



Supplement of

Transport of heavy minerals and heavy anthropogenic particles in the Rio Sella catchment and along the adjacent coast, northern Spain

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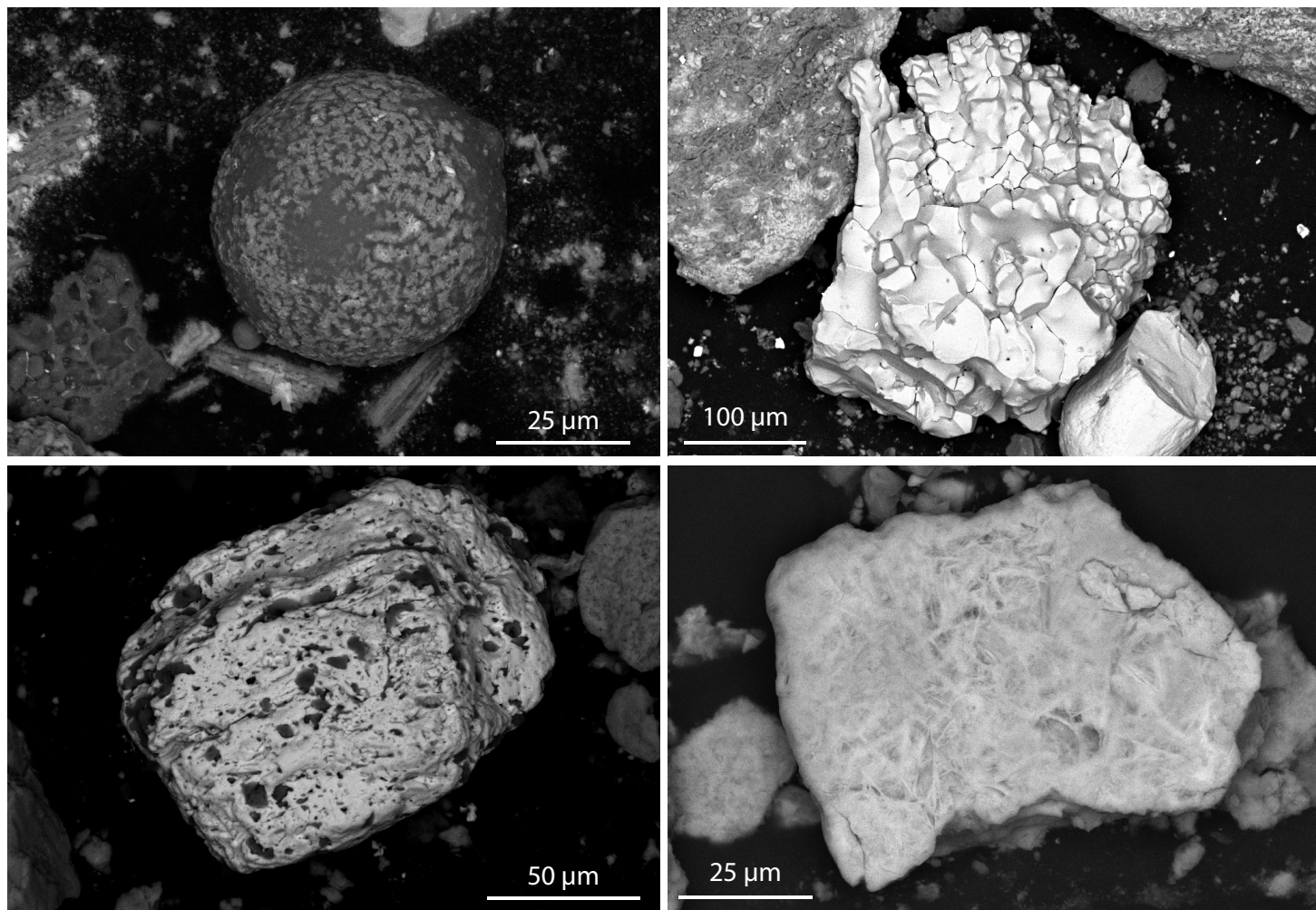


Figure S1: Overview of typical HAP found within the modern sediments. Upper left: glassy spherule with magnetitic dendritic crystals on its surface; note the smaller glass sphere to the lower left and the slag at lower left corner. Upper right: Fe⁺⁺ particle with traces of Mn. Lower left: HAP with abundant REE in the bright areas, e.g. La (~10 mass%), Ce (~24 mass%), Pr (~3 mass%), Nd (~9 mass%), Sm (~1 mass%), Y (~1 mass%) and traces of Gd. Lower right: Fe⁺⁺ particle with about 2 mass% Ni.

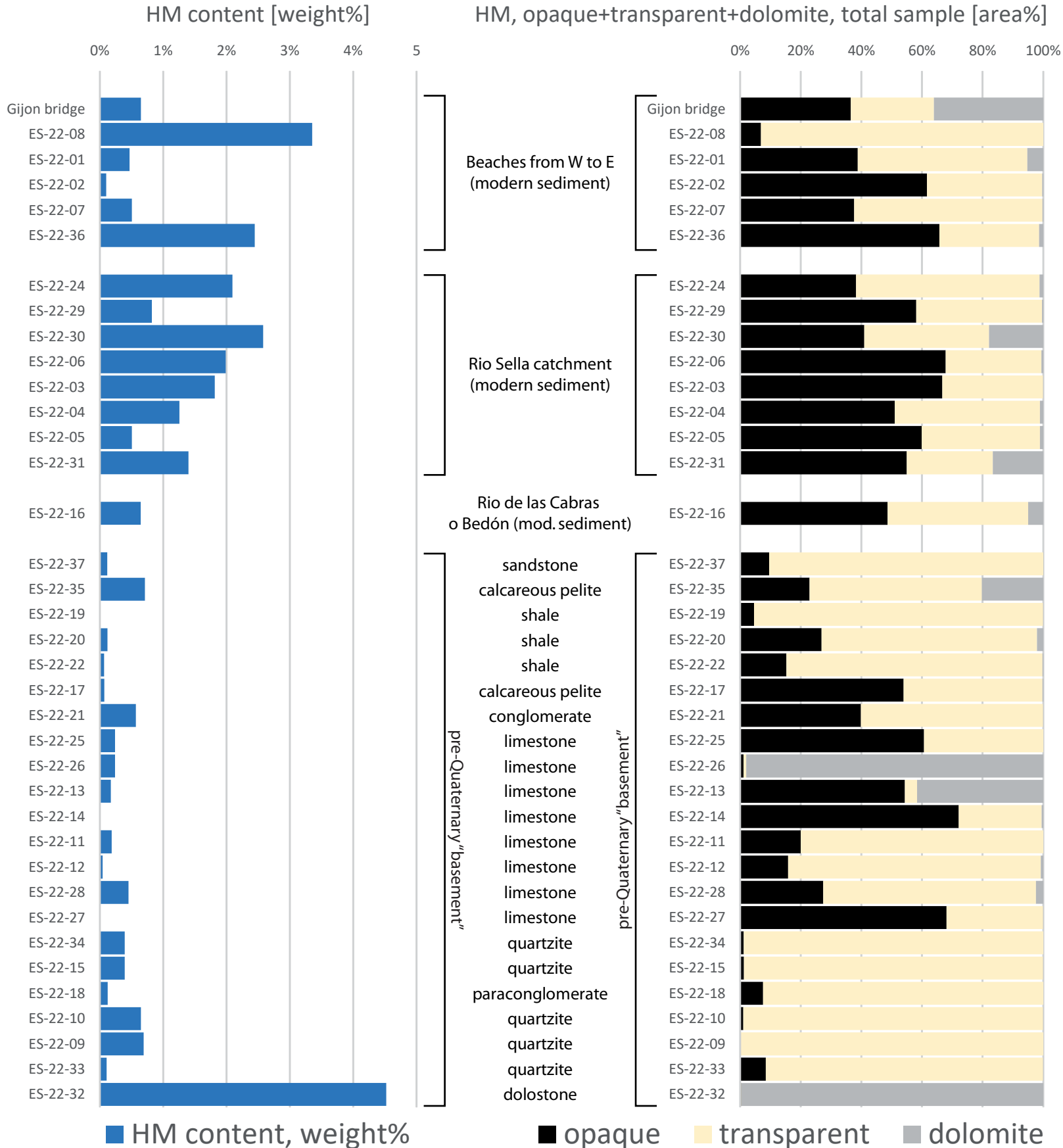


Figure S2: Left side: Heavy mineral content of each sample in weight%; right side: Proportions of opaque and transparent heavy minerals as well as dolomite in area% of the total grain size range.

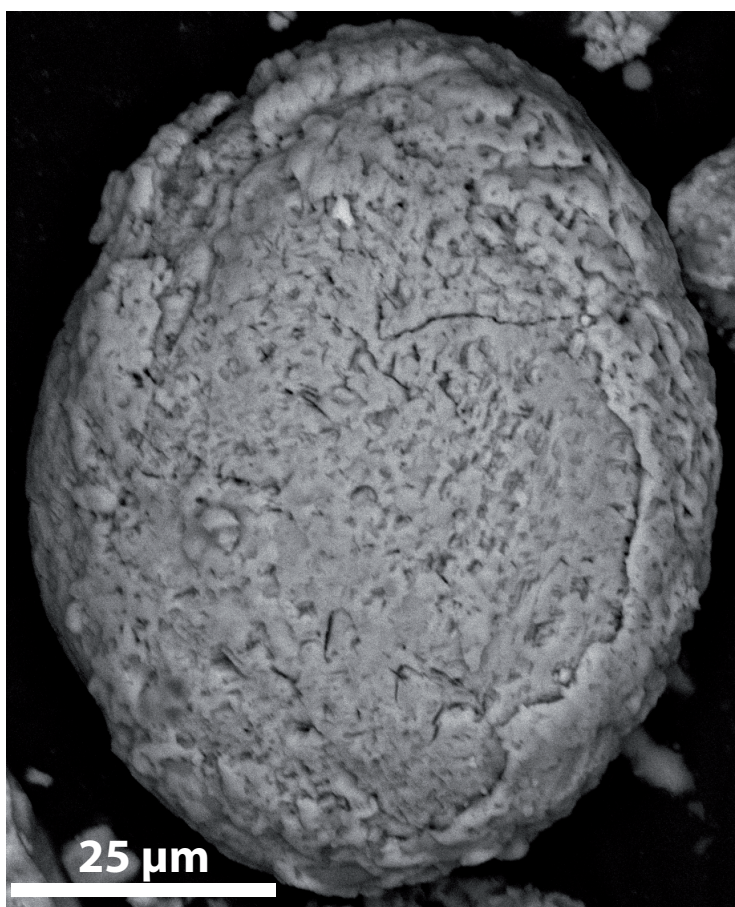


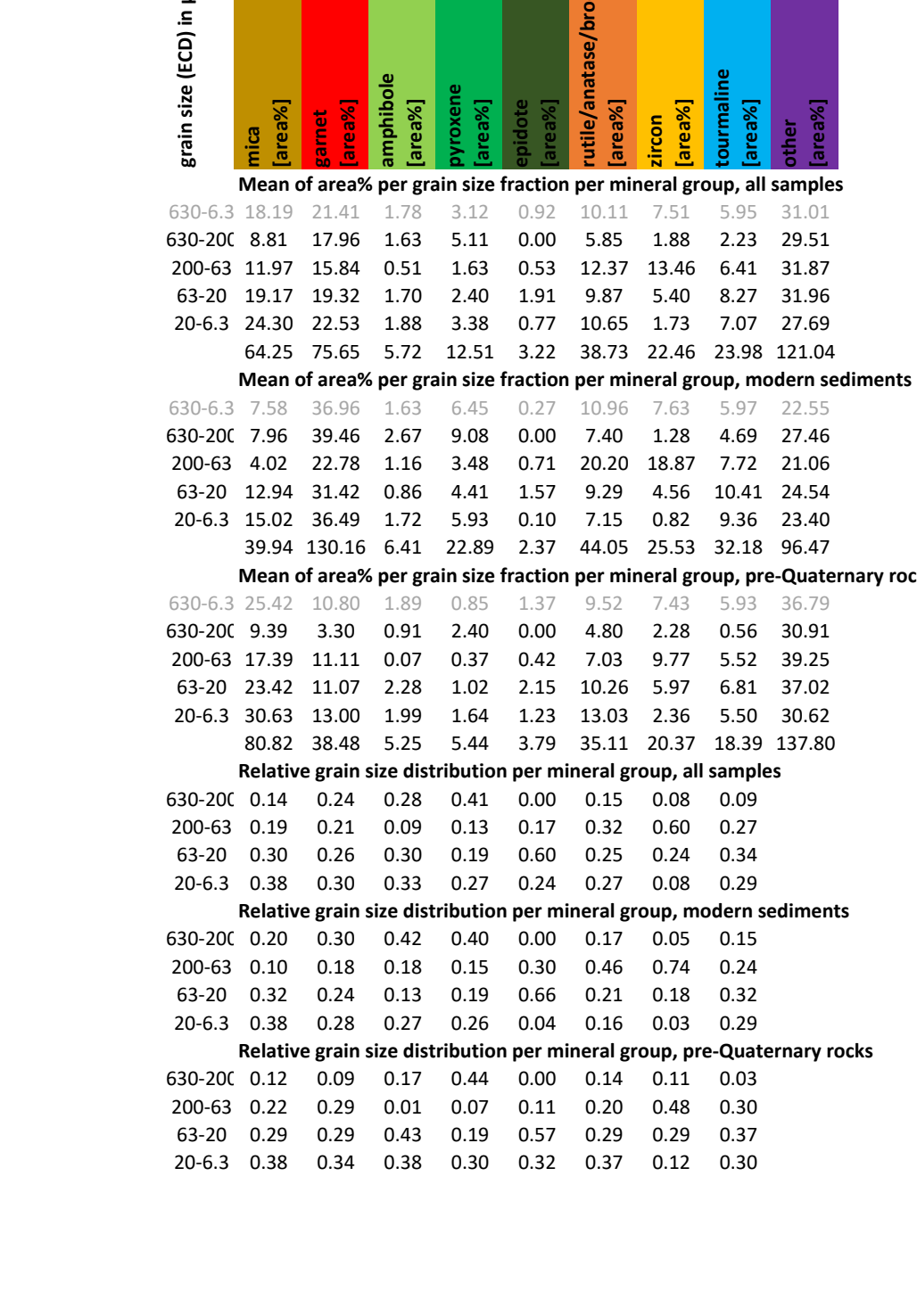
Figure S3: Exemplary image of a heavily pitted and corroded apatite from the Rio Sella catchment.

Table S1: Detailed data for all samples presented in this study: a) sample locations and stratigraphy, b) grain size distribution of selected heavy minerals from all, modern and pre-Quaternary samples, c) grain size distribution of heavy minerals for all samples in grain size fractions 630-6.3 µm, 630-200 µm, 200-63 µm, 63-20 µm, 20-6.3 µm in area%, d) grain size distribution of heavy minerals for all samples in grain size fractions 630-6.3 µm, 630-200 µm, 200-63 µm, 63-20 µm, 20-6.3 µm in grain%.

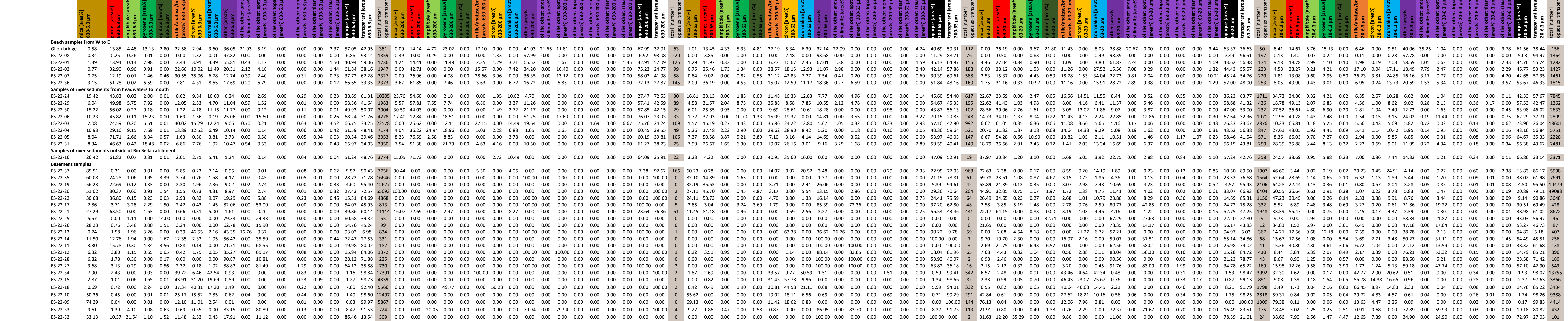
a)

sample ID	location	rock type	latitude	longitude	stratigraphic age
Beach samples from W to E					
Gijón bridge	playa Gijón / Rio Piles	beach/fluvial sediment	43.541083	-5.645167	modern / Holocene
E5-22-08	playa de Vega	beach sediment	43.480000	-5.139740	modern / Holocene
E5-22-05	glaua Ribadeneira	beach sediment	43.460760	-5.066660	modern / Holocene
E5-22-02	playa de St. Antonio	beach sediment	43.442030	-4.875380	modern / Holocene
E5-22-07	playa Colera	beach sediment	43.431570	-4.808870	modern / Holocene
E5-22-36	playa de Lauña	beach sediment	43.391720	-4.220700	modern / Holocene
Samples of river sediments from headwaters to mouth					
E5-22-24	Arroyo de Fonseña	fluvial sediment	43.126480	-5.093730	modern / Holocene
E5-22-29	Rio Ponga	fluvial sediment	43.275700	-5.148760	modern / Holocene
E5-22-30	Rio Sella	fluvial sediment	43.295670	-5.135710	modern / Holocene
E5-22-06	Rio Renaua o Cavadonga	fluvial sediment	43.342070	-5.083600	modern / Holocene
E5-22-03	Rio Pehola	fluvial sediment	43.357880	-5.051000	modern / Holocene
E5-22-04	Rio Pehola	fluvial sediment	43.368000	-5.243080	modern / Holocene
E5-22-05	Rio Sella	fluvial sediment	43.387510	-5.100400	modern / Holocene
E5-22-31	Rio Sella	fluvial sediment	43.411300	-5.122360	modern / Holocene
Samples of river sediments outside of Rio Sella catchment					
E5-22-16	Rio de las Cabras o Beón	fluvial sediment	43.438520	-4.817300	modern / Holocene
Basement samples					
E5-22-37	Buelba Fm., Siliclastic Mbr.	sandstone	43.394490	-4.219570	Cretaceous, Late Albian
E5-22-35	Tereñes y Laitres Fm.	shale	43.660970	-5.056660	Jurassic, Late Malm
E5-22-19	Pontón Gp.	shale	43.100450	-5.039210	Carboniferous, Gzhelian to Kasimovian (Early Steфанian)
E5-22-20	Pontón Gp.	shale	43.100490	-5.020210	Carboniferous, Early Kasimovian
E5-22-22	Lechada Fm.	shale	43.100880	-5.030070	Carboniferous, Kasimovian-Bashkirian (Westfalian A)
E5-22-17	no Fm. name, No 12 on map	calcareous pelite	43.431077	-4.872061	Carboniferous, Kasimovian (Stephanian)
E5-22-21	Lechada Fm.	conglomerate, matrix	43.104300	-5.028400	Carboniferous, Moscovian
E5-22-25	"Caltza de Montaña"	limestone	43.207390	-5.051070	Carboniferous, Bashkirian-Serpukhovian (Namurian)
E5-22-26	"Caltza de Montaña"	limestone	43.208490	-5.090720	Carboniferous, Bashkirian-Serpukhovian (Namurian)
E5-22-14	Bañalón Fm.	limestone, white	43.444030	-4.862700	Carboniferous, Bashkirian-Serpukhovian (Namurian)
E5-22-14	Caliza "gritosa"/Grioto Fm. and equivalents	limestone, black, "Sinkinkai"	43.443430	-4.862630	Carboniferous, Serpukhovian-Visean (perfect Namurian)
E5-22-11	Caliza "gritosa"/Grioto Fm. and equivalents	limestone, red	43.442930	-4.861630	Carboniferous, Visean
E5-22-12	Caliza "gritosa"/Grioto Fm. and equivalents	limestone, red	43.443220	-4.861630	Carboniferous, Visean
E5-22-27	Ermita Fm., and equivalents	limestone, grey "Sinkinkai"	43.209370	-5.091000	Carboniferous, Late Tournaisian to Visean
E5-22-27	Ermita Fm., and equivalents	quartzite	43.209480	-5.091160	Late Devonian
E5-22-34	Barrios Fm.	quartzite	43.420090	-5.075230	Ordovician, Early Tremadocian to Floian (Tremadoc-Arenig)
E5-22-15	Barrios Fm.	quartzite	43.422690	-4.867400	Ordovician, Early Tremadocian to Floian (Tremadoc-Arenig)
E5-22-18	Barrios Fm.	paraconglomerate	43.442770	-4.867740	Ordovician, Early Tremadocian to Floian (Tremadoc-Arenig)
E5-22-30	Barrios Fm.	quartzite	43.443390	-4.871020	Ordovician, Early Tremadocian to Floian (Tremadoc-Arenig)
E5-22-09	Barrios Fm.	quartzite	43.440010	-4.872510	Ordovician, Early Tremadocian to Floian (Tremadoc-Arenig)
E5-22-33	Ovella Fm.	quartzite	43.424040	-5.080020	Middle-Late Cambrian (Drumian-Ougthartian)
E5-22-32	Lanzara Fm.	dolomite	43.424210	-5.082350	Early to Middle Cambrian

b)



c)



d)

