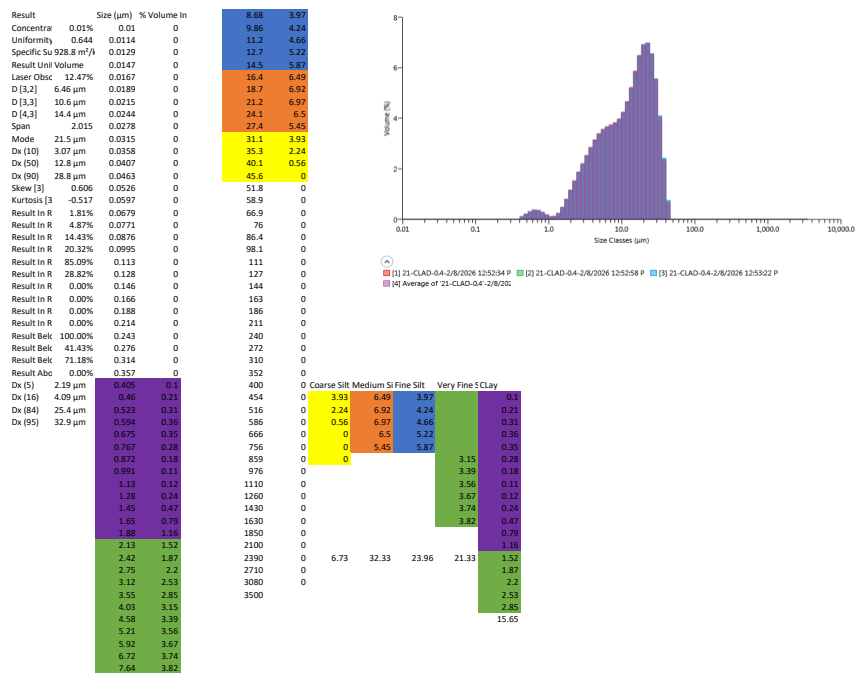
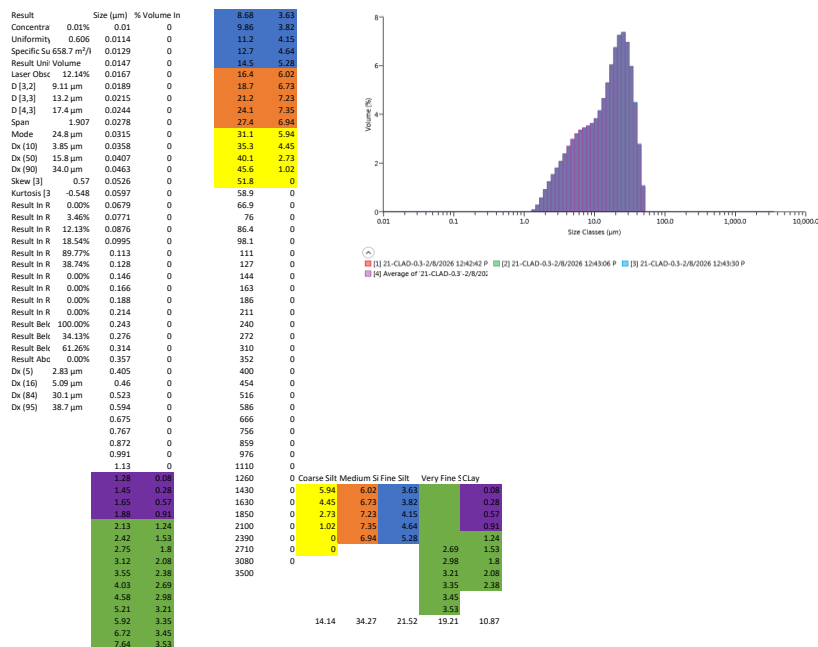


[1] LE-MUY-0.9-2/8/2026 3:23:08 PM [2] LE-MUY-0.9-2/8/2026 3:23:29 PM [3] LE-MUY-0.9-2/8/2026 3:23:53 PM
 [4] Average of LE-MUY-0.9-2/8/2026

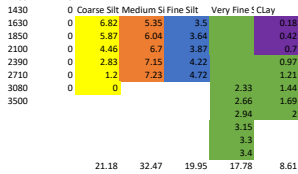
	Coarse Silt	Medium Si	Fine Silt	Very Fine S	Clay
0	2.12	6.33	4.91	0.12	
0	0.73	6.14	4.81	0.2	
0	0	5.66	5.2	0.28	
0	0	4.76	5.62	0.3	
0	0	3.51	6	0.27	
0				3.65	0.22
0				3.89	0.14
0				3.96	0.29
0				4.06	0.51
0				4.15	0.87
0				4.29	1.32
0					1.79
2.85	26.29	26.13	23.94	2.24	
0				2.62	
0				2.92	
0				3.19	
0				3.46	
0				3.79	
0				4.06	
0				4.35	
0				4.62	
0				4.91	
0				5.2	
0				5.52	
0				5.85	
0				6.18	
0				6.52	
0				6.87	
0				7.22	
0				7.58	
0				7.94	
0				8.31	
0				8.68	
0				9.05	
0				9.42	
0				9.8	
0				10.18	
0				10.56	
0				10.94	
0				11.32	
0				11.7	
0				12.08	
0				12.46	
0				12.84	
0				13.22	
0				13.6	
0				13.98	
0				14.36	
0				14.74	
0				15.12	
0				15.5	
0				15.88	
0				16.26	
0				16.64	
0				17.02	
0				17.4	
0				17.78	
0				18.16	
0				18.54	
0				18.92	
0				19.3	
0				19.68	
0				20.06	
0				20.44	
0				20.82	
0				21.2	
0				21.58	
0				21.96	
0				22.34	
0				22.72	
0				23.1	
0				23.48	
0				23.86	
0				24.24	
0				24.62	
0				25	
0				25.38	
0				25.76	
0				26.14	
0				26.52	
0				26.9	
0				27.28	
0				27.66	
0				28.04	
0				28.42	
0				28.8	
0				29.18	
0				29.56	
0				29.94	
0				30.32	
0				30.7	
0				31.08	
0				31.46	
0				31.84	
0				32.22	
0				32.6	
0				32.98	
0				33.36	
0				33.74	
0				34.12	
0				34.5	
0				34.88	
0				35.26	
0				35.64	
0				36.02	
0				36.4	
0				36.78	
0				37.16	
0				37.54	
0				37.92	
0				38.3	
0				38.68	
0				39.06	
0				39.44	
0				39.82	
0				40.2	
0				40.58	
0				40.96	
0				41.34	
0				41.72	
0				42.1	
0				42.48	
0				42.86	
0				43.24	
0				43.62	
0				44	
0				44.38	
0				44.76	
0				45.14	
0				45.52	
0				45.9	
0				46.28	
0				46.66	
0				47.04	
0				47.42	
0				47.8	
0				48.18	
0				48.56	
0				48.94	
0				49.32	
0				49.7	
0				50.08	
0				50.46	
0				50.84	
0				51.22	
0				51.6	
0				51.98	
0				52.36	
0				52.74	
0				53.12	
0				53.5	
0				53.88	
0				54.26	
0				54.64	
0				55.02	
0				55.4	
0				55.78	
0				56.16	
0				56.54	
0				56.92	
0				57.3	
0				57.68	
0				58.06	
0				58.44	
0				58.82	
0				59.2	
0				59.58	
0				59.96	
0				60.34	
0				60.72	
0				61.1	
0				61.48	
0				61.86	
0				62.24	
0				62.62	
0				63	



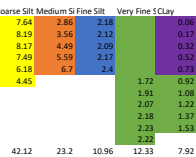




1.45	0.18
1.65	0.42
1.88	0.7
2.13	0.97
2.42	1.21
2.75	1.44
3.12	1.69
3.55	2
4.03	2.33
4.58	2.66
5.21	2.94
5.92	3.15
6.72	3.3
7.64	3.4



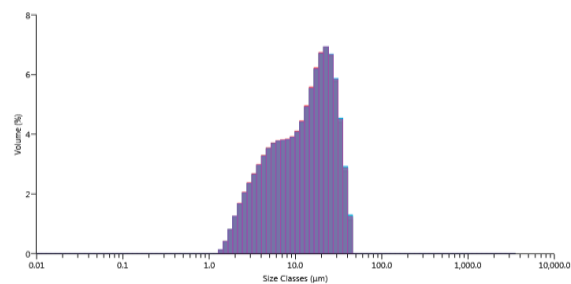
1.13	0.06
1.28	0.17
1.45	0.32
1.65	0.52
1.88	0.73
2.13	0.92
2.42	1.08
2.75	1.22
3.12	1.37
3.55	1.53
4.03	1.72
4.58	1.91
5.21	2.07
5.92	2.18
6.72	2.23
7.64	2.22



Result	Size (µm)	% Volume In
Concentration	0.01%	0
Uniformity	0.65	0
Specific Surface Area	765.8 m ² /g	0
Result Unit Volume	0.0147	0
Laser Obsc	12.12%	0
D [3,2]	7.84 µm	0
D [3,3]	11.2 µm	0
D [4,3]	15.0 µm	0
Span	2.033	0
Mode	22.3 µm	0
Dx (10)	3.32 µm	0
Dx (50)	13.1 µm	0
Dx (90)	30.0 µm	0
Skew [3]	0.639	0
Kurtosis [3]	-0.504	0
Result In R	0.0079	0
Result In R	4.82%	0
Result In R	15.28%	0
Result In R	20.65%	0
Result In R	86.40%	0
Result In R	30.75%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result Belk	100.00%	0
Result Belk	40.75%	0
Result Belk	69.25%	0
Result Abc	0.000%	0
Dx (5)	2.53 µm	0
Dx (16)	4.29 µm	0
Dx (84)	26.4 µm	0
Dx (95)	34.2 µm	0

1.28	0.13
1.45	0.41
1.65	0.81
1.98	1.26
2.13	1.69
2.42	2.05
2.75	2.37
3.12	2.68
3.55	2.99
4.03	3.29
4.58	3.54
5.21	3.71
5.92	3.79
6.72	3.82
7.64	3.84

8.68	3.92
9.86	4.1
11.2	4.45
12.7	4.95
14.5	5.58
16.4	6.23
18.7	6.74
21.2	6.93
24.1	6.64
27.4	5.77
31.1	4.41
35.3	2.77
40.1	1.14
45.6	0
51.8	0
58.9	0



[1] 21-CLAD-0.8-2/R/2026 1:30:35 Ph [2] 21-CLAD-0.8-2/R/2026 1:30:58 Ph [3] 21-CLAD-0.8-2/R/2026 1:31:21 Ph
 [4] Average of 21-CLAD-0.8-2/R/2026

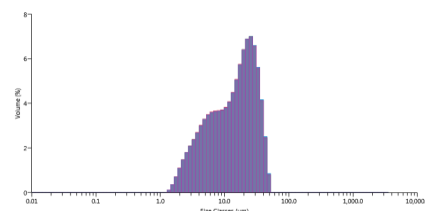
	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
0	4.41	6.23	3.92	0.13	
0	2.77	6.74	4.1	0.41	
0	1.14	6.93	4.45	0.81	
0	0	6.64	4.95	1.26	
0	0	5.77	5.58	1.69	
0	0	0	0	2.05	
0	0	0	0	2.37	
0	0	0	0	2.68	
0	0	0	0	2.99	
0	0	0	0	3.29	
0	0	0	0	3.54	
0	0	0	0	3.71	
0	0	0	0	3.79	
0	0	0	0	3.82	
0	0	0	0	3.84	

8.32 32.31 23 18.7 14.39

Result	Size (µm)	% Volume In
Concentration	0.01%	0
Uniformity	0.649	0
Specific Surface Area	710.3 m ² /g	0
Result Unit Volume	0.0147	0
Laser Obsc	12.38%	0
D [3,2]	8.45 µm	0
D [3,3]	12.3 µm	0
D [4,3]	16.6 µm	0
Span	2.026	0
Mode	24.7 µm	0
Dx (10)	3.55 µm	0
Dx (50)	14.4 µm	0
Dx (90)	33.2 µm	0
Skew [3]	0.636	0
Kurtosis [3]	-0.51	0
Result In R	0.0079	0
Result In R	4.18%	0
Result In R	13.76%	0
Result In R	19.61%	0
Result In R	88.03%	0
Result In R	36.19%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result In R	0.000%	0
Result Belk	100.00%	0
Result Belk	37.55%	0
Result Belk	63.81%	0
Result Abc	0.000%	0
Dx (5)	2.65 µm	0
Dx (16)	4.64 µm	0
Dx (84)	29.2 µm	0
Dx (95)	38.0 µm	0

1.28	0.13
1.45	0.35
1.65	0.7
1.98	1.09
2.13	1.47
2.42	1.8
2.75	2.09
3.12	2.36
3.55	2.69
4.03	3.01
4.58	3.29
5.21	3.5
5.92	3.61
6.72	3.65
7.64	3.67

8.68	3.71
9.86	3.82
11.2	4.07
12.7	4.49
14.5	5.07
16.4	5.75
18.7	6.41
21.2	6.88
24.1	6.96
27.4	6.55
31.1	5.55
35.3	4.09
40.1	2.41
45.6	0.77
51.8	0
58.9	0



[1] 21-CLAD-0.7-2/R/2026 1:21:58 Ph [2] 21-CLAD-0.7-2/R/2026 1:22:01 Ph [3] 21-CLAD-0.7-2/R/2026 1:22:45 Ph
 [4] Average of 21-CLAD-0.7-2/R/2026

	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay
0	5.55	5.75	3.71	0.13	
0	4.09	6.41	3.82	0.35	
0	2.43	6.88	4.07	0.7	
0	0.77	6.96	4.49	1.09	
0	0	6.55	5.07	1.47	
0	0	0	0	1.8	
0	0	0	0	2.09	
0	0	0	0	2.36	
0	0	0	0	2.69	
0	0	0	0	3.01	
0	0	0	0	3.29	
0	0	0	0	3.5	
0	0	0	0	3.61	
0	0	0	0	3.65	
0	0	0	0	3.67	

12.84 32.57 21.16 20.73 12.68

