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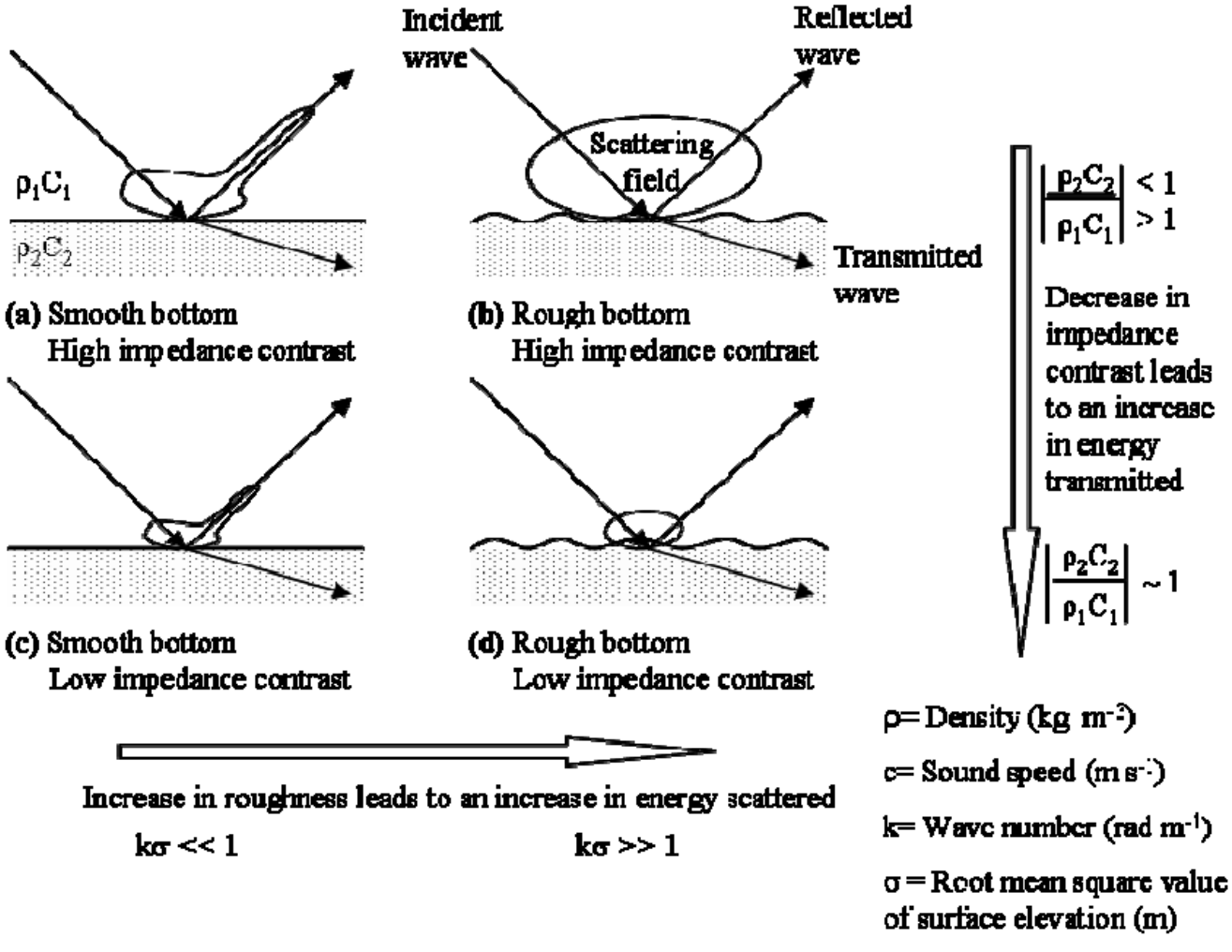
Relazioni tra caratteristiche tessiturali e misure geofisiche

Giovanni De Falco

IAMC – CNR, Oristano

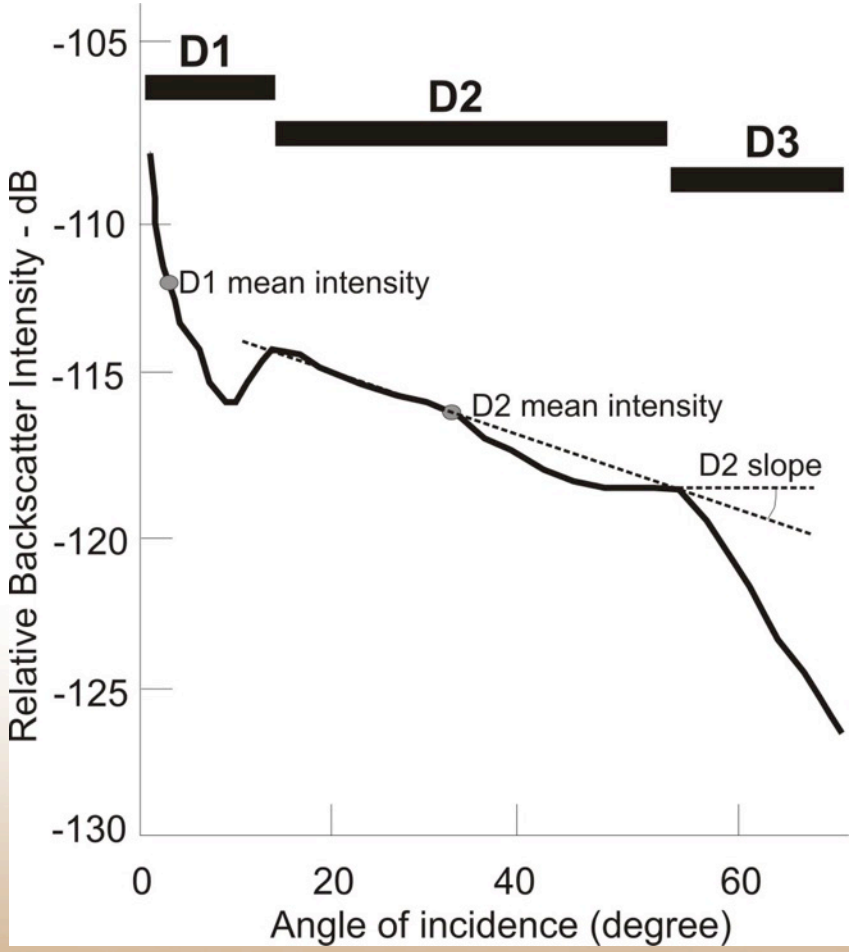
Backscatter intensity is a measure of sound that is scattered back toward the transmitter by acoustic reflection and scattering, both at the sediment–water interface and from within the sediment ***(Jackson et al., 1986; Jackson and Briggs, 1992; Nishimura, 1997; Urick, 1983).***



The angular response is a measure of the variation of backscatter strength along the across-track direction.

Backscatter strength near nadir > Backscatter strength in the outer swath (differences between acoustic reflection – nadir - and scattering -outer swath)

(Hughes-Clarke et al., 1997; Parnum et al., 2004, Ferrini and Flood, 2006).



SEDIMENT MAPPING	➢ **Backscatter strength *vs.* sediment grain size and seabed roughness:** *(i) Correlation Backscatter strength/Coarse Grains (>4 mm);* *(ii) Modeling seabed roughness based on Backscatter strength* *(iii) Correlation Backscatter/grain size, porosity, sulphur content in silt-clay sediments.* ➢ **Backscatter Angular Response *vs.* sediment type (grain size and bedforms)**	Goff et al. 2004 Ferrini and Flood, Mar. Geol., 2006 Sutherland et al., 2007, ECSS Hughes-Clarke, 1997
HABITAT MAPPING	➢ **Backscatter strength *vs.* benthic habitat:** *(i) Benthic fauna associated to different sediment types* *(ii) Mapping of Seagrass and Rhodolit* ➢ **Terrain analysis vs. macroalgae and sessile invertebrates distribution** ➢ **Backscatter Angular Response vs. habitat type (seagrass, Rhodolit)**	Kostylev et al., 2001, MEPS Siwabessy et al., 2006, Parnum, 2008 Holmes et al., 2008, CSR Parnum, 2008 Siwabessy et al., 2006,

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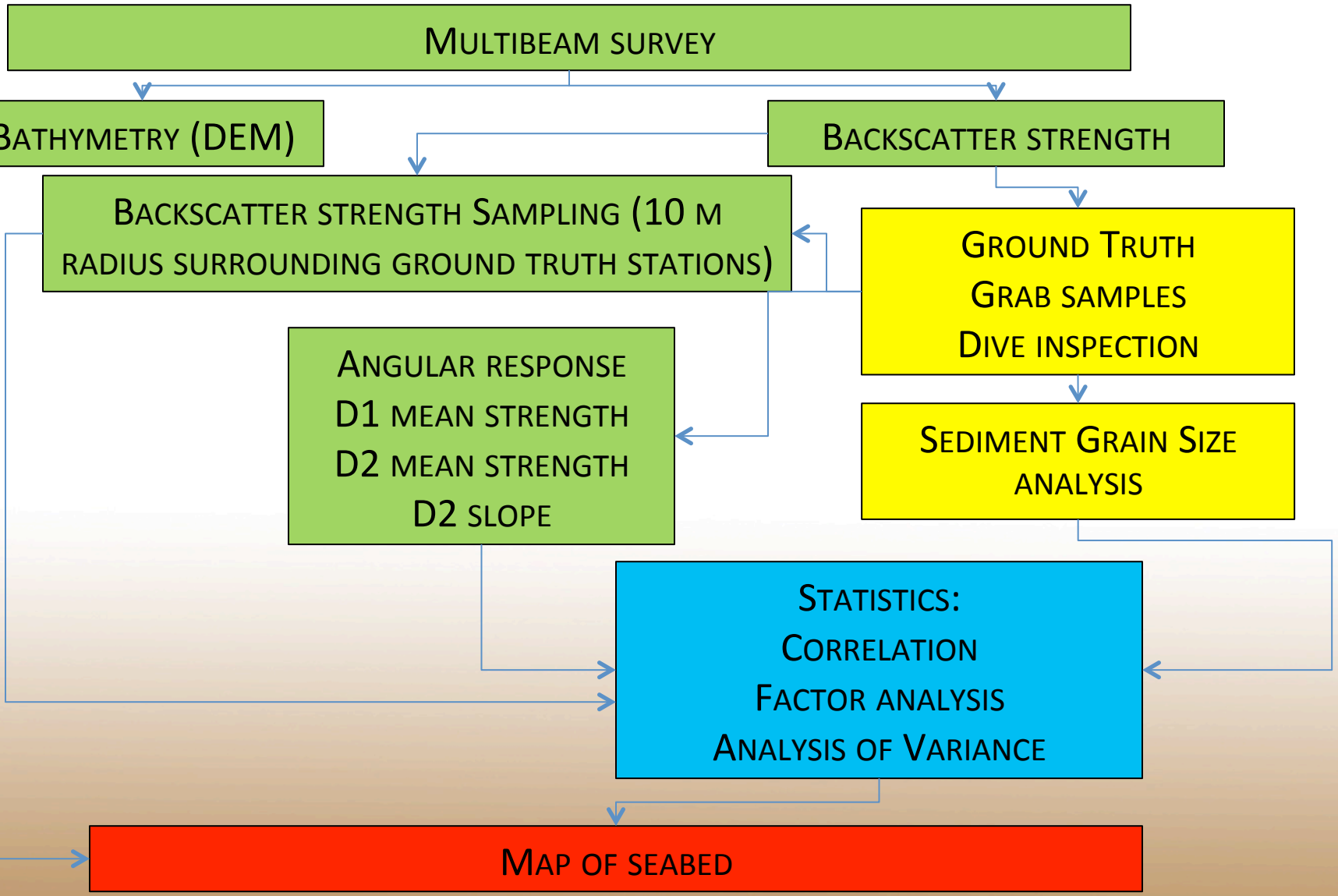

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Relationships between multibeam backscatter, sediment grain size and *Posidonia oceanica* seagrass distribution

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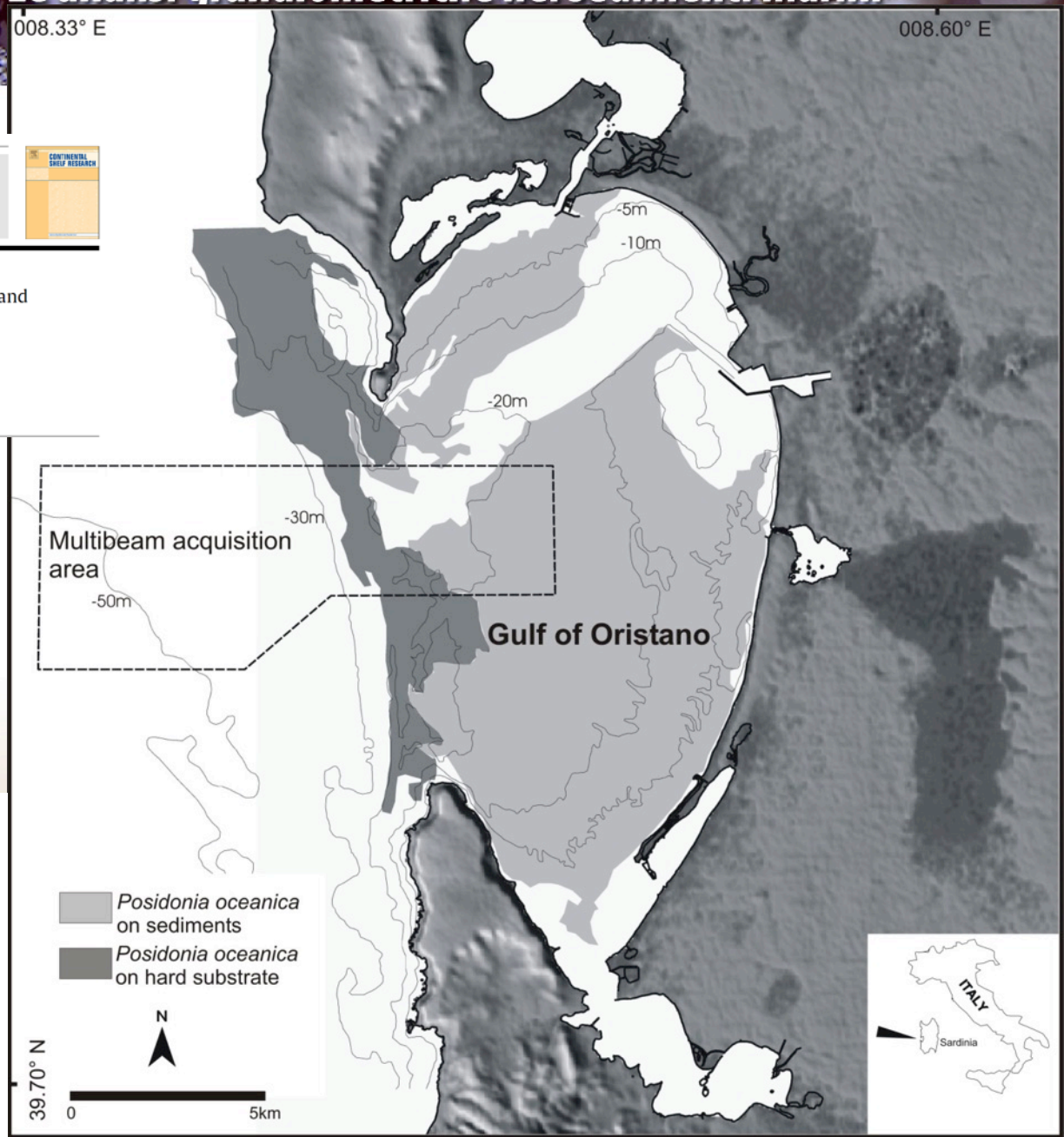

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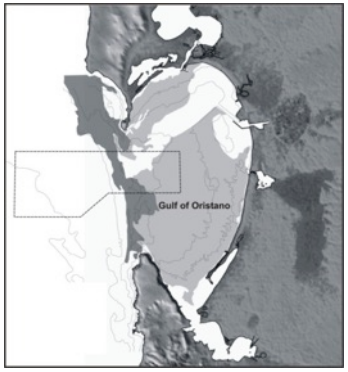
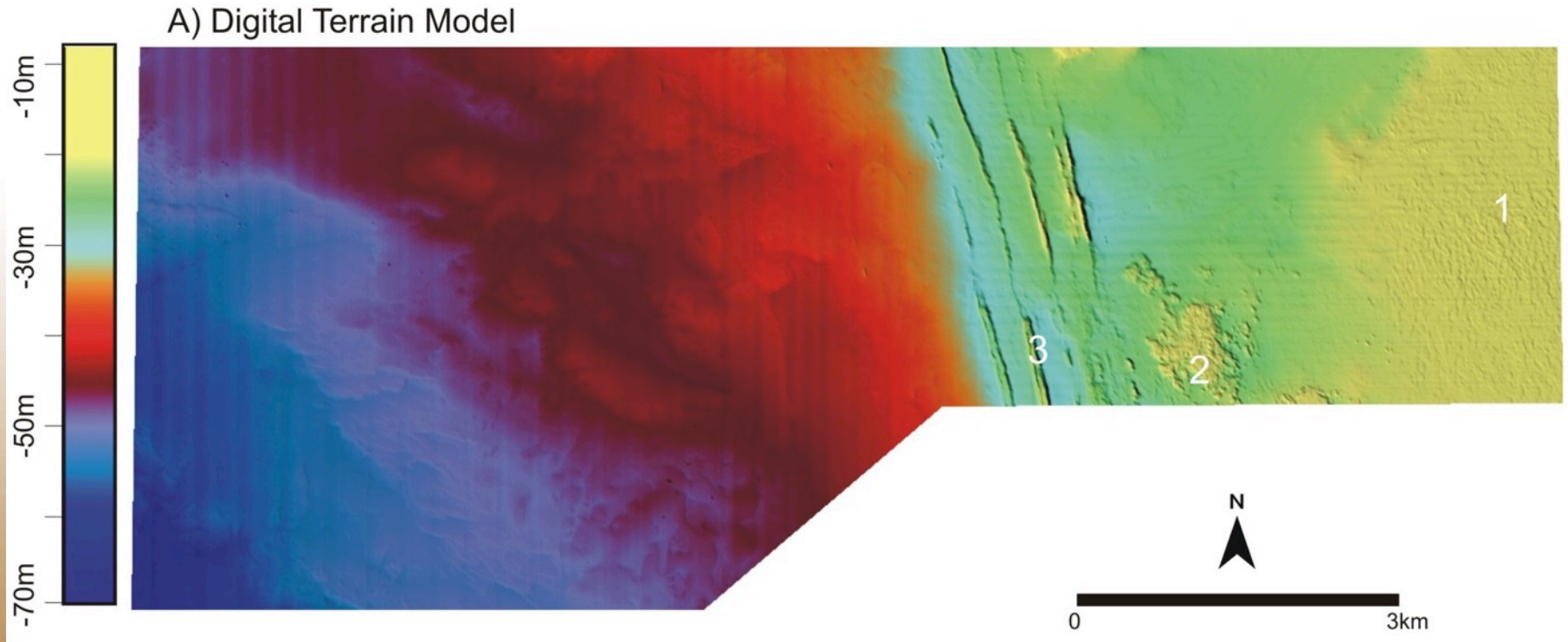


Bathymetry



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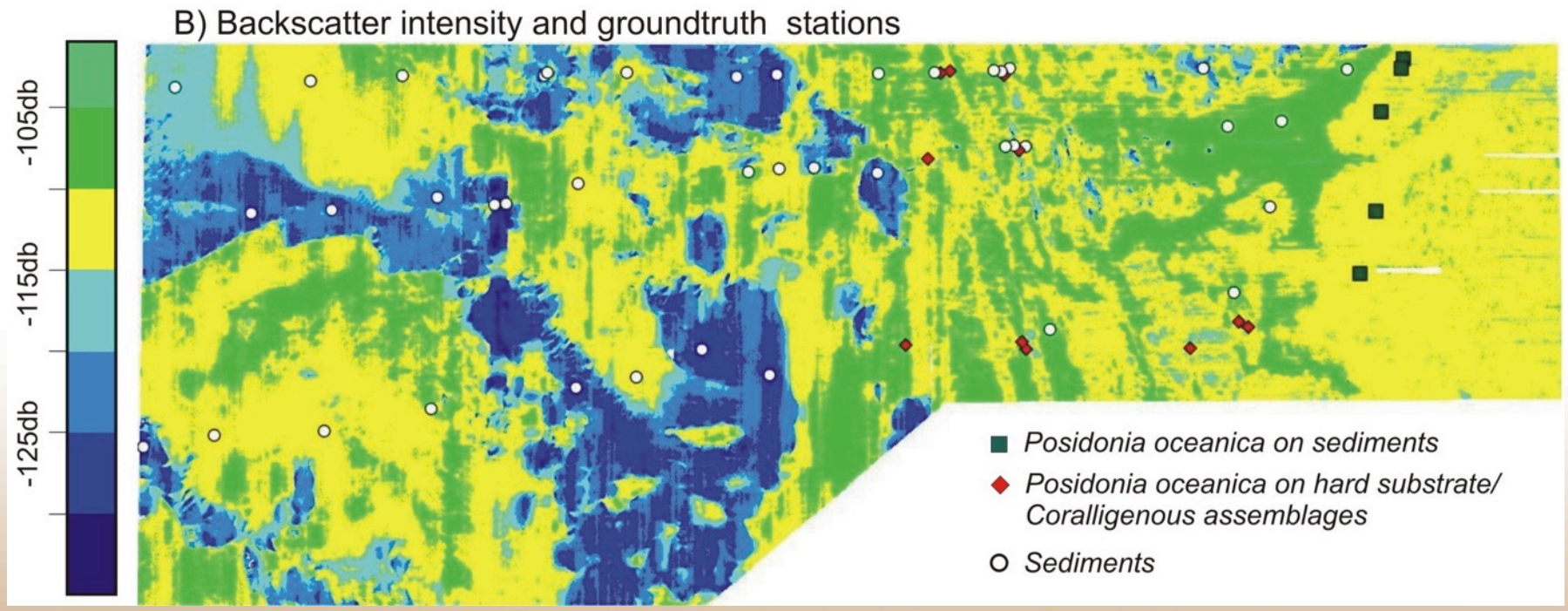
Backscatter strength and ground truth stations



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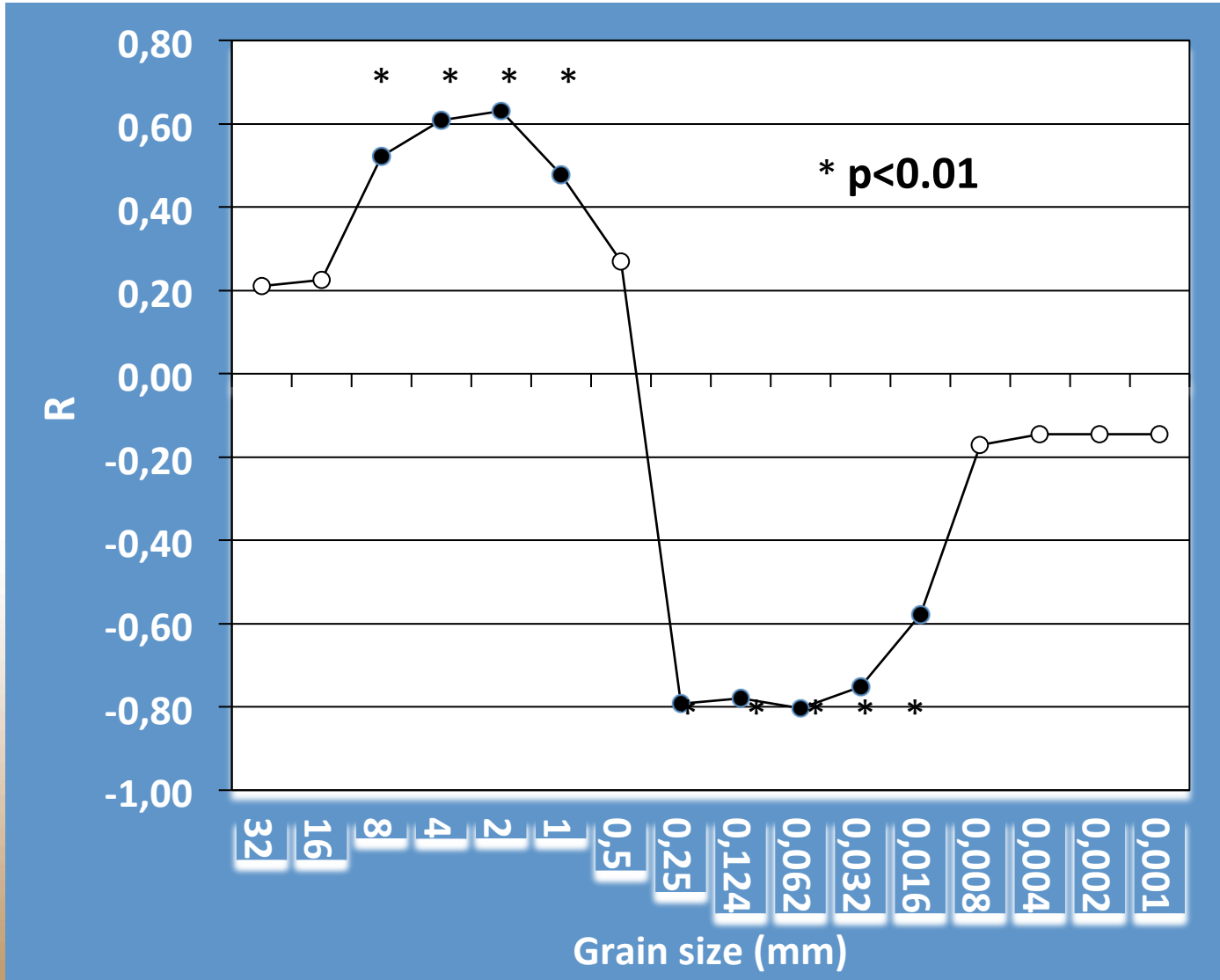
Backscatter strength vs. sediment grain size
Linear correlation



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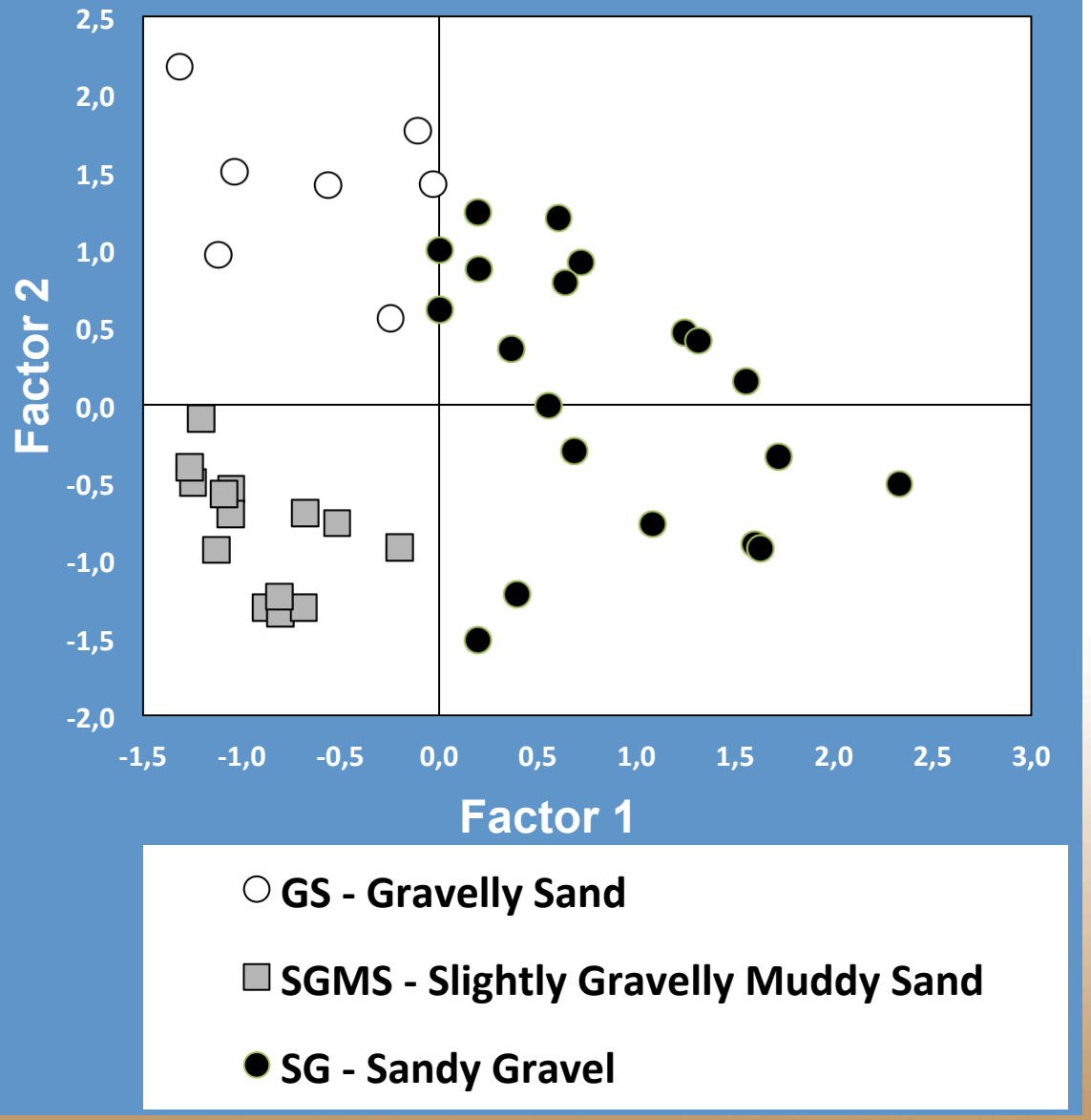
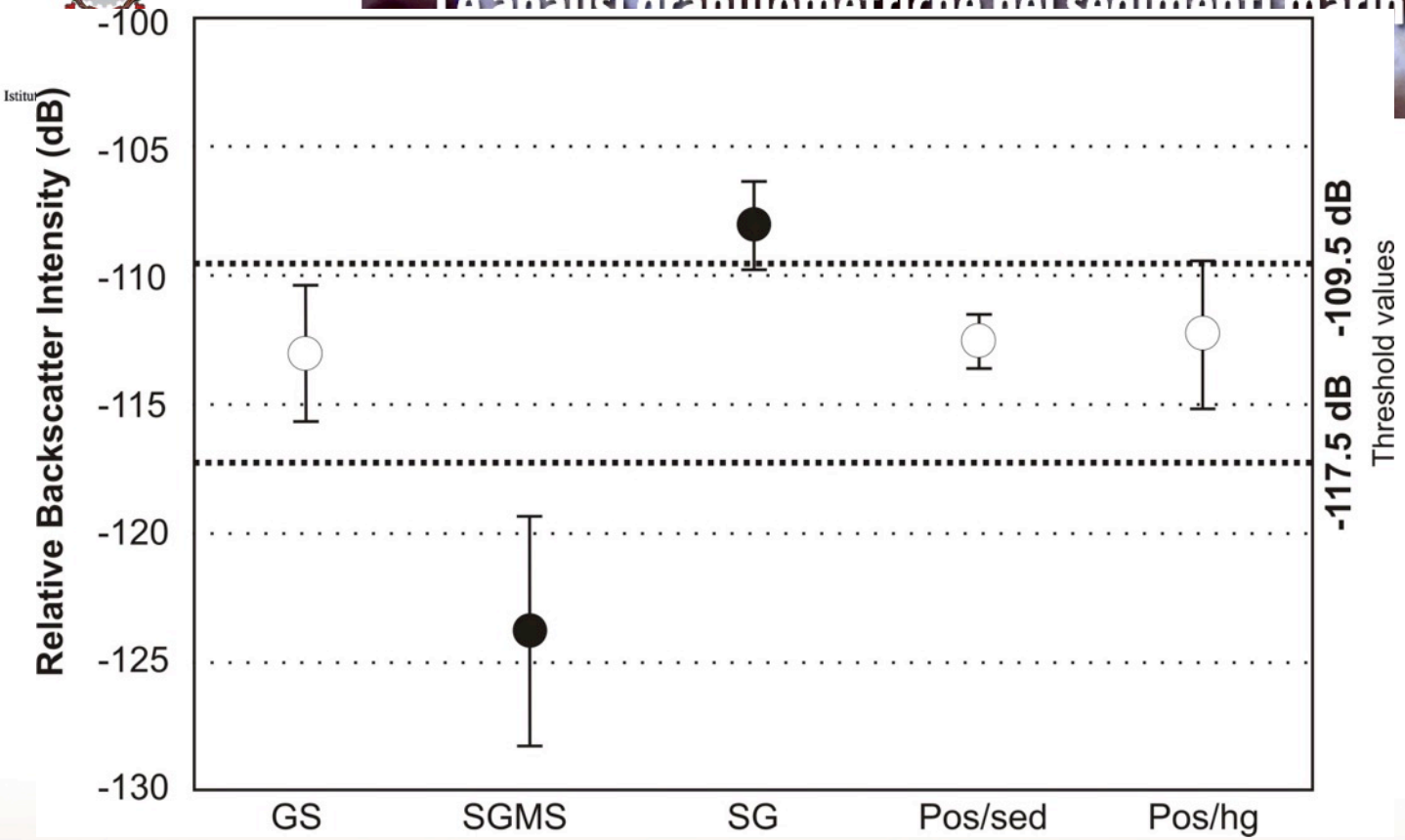


	F 1	F 2
Backscatter intensity (dB)	**0.88**	0.31
D1 Backscatter intensity (dB)	**0.84**	0.33
D2 Backscatter intensity (dB)	**0.83**	0.30
D2 slope	0.33	**0.73**
32-64 mm - very coarse gravel (%)	0.64	-0.14
16-32 mm - coarse gravel (%)	**0.68**	0.18
8-16 mm - medium gravel (%)	**0.81**	0.33
4-8 mm - fine gravel (%)	**0.69**	0.62
2-4 mm - very fine gravel (%)	0.58	**0.75**
1-2 mm -very coarse sand (%)	0.26	**0.91**
0.5-1 mm - coarse sand (%)	-0.11	**0.78**
0.25-0.5 mm - medium sand (%)	**-0.74**	-0.49
0.124-0.25 mm - fine sand (%)	**-0.69**	-0.54
0.062-0.124 mm - very fine sand (%)	**-0.67**	**-0.66**
<0.062 mm - Silt + Clay (%)	-0.64	**-0.68**
Explained Variance	44%	32%



Source	DF	MS	F	p	SNK test
Backscatter intensity (dB)*					
Seabed	4	23.059	17.1	<0.00001	SG > GS=*Pos/sed*=*Pos/hg*> SGMS
Station (Seabed)	20	1.348	482.2	<0.00001	
Error	725	0.003			

* transformed ln(x+constant); Cochran test NS after transformation

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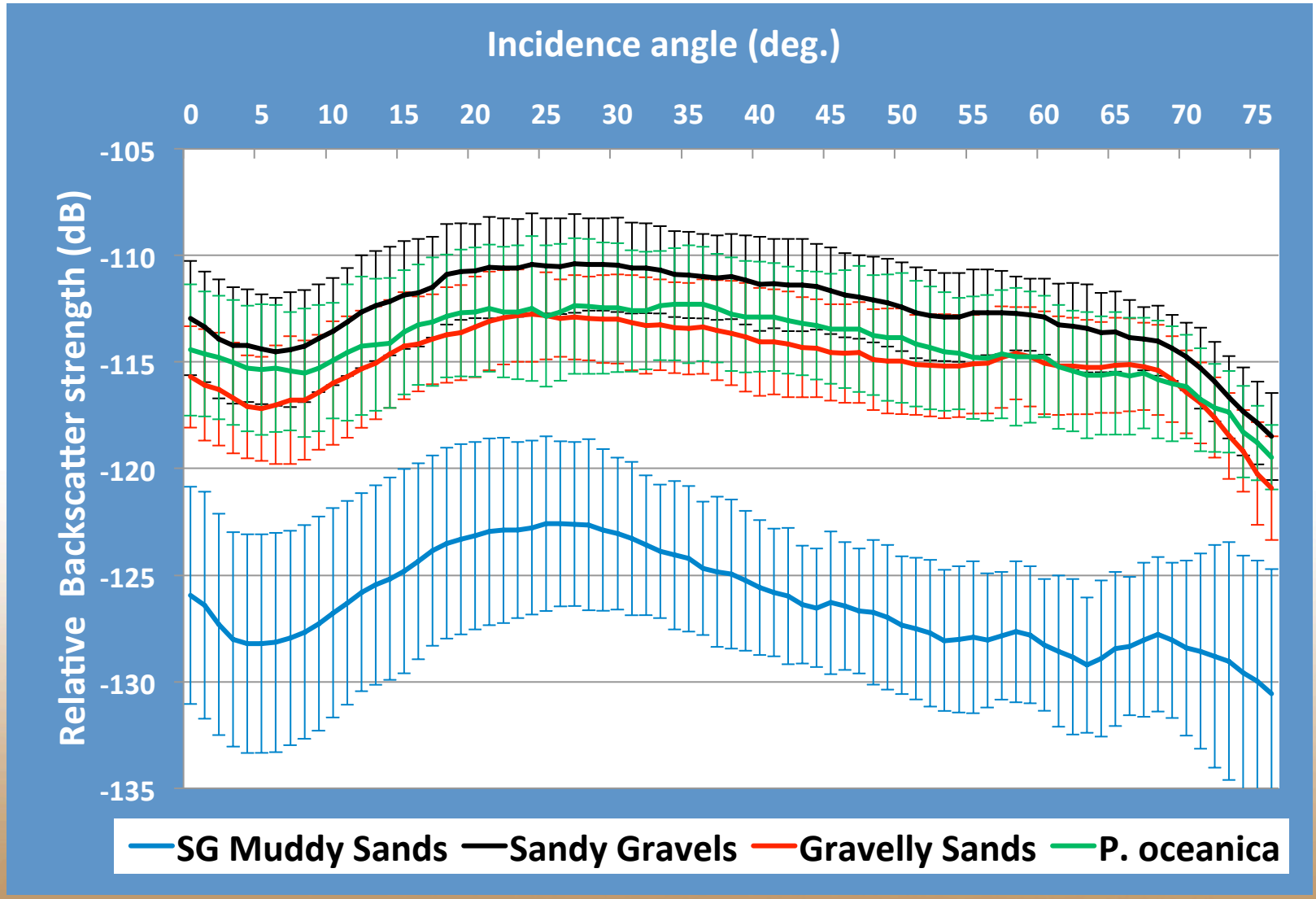
Mean Angular Response (±SD) including *Posidonia oceanica on sediments*



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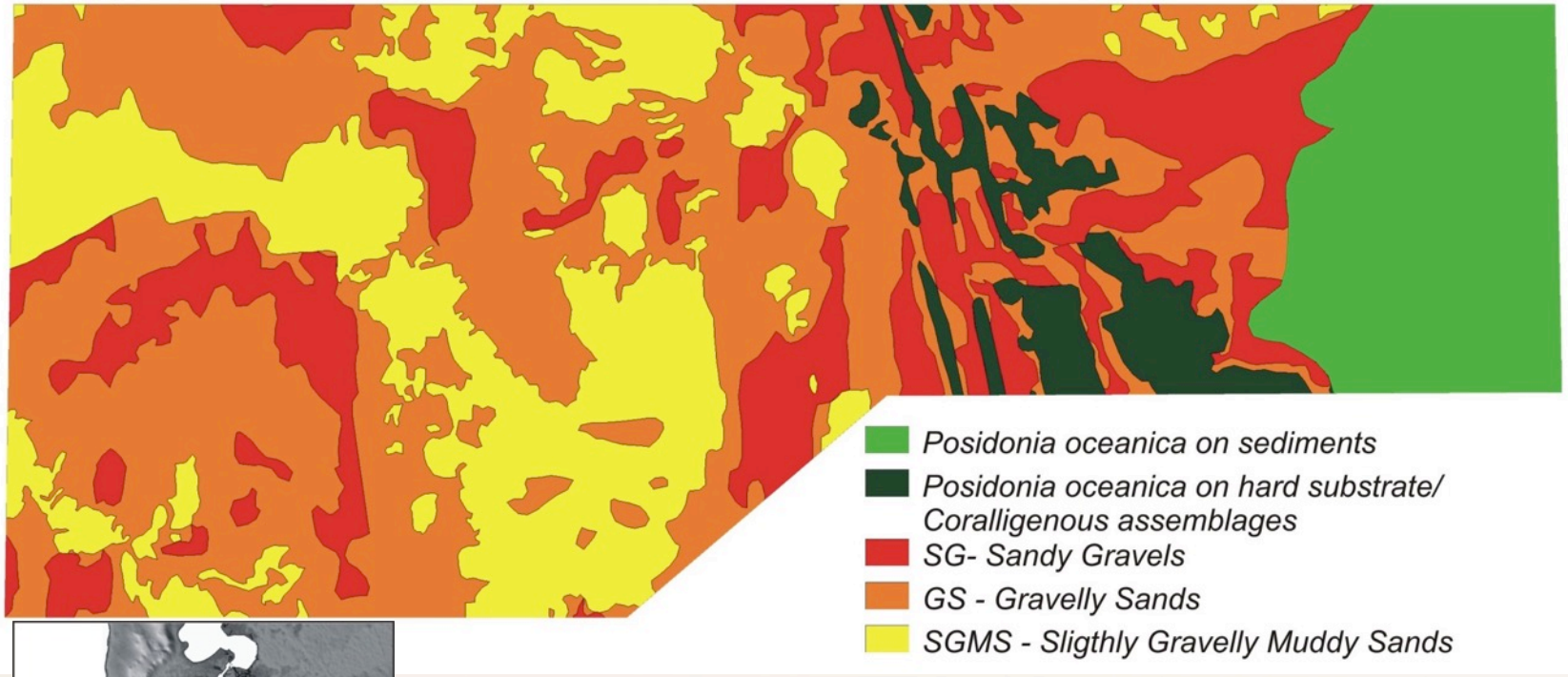
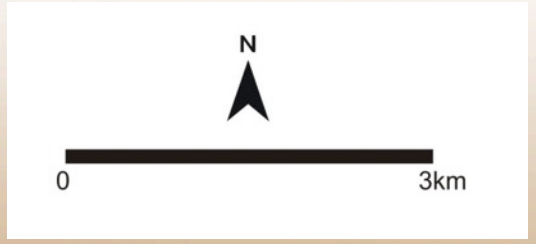
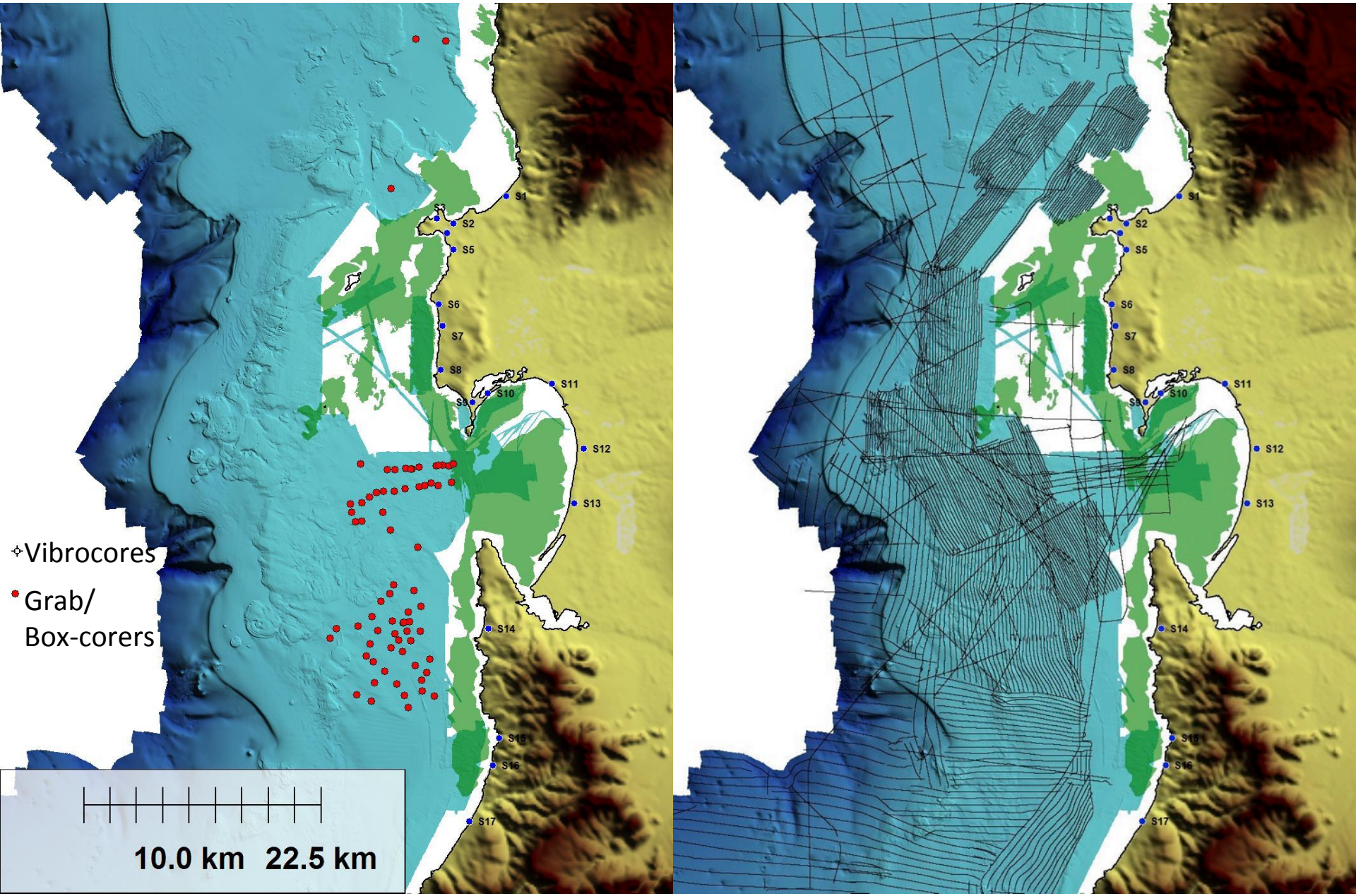
B) Map of seabed classification





Sediments reservoirs



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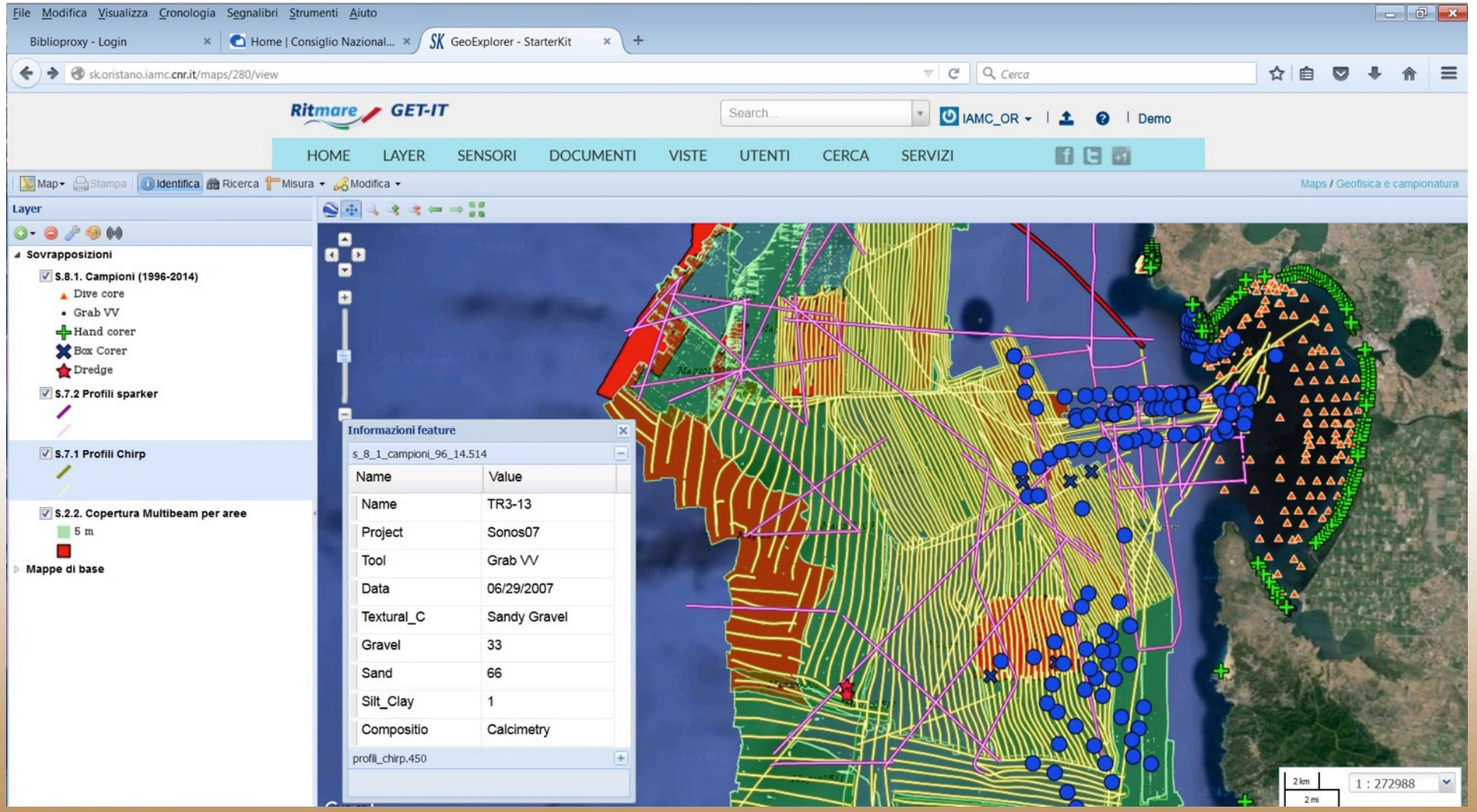
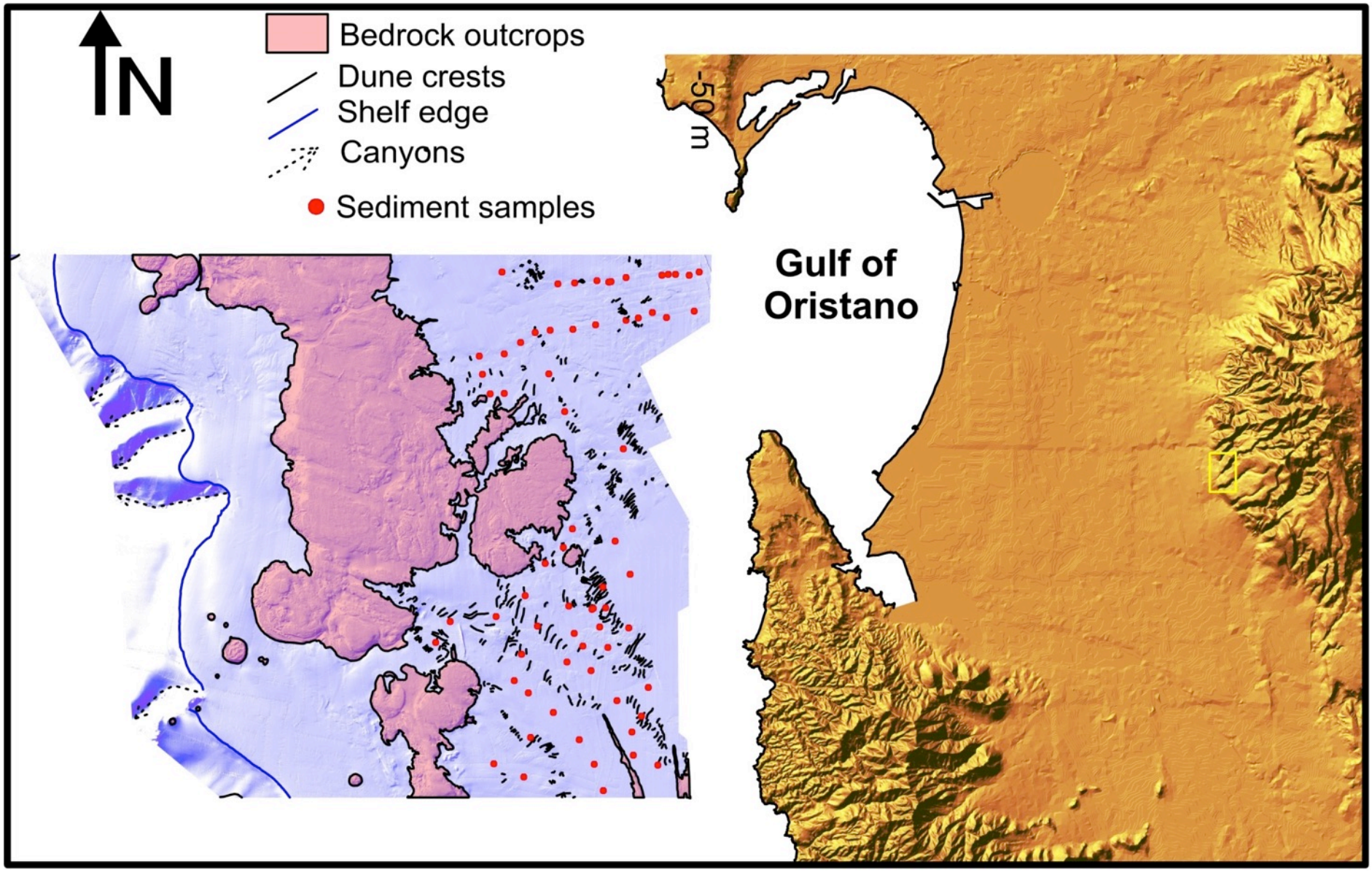
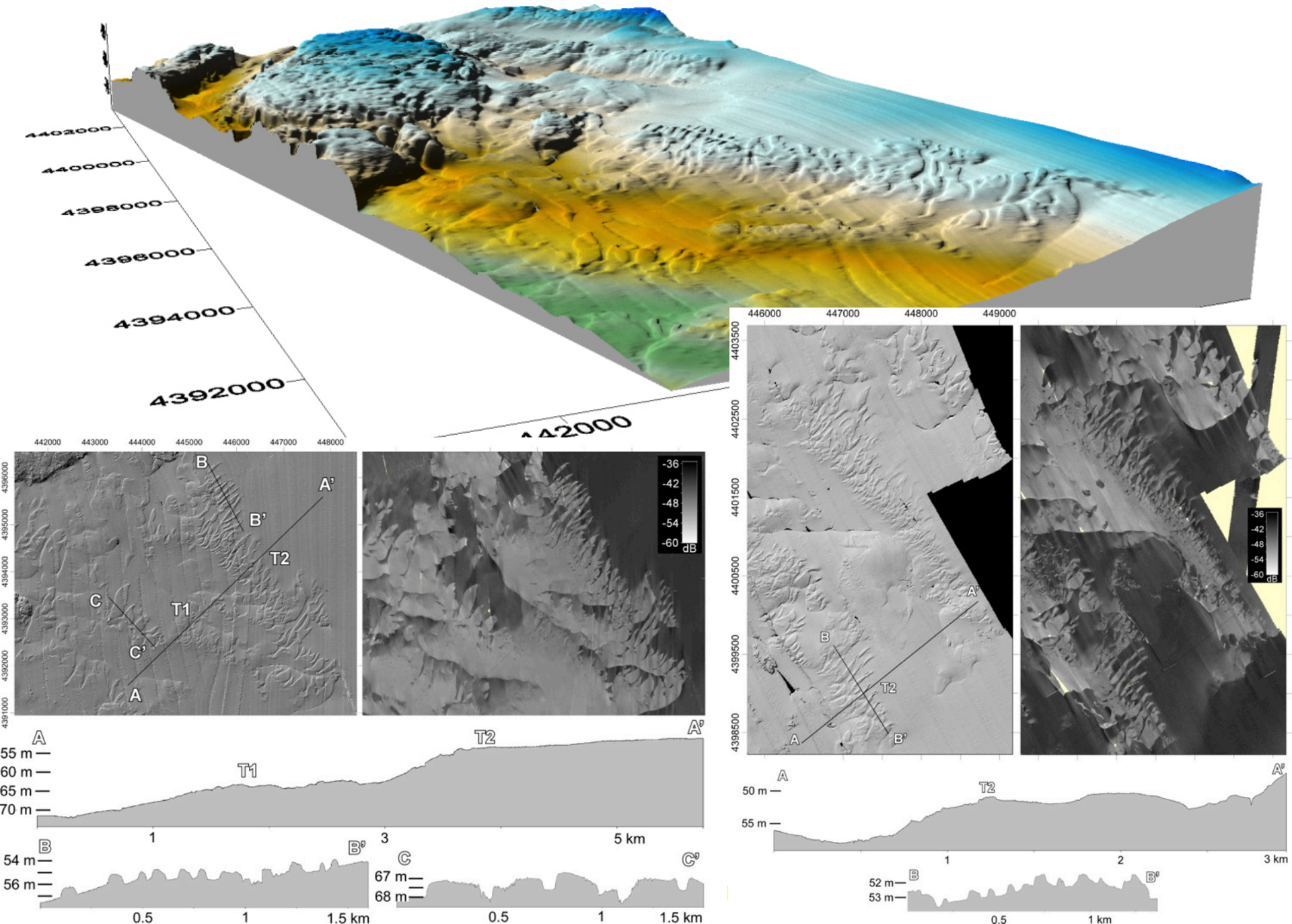
Geodatabase online (Get it- RITMARE)



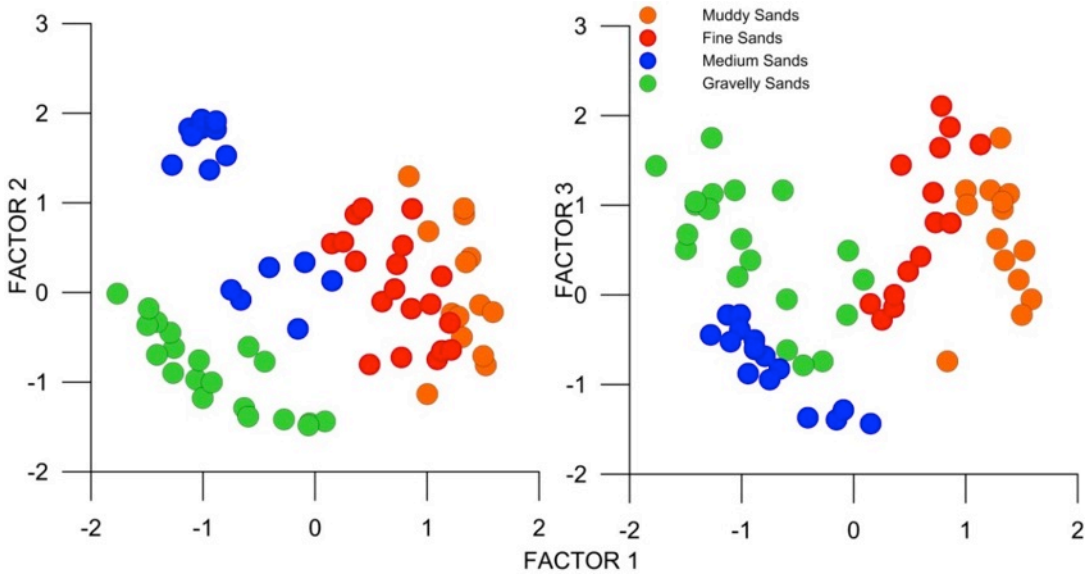
MAGIC project



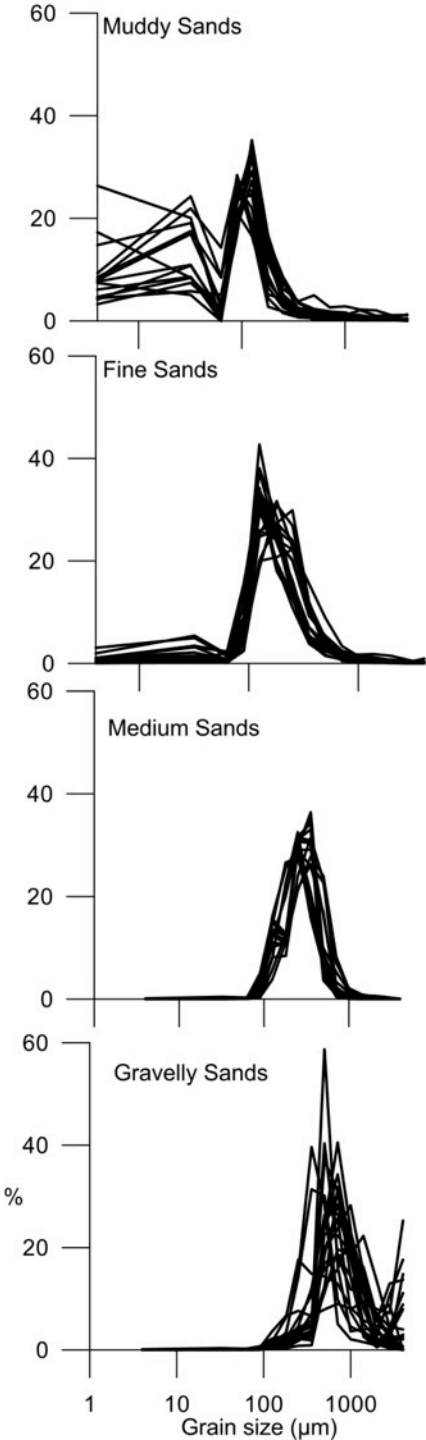
De Falco et al., Marine Geology, 2015



Marine sedimentary facies classification: factor analysis



µm	F1	F2	F3
>4000	0.17	**-0.70**	0.24
2800-4000	-0.19	**-0.87**	0.33
2000-2800	-0.18	**-0.93**	0.23
1400-2000	-0.25	**-0.92**	0.24
1000-1400	-0.39	**-0.87**	0.13
710-1000	-0.57	**-0.76**	-0.04
500-710	**-0.87**	-0.35	-0.15
355-500	-0.47	0.26	**-0.77**
250-355	-0.08	0.43	**-0.87**
180-250	0.56	0.30	**-0.71**
125-180	**0.83**	0.30	-0.29
90-125	**0.86**	0.41	0.07
63-90	**0.74**	0.20	-0.26
32-63	**0.96**	0.04	0.09
4-32	**0.95**	0.01	0.13
<4	**0.93**	0.06	0.13
% Exp. V.	41%	32%	15%



Sed. Facies		D_{50} µm	Gravel %	Coarse Sands %	Medium Sands %	Fine sands %	Mud %	$CaC0_3$ %
Bioclastic Muddy Sands	Mean	123	1	4	7	64	24	66
	SD	27	1	3	3	8	11	8
BIOCLASTIC Fine Sands	Mean	203	1	7	27	63	3	63
	SD	29	1	3	9	8	2	17
MIXED Medium Sands	Mean	328	0	14	57	29	0	43
	SD	41	0	9	7	8	0	29
SILICICLASTIC Gravelly Sands	Mean	879	13	69	14	3	0	14
	SD	250	12	18	14	3	0	11

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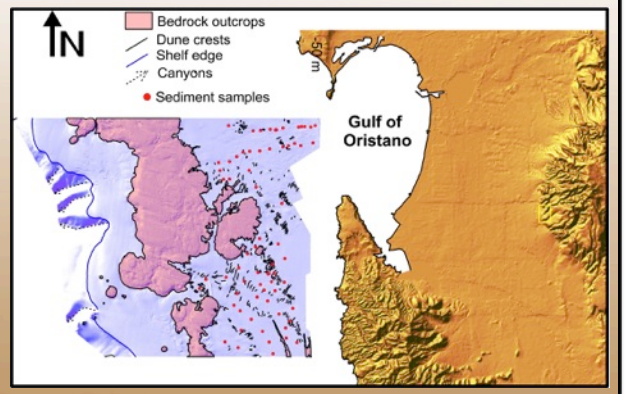
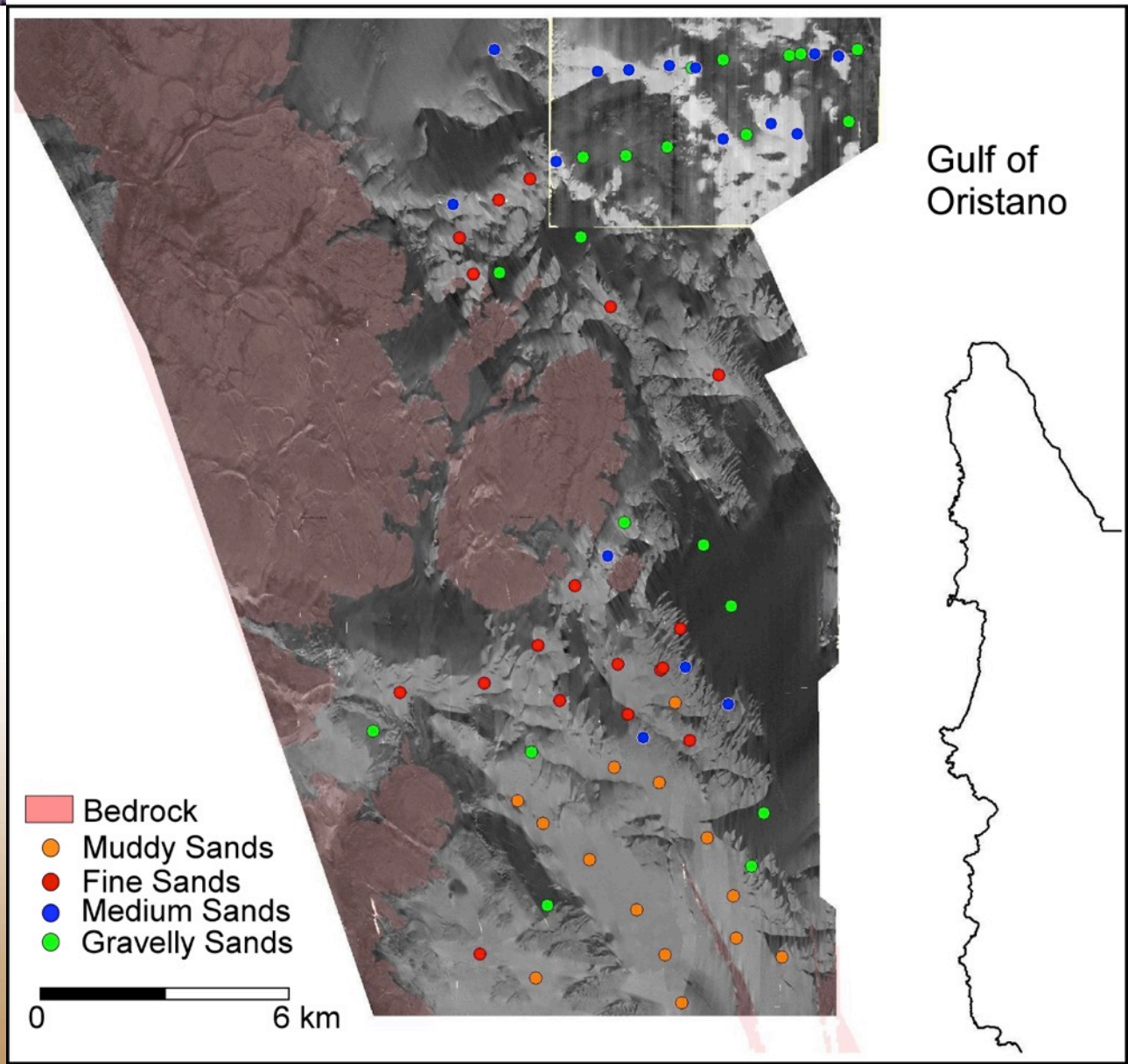
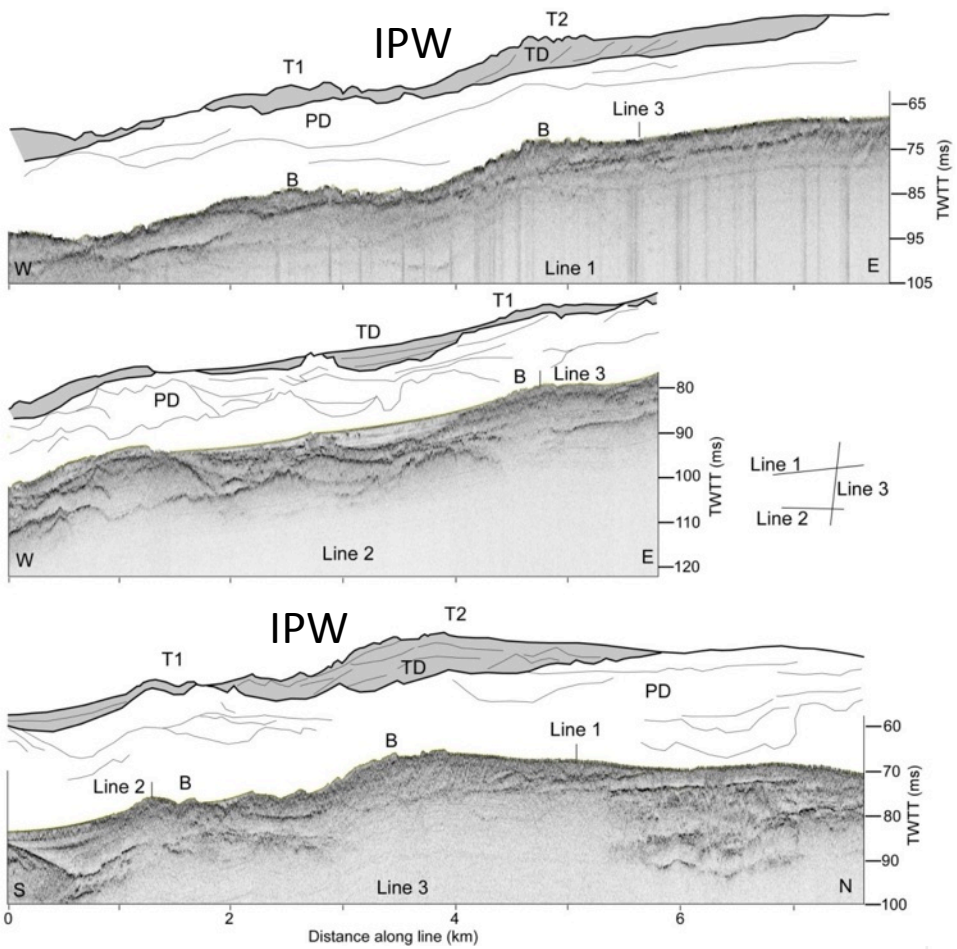
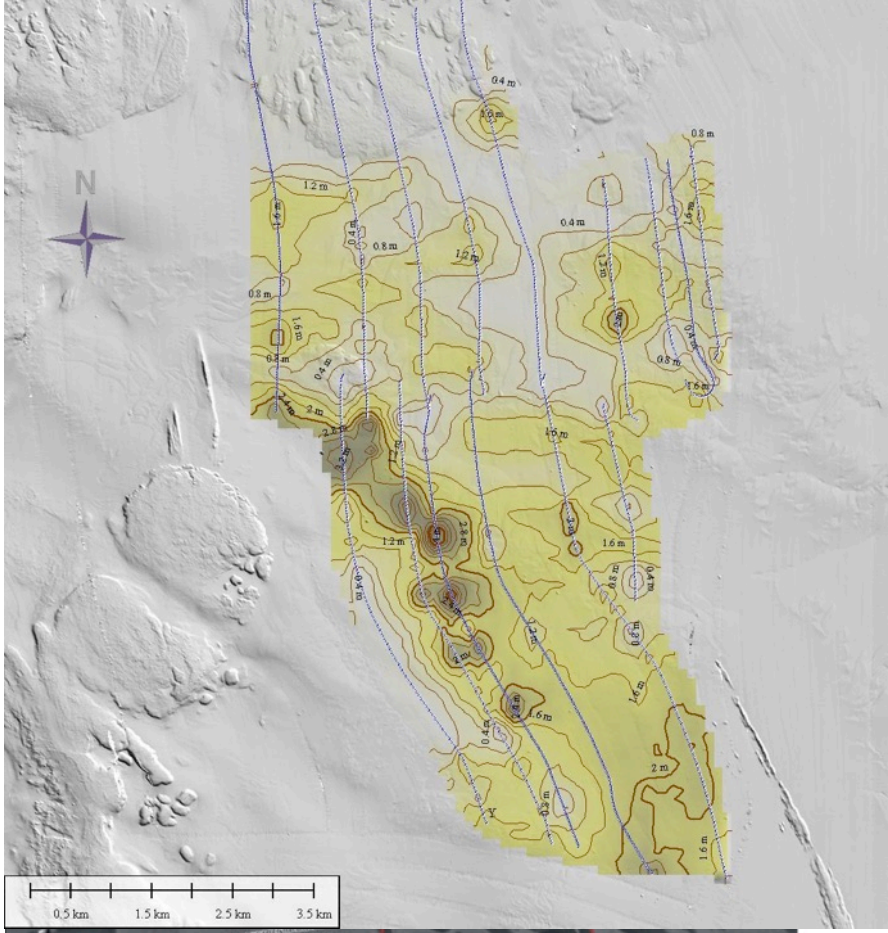
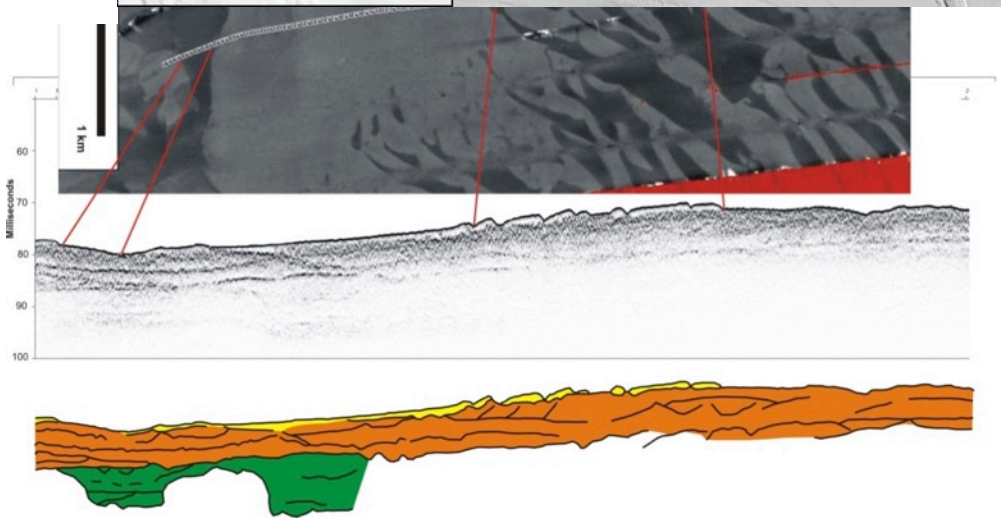




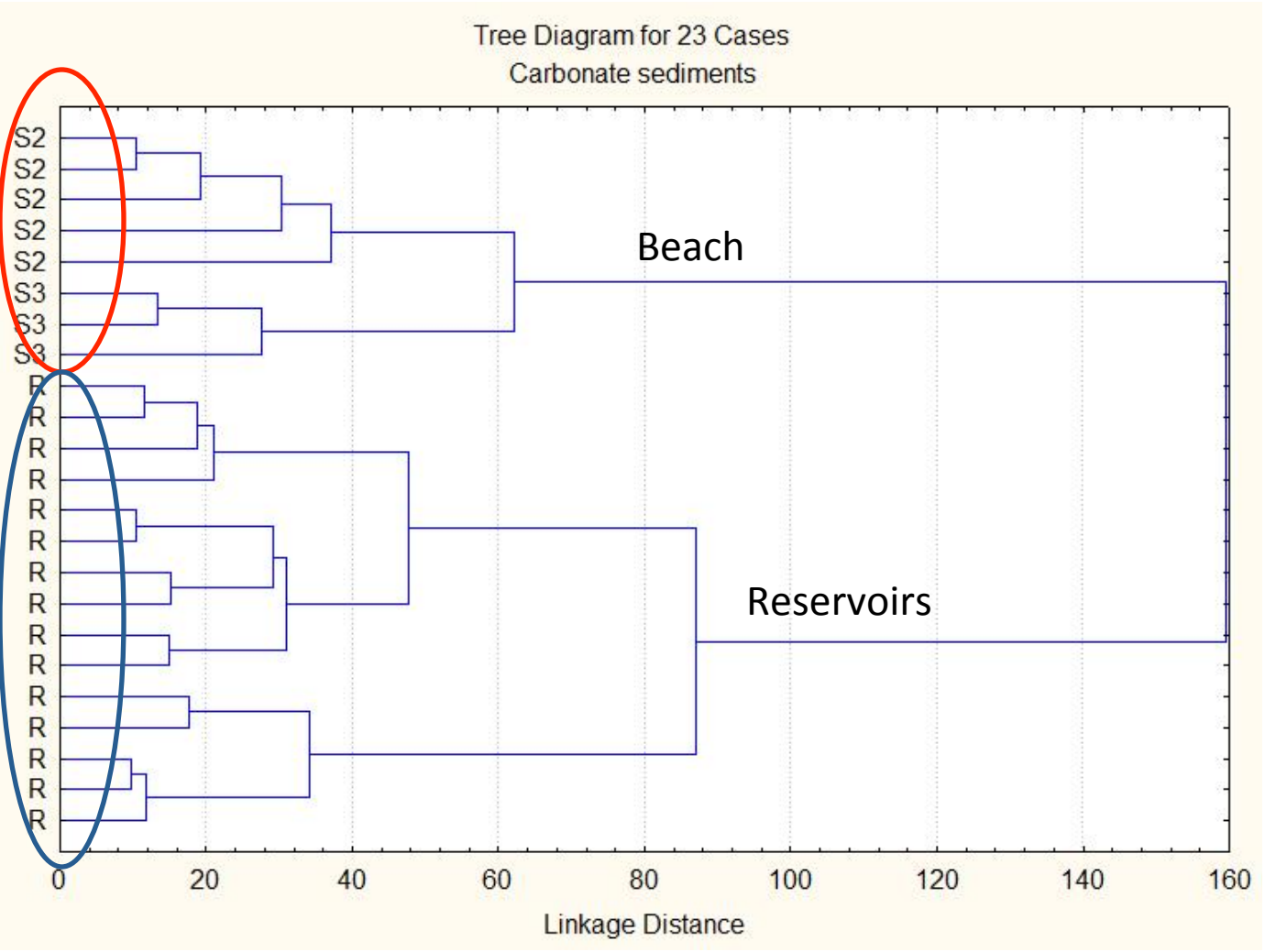


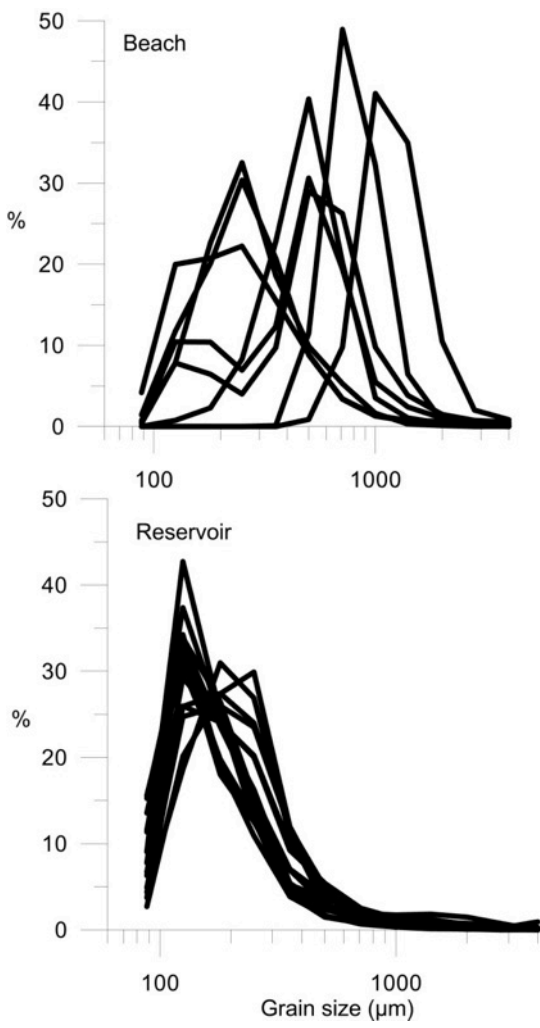


Backstepping Infralittoral prograding wedge (IPW) of siliciclastic coarse sands covered by mixed and carbonate medium and fine sands



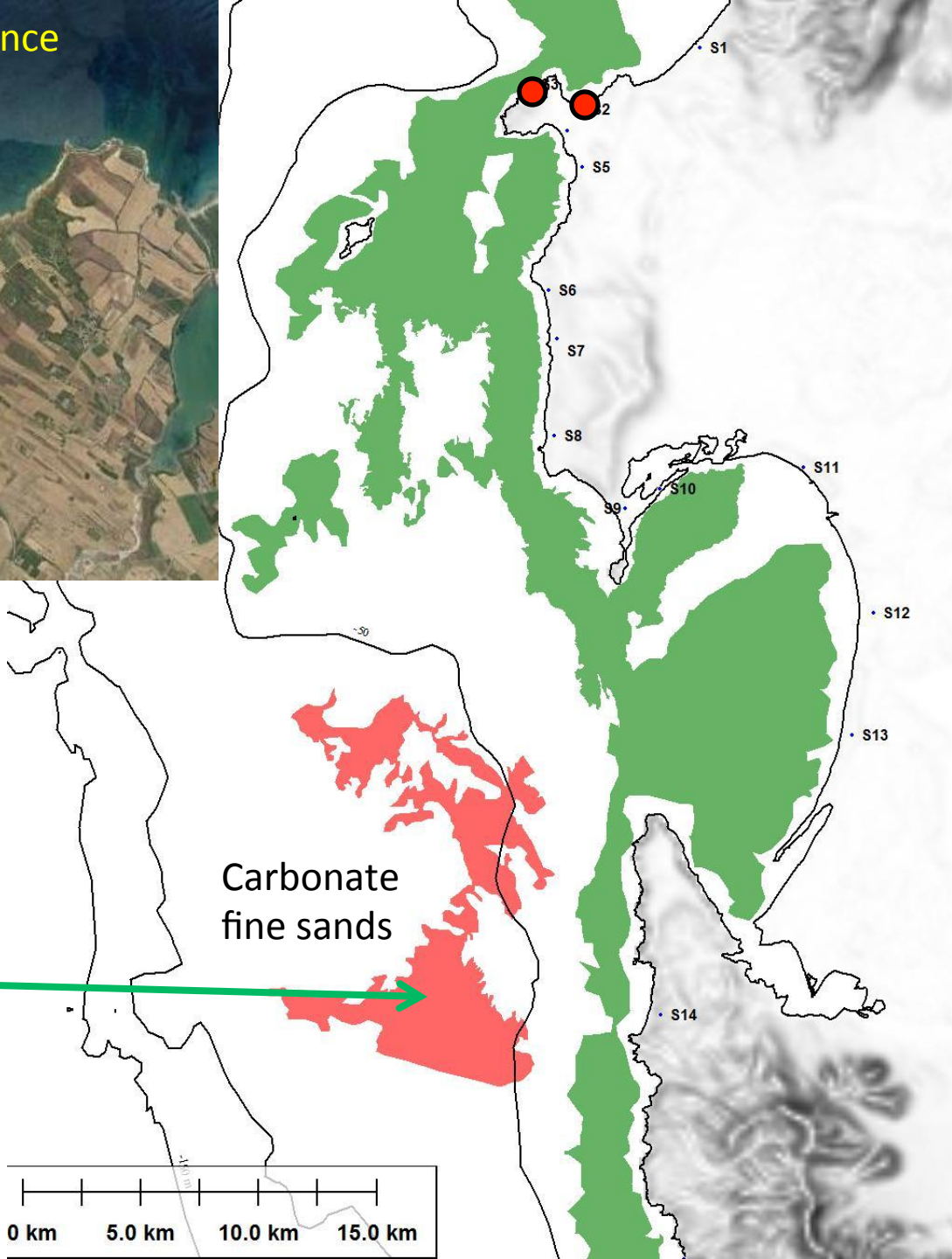
Beach sediments vs. Reservoir sediment grain size
Carbonate sediments ($CaC0_3$ > 60%)



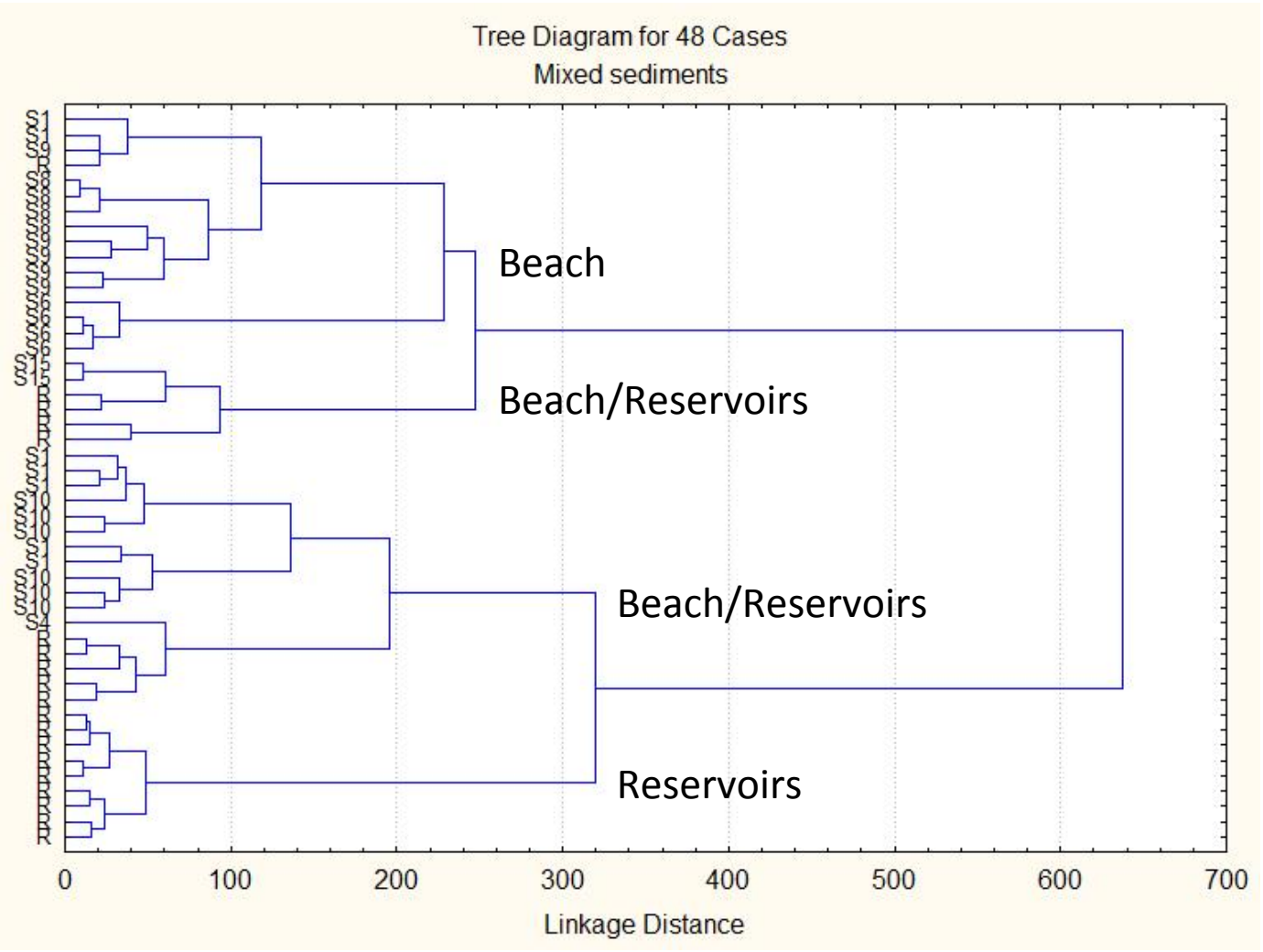


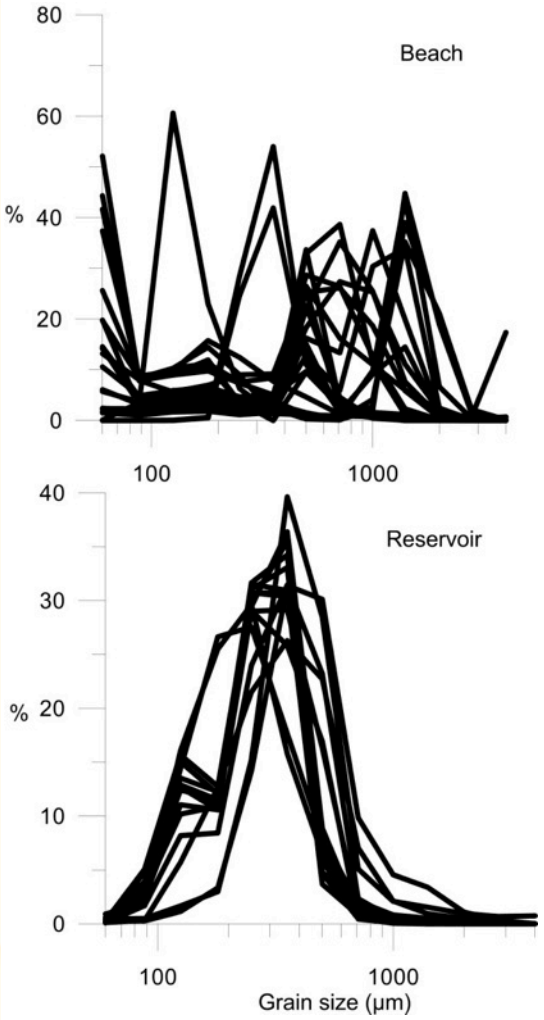
Beach sediments: low source to sink distance

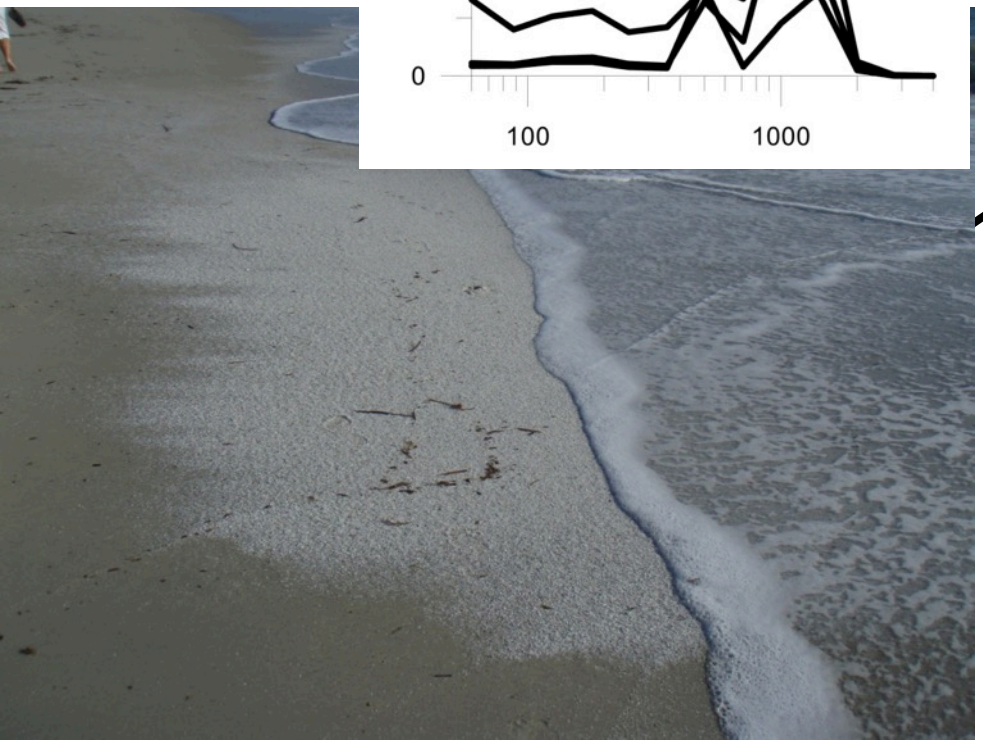
Reservoirs: sediment sorting by hydrodynamics (sorted bedforms)

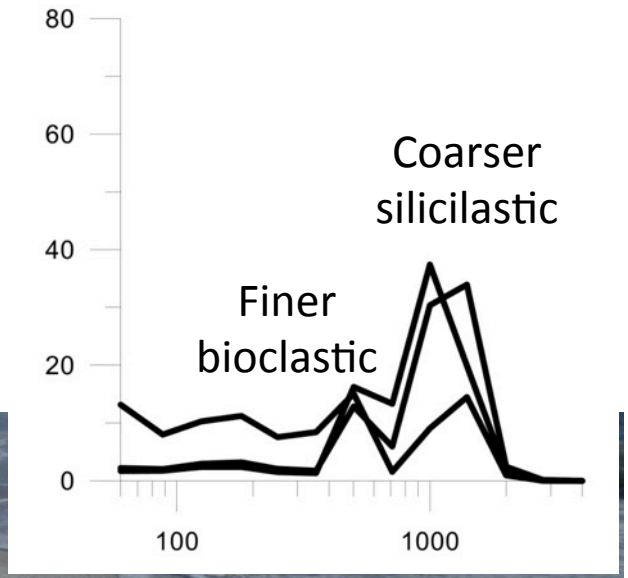


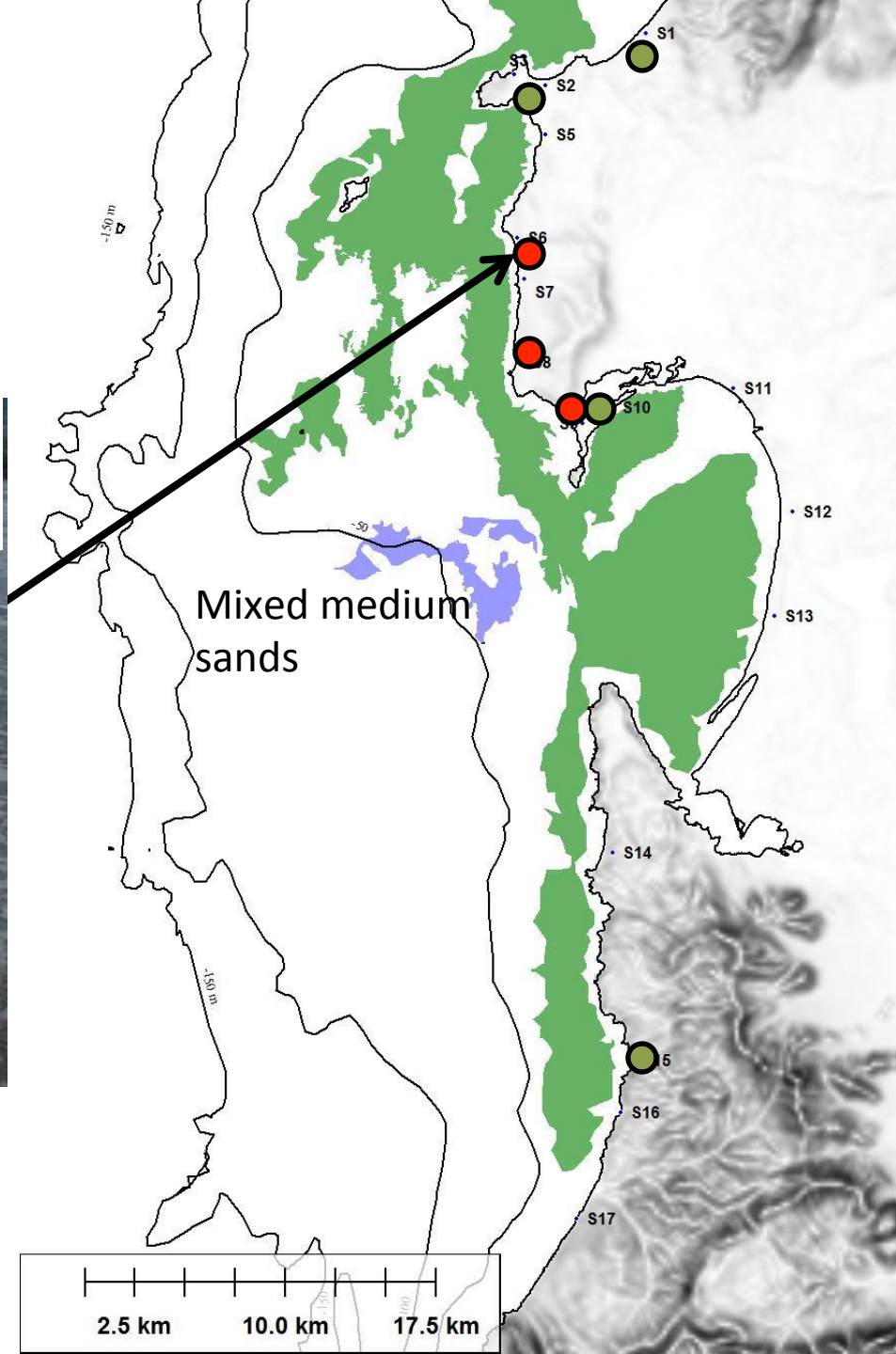
Beach sediments vs. Reservoir sediment grain size
Mixed sediments ($CaC0_3$ 20-60%)





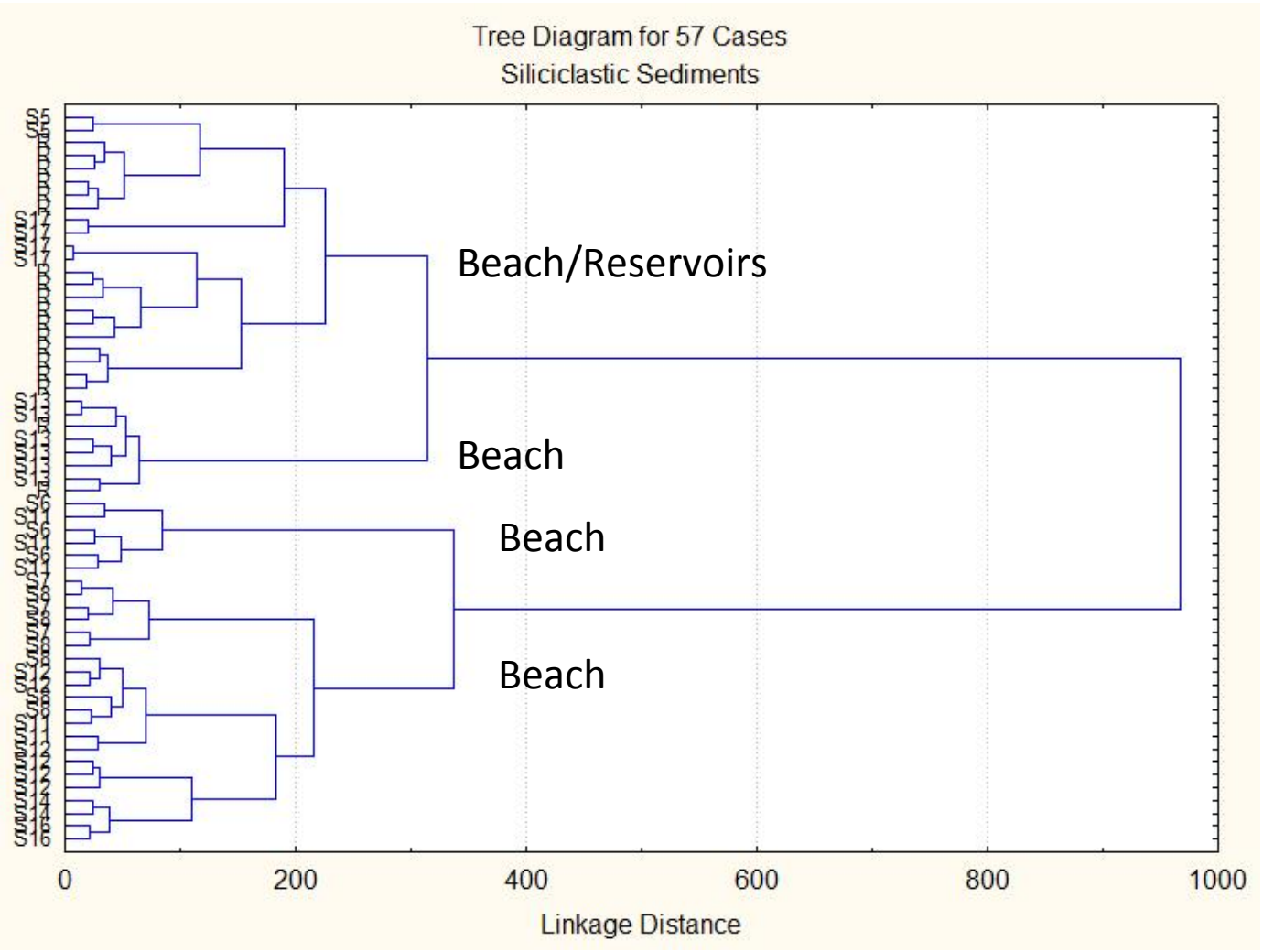


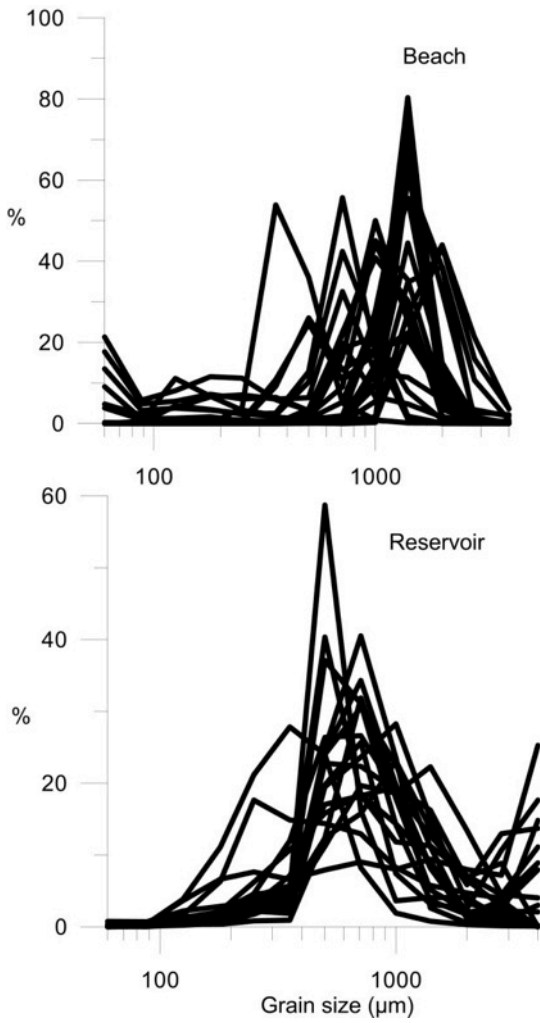




De Falco et al., Est Coast. Sh. Sc. 2003
De Falco et al., JCR, 2014
Simeone, Palombo, Guala Oc. & Coast. Man. 2012

Beach sediments vs. Reservoir sediment grain size
Siliciclastic sediments ($CaC0_3$ < 20%)





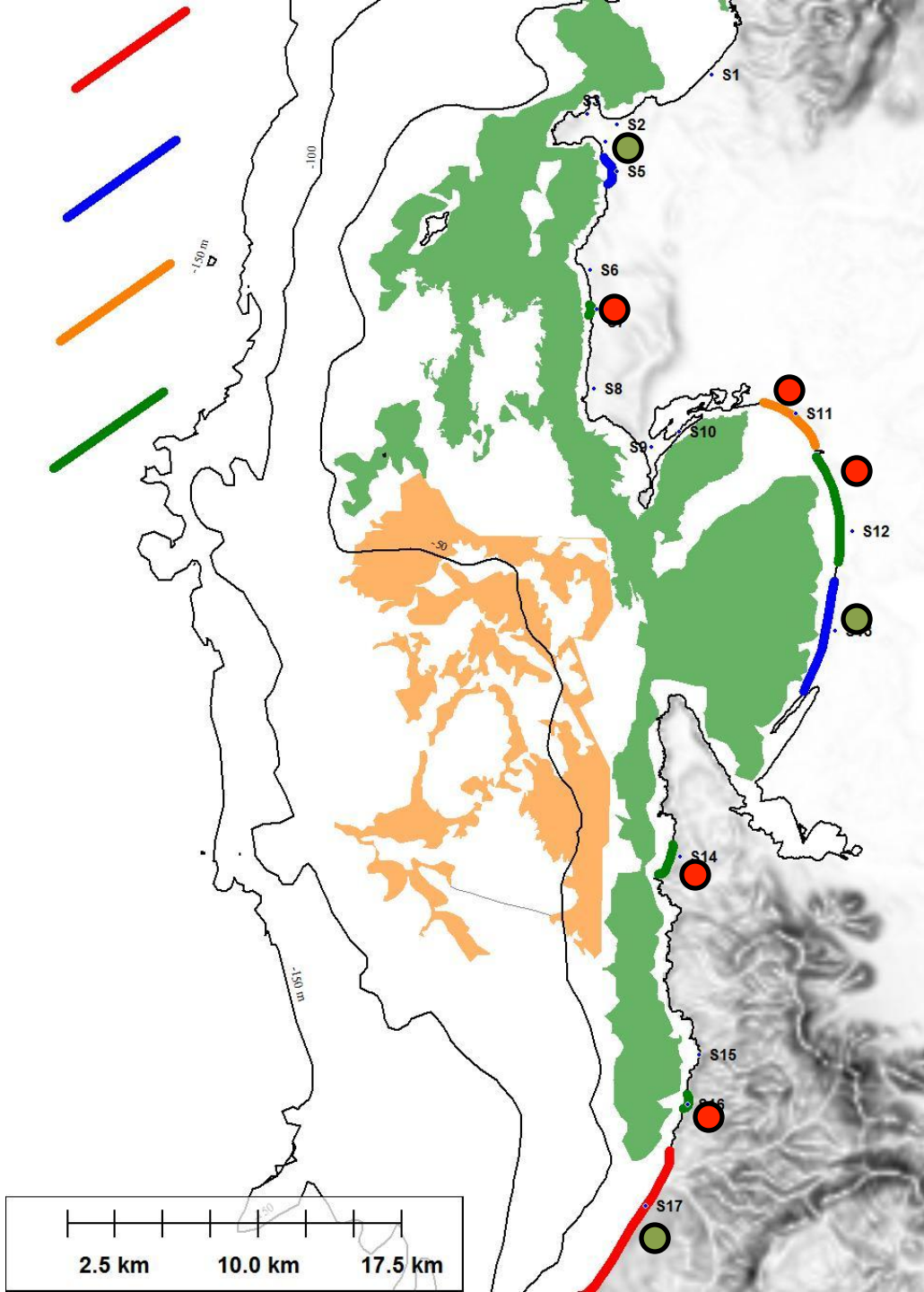
coarse sands

medium sands

gravel/very Coarse sands

very coarse sands

Beach with Coarse-medium sands of 3 beaches (out of 8) are compatible with reservoir sediments of IPW



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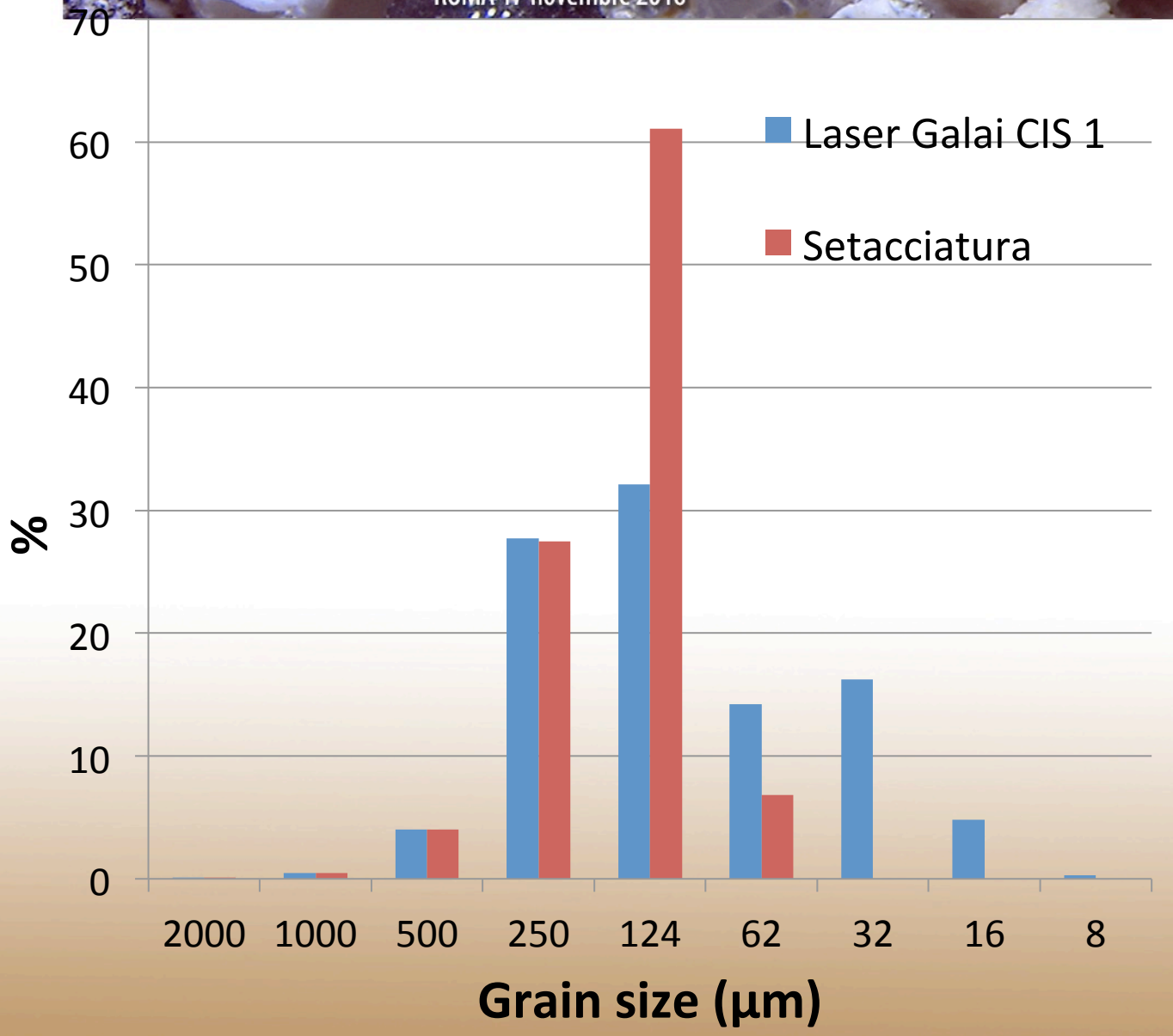
Si fa presto a dire sabbie .....




Grazie per l'attenzione