



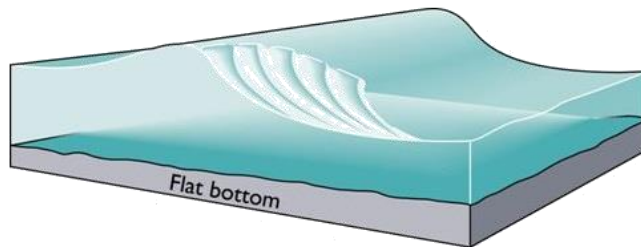
Grain-size selective longshore transport at a headland-bay beach: insights from a sediment tracer experiment

M. Ribeiro, R. Taborda, J. Duarte and A. Rodrigues

Longshore Sediment Transport (LST) → wave power

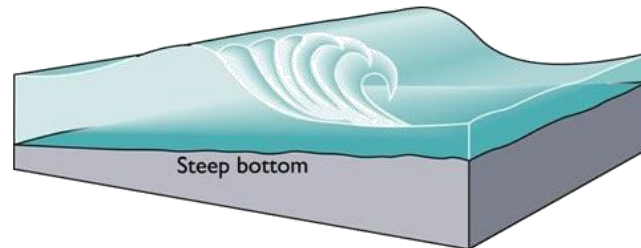


site specific factors



SPILLING BREAKER

beach slope
breaking type

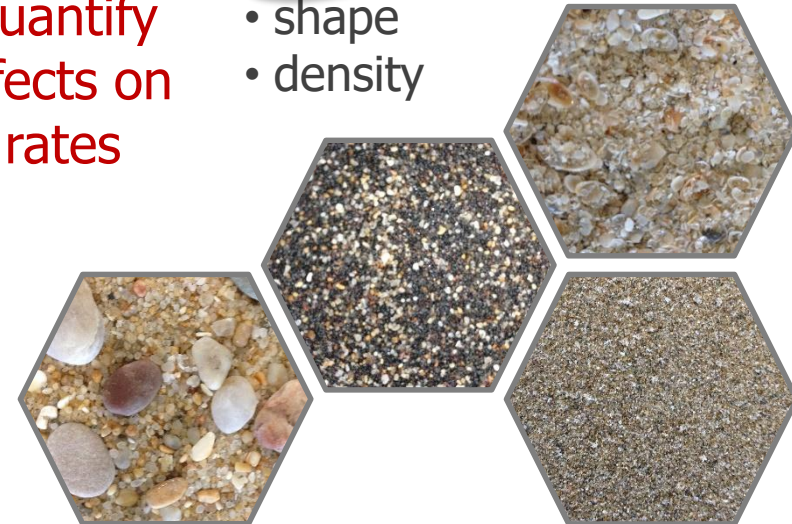


PLUNGING BREAKER

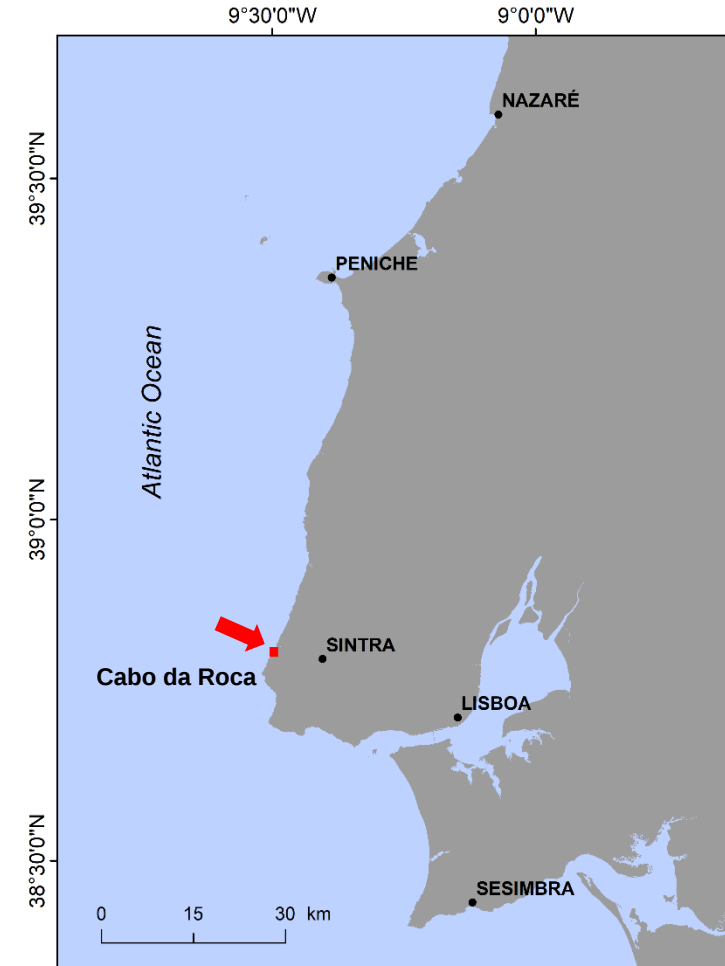
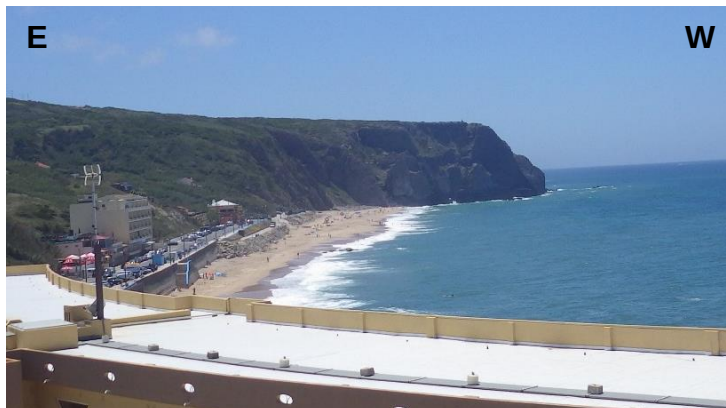
Understand
and quantify
the effects on
LST rates

Sediment characteristics:

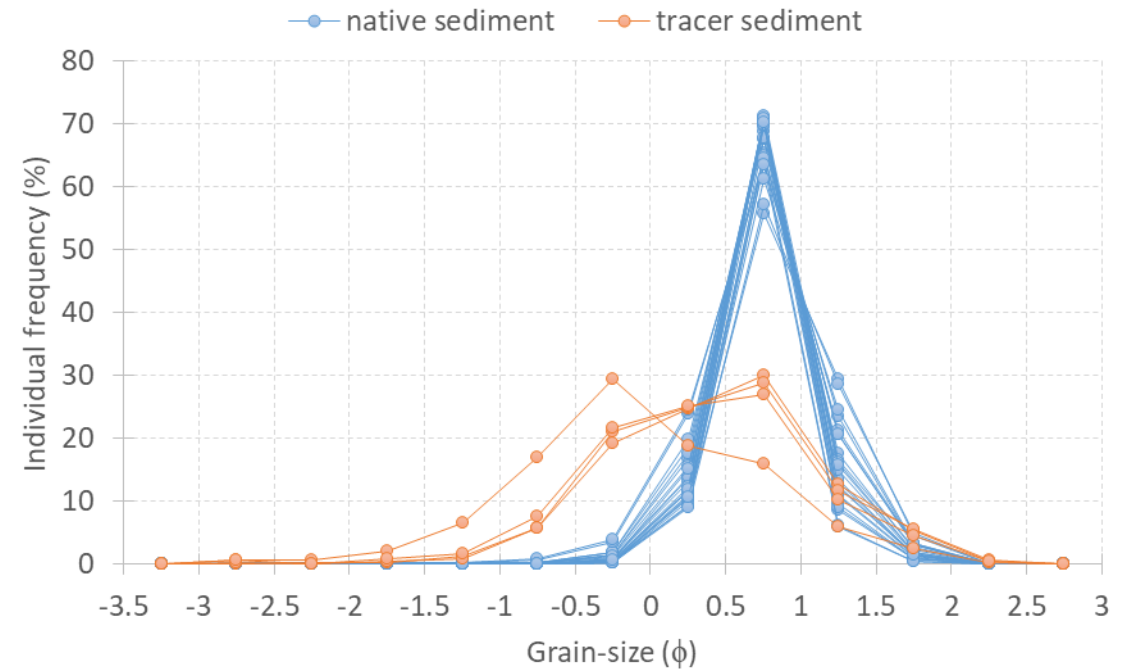
- size
- shape
- density



Praia Grande



1.7 tons of tracer



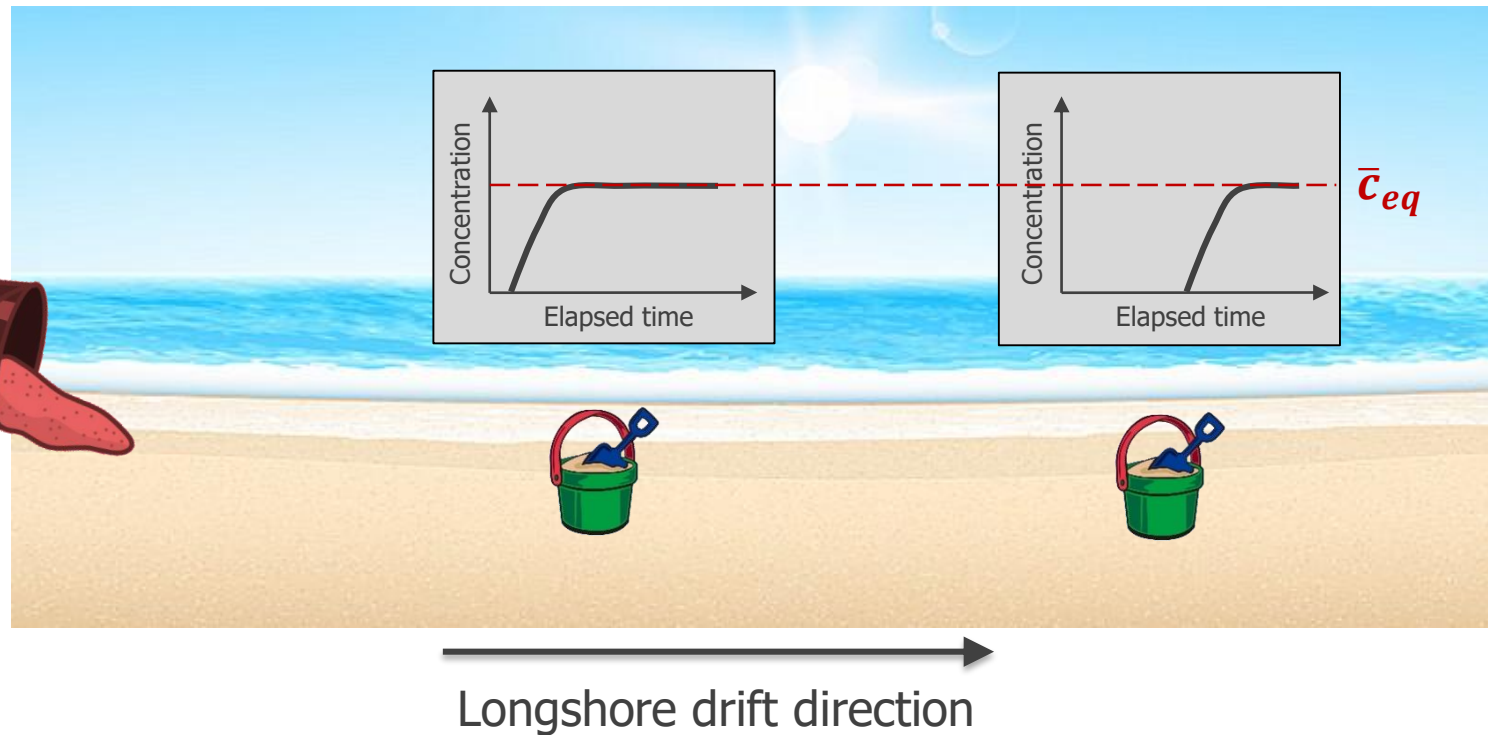
Continuous injection or dilution method

Duane, D.B. and James, W.R. (1980). Littoral transport in the surf zone elucidated by an Eulerian sediment tracer experiment. *Journal of Sedimentary Petrology*, 50(3): 929–942.

Constant
injection rate

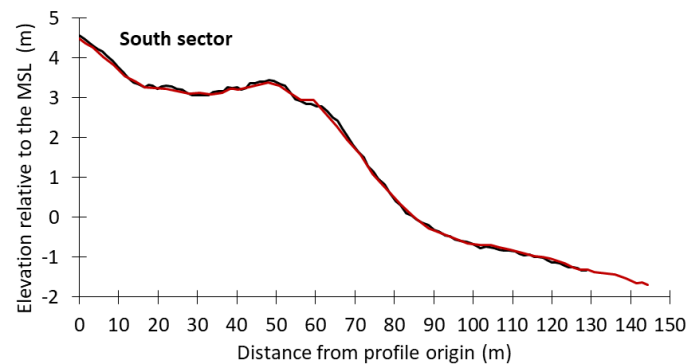
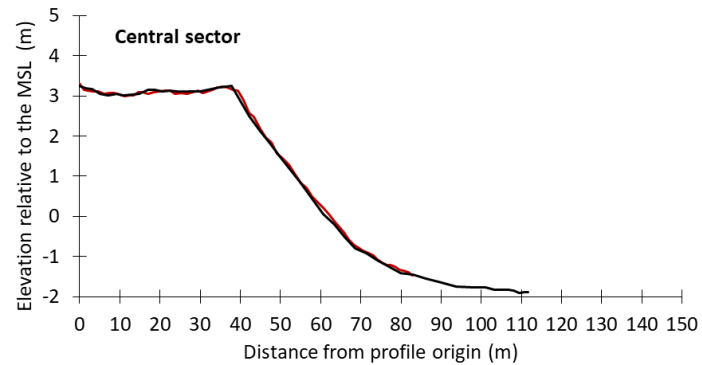
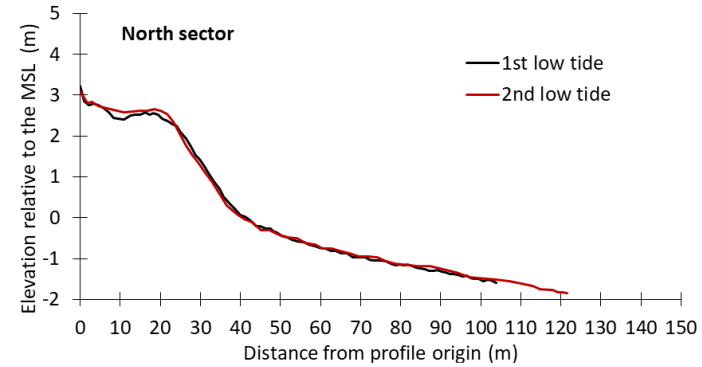
q_{dm}

$$q = \frac{q_{dm}}{(1 - p)\rho_s}$$



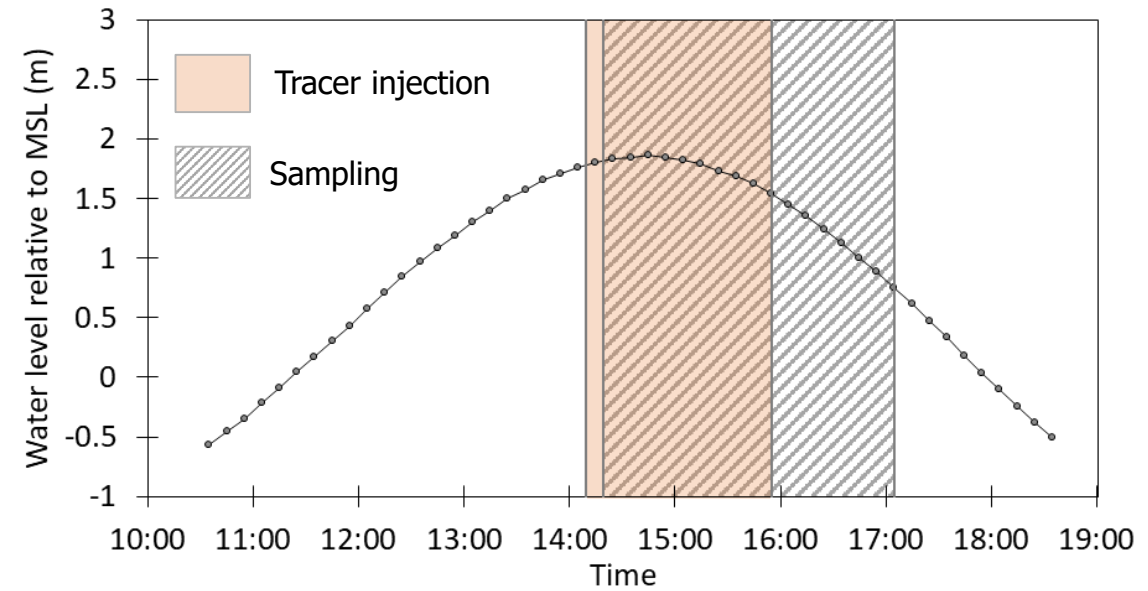
$$Q = \frac{q}{\bar{c}_{eq}}$$

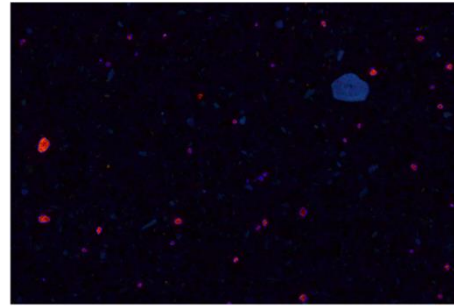
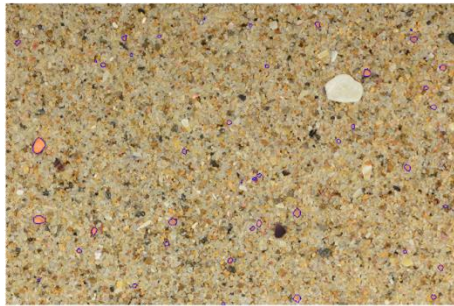
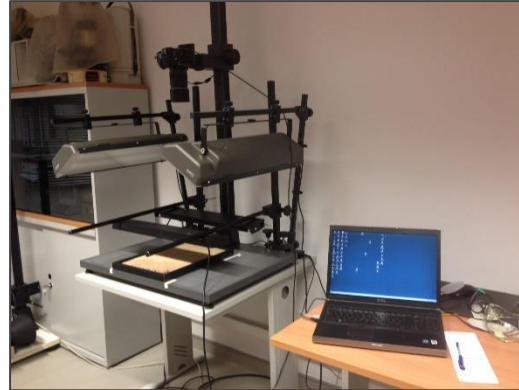
8th September 2014



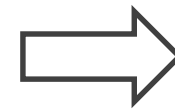
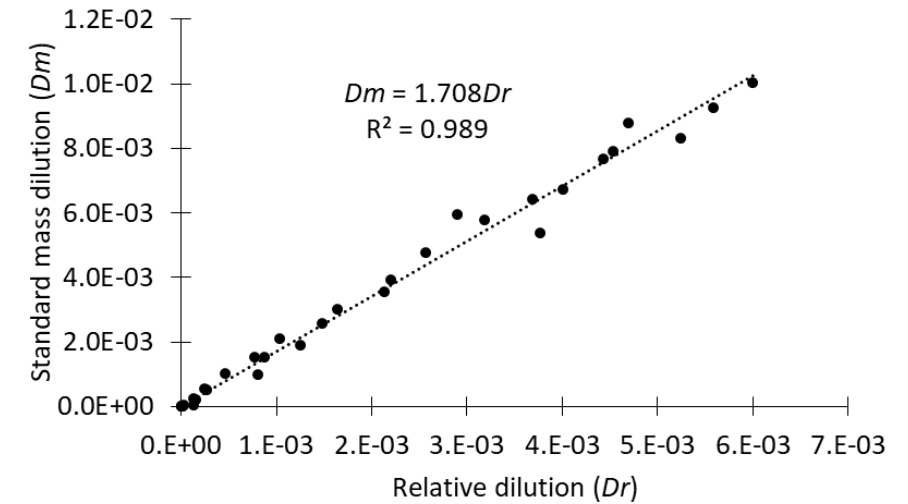
Oceanographic conditions

$\overline{H_s}$	0.7 m
$\overline{T_z}$	6 s
Dir	W and NW
$\overline{v_l}$	0.6 m.s ⁻¹ North-directed

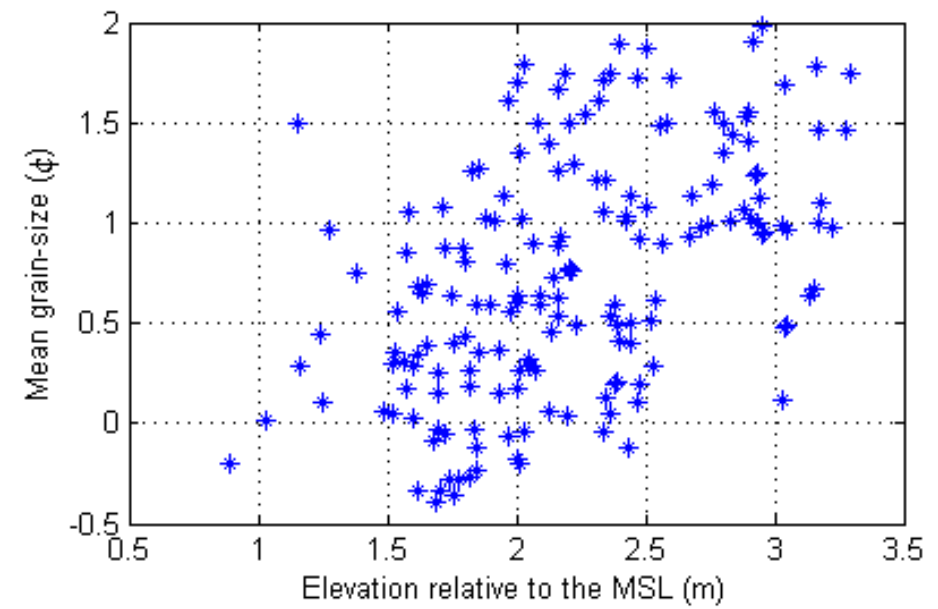
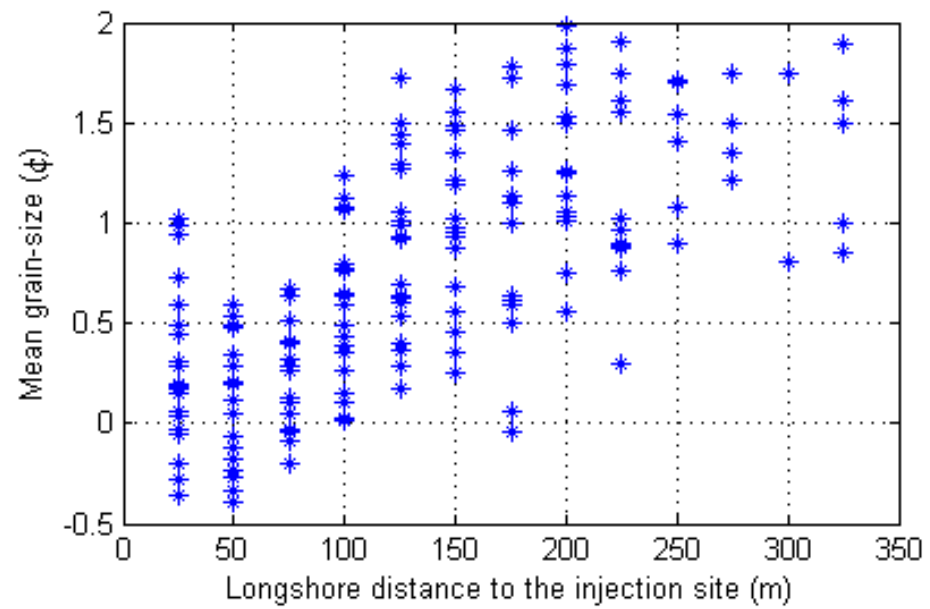


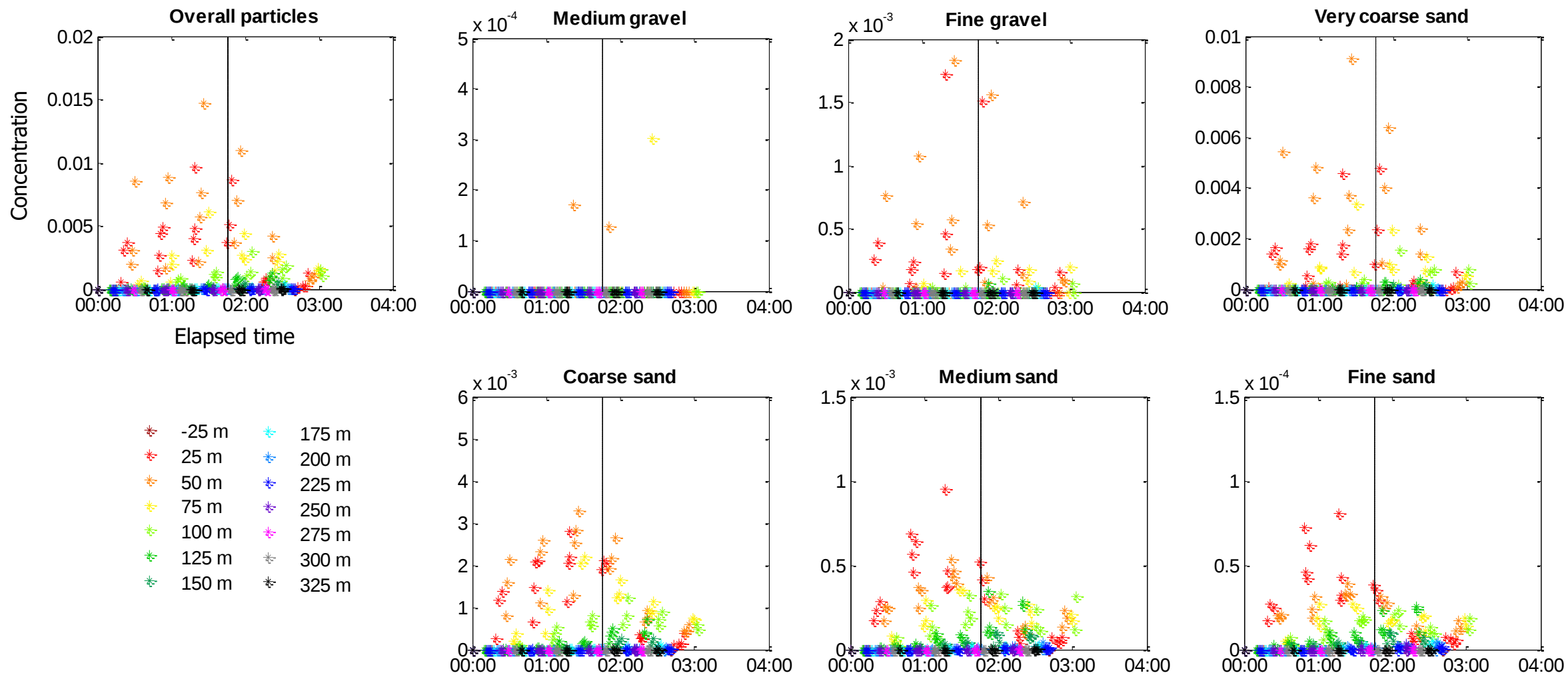


SedPhoto2 toolbox - MATLAB

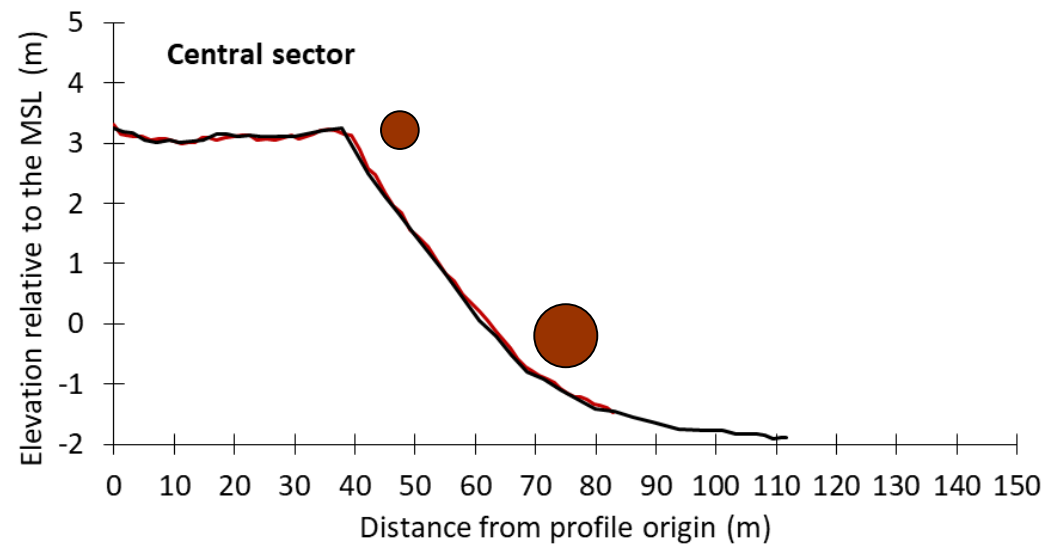


- Grain-size
- Tracer dilution

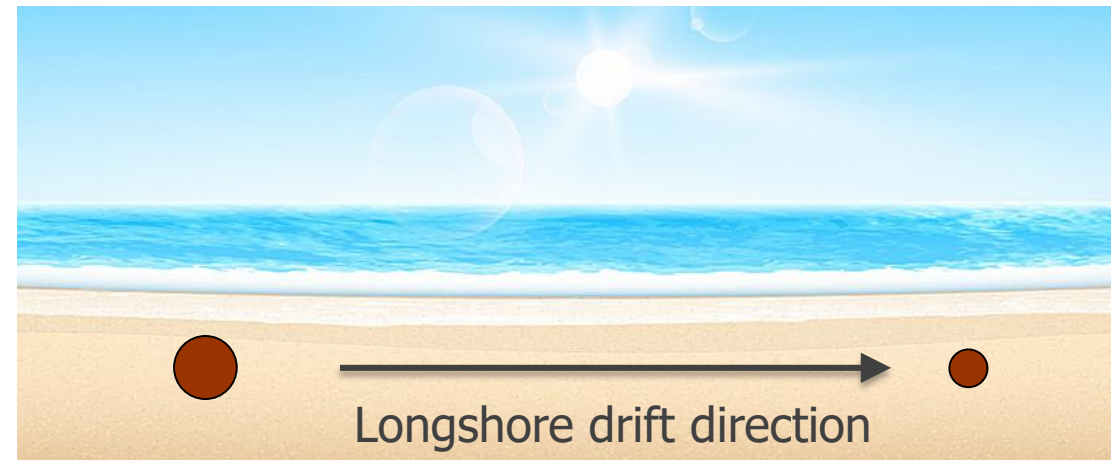


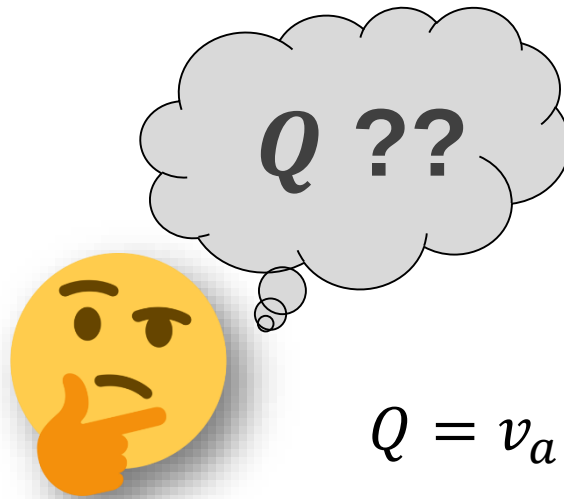


Selective transport



Finer sediments travel faster alongshore





$$Q = v_a \times A$$

↓

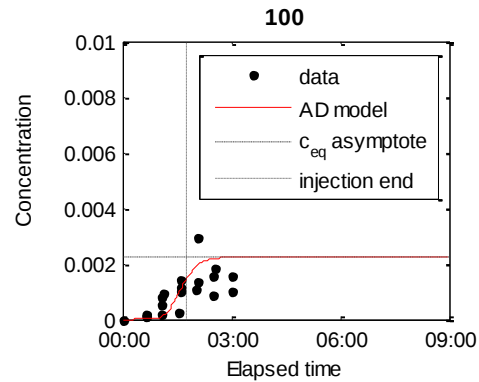
$$\frac{Q_s}{Q} = \frac{v_{a_s}}{v_a}$$

Analytical solution of advection-diffusion equation

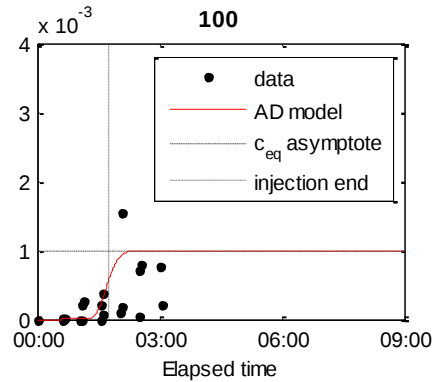
$$c(x, t) = \frac{c_0}{2} \operatorname{erfc} \left[\frac{x - v_a t}{\sqrt{4Dt}} \right]$$

Grain-size	$c_0 \times 10^{-3}$	$v_a \times 10^{-2}$ (m.s ⁻¹)	$D \times 10^{-2}$ (m ² .s ⁻¹)
Very coarse sand	1	1.61	1.33
Coarse sand	1	1.76	4.63
Medium sand	0.225	1.92	5.04
Fine sand	0.0175	1.97	6.62
Overall particles	2.3	1.72	4.18

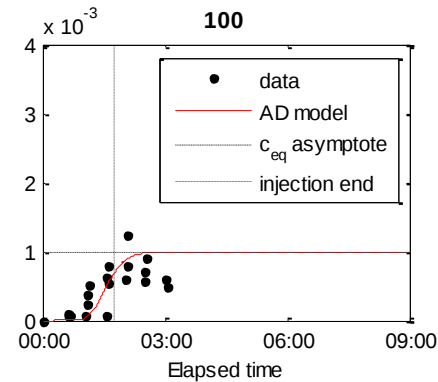
Overall particles



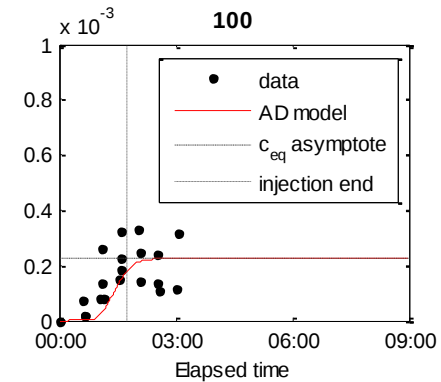
Very coarse sand



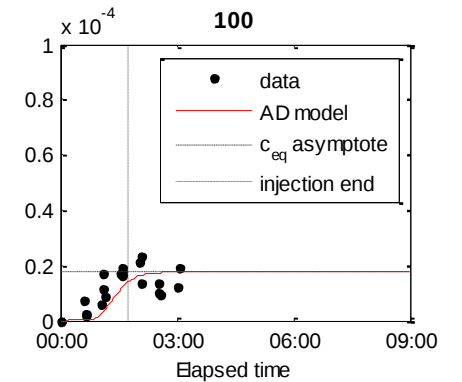
Coarse sand



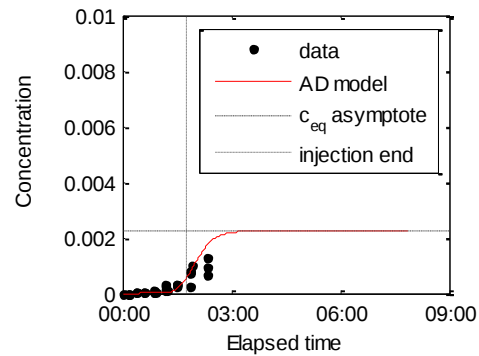
Medium sand



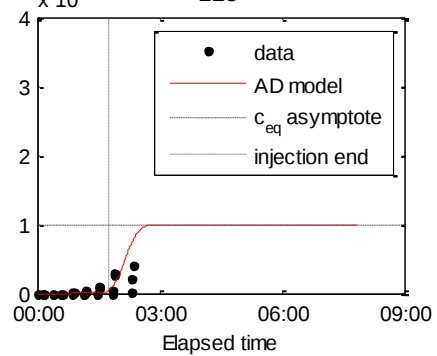
Fine sand



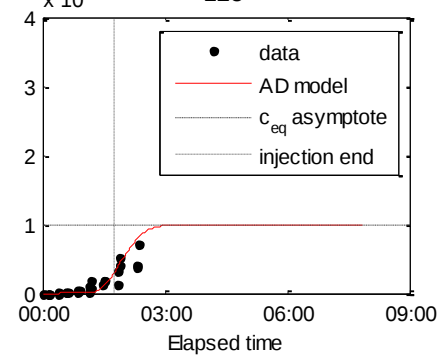
125



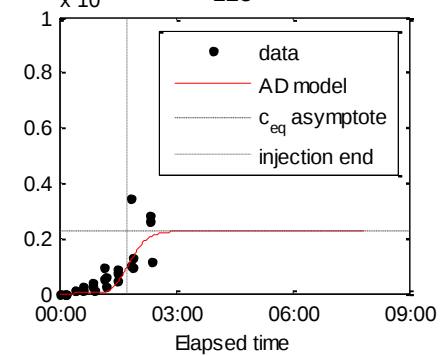
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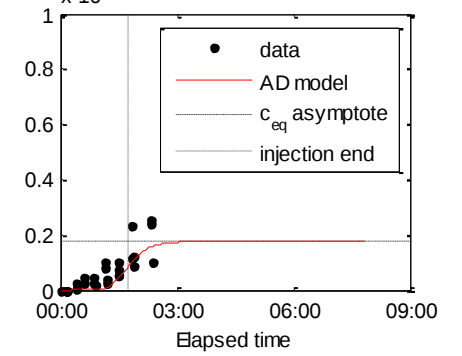
125

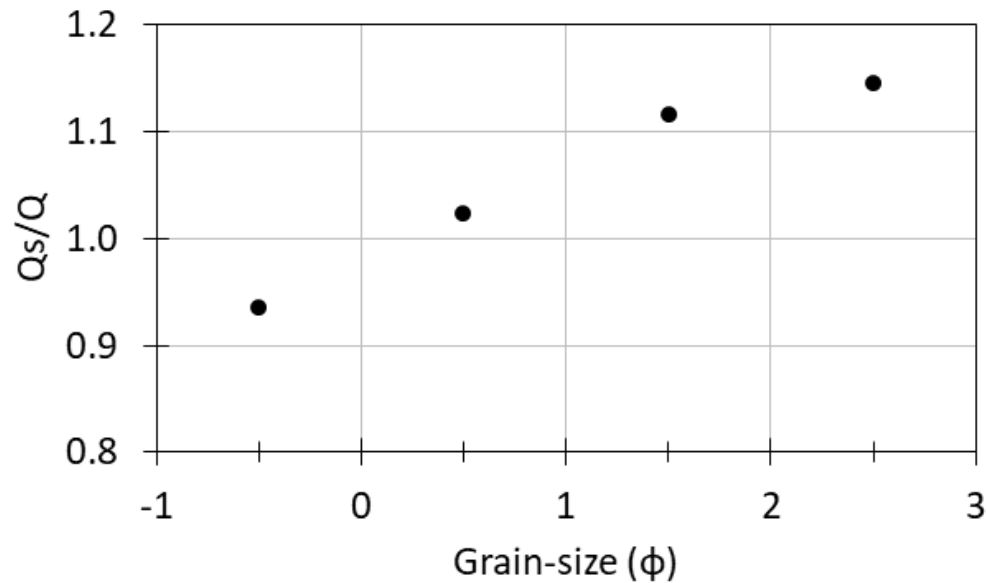


125



125





This experiment allowed to estimate the effects of grain-size on longshore drift rates.

The results show the transport rate decreases with the increase of grain-size, a result in agreement with previous works (*e.g.* Komar, 1988; del Valle *et al.*, 1993).

del Valle, R., Medina, R., Losada, M. (1993). Dependence of coefficient K on grain size. *Journal of Waterway, Port, Coastal and Ocean Engineering*, 119: 568-574.

Komar, P.D. (1988). Environmental controls on littoral sand transport. *Proceedings of the 21st International Conference on Coastal Engineering*, 1238-1252, ASCE.

Muito obrigada!

