

Shelf-to-canyon sediment supply mechanisms in the Gulf of Lions and Eel margins

Pere Puig

Institut de Ciències del Mar, CSIC

With contributions from:

ICM-CSIC: Albert Palanques, Jorge Guillén, Jacobo Martín, Marta Ribó

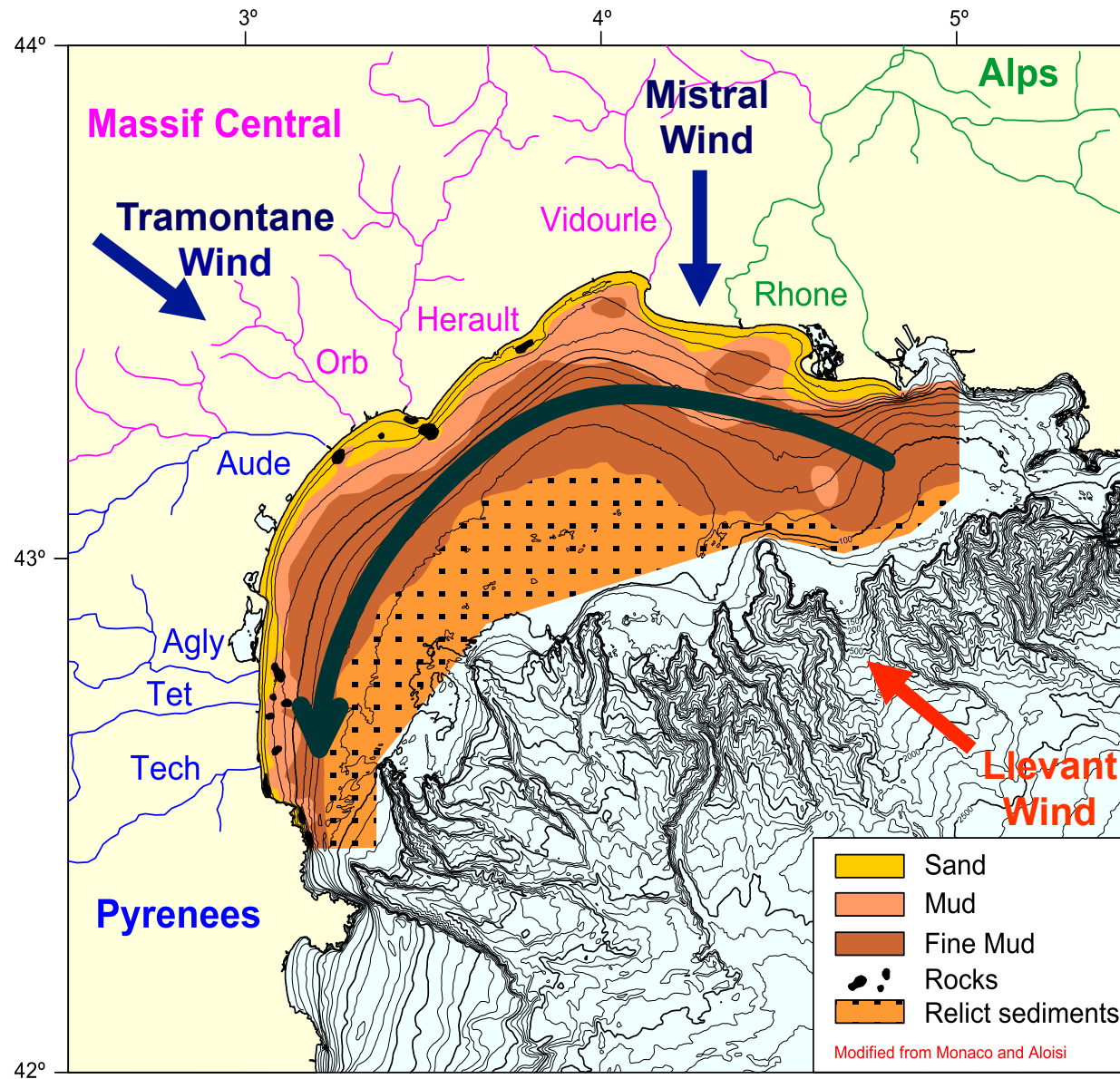
UB: Antoni Calafat, Joan Fabrés, Miquel Canals

CEFREM: Xavier Durrieu de Madron, Serge Heussner

UW: Andrea Ogston, Beth Mullenbach, Chuck Nittrouer, Dick Sternberg



Gulf of Lions



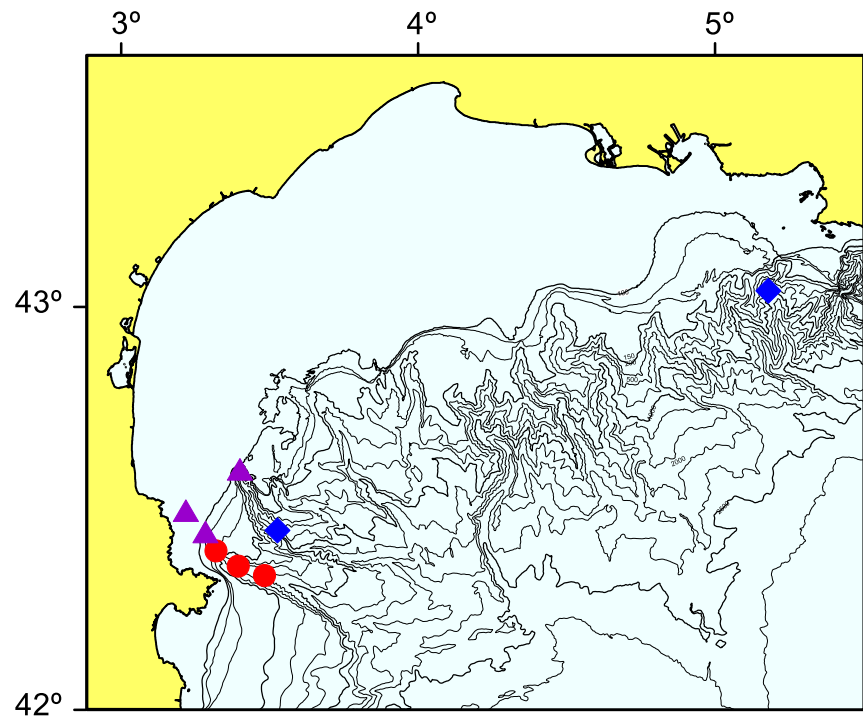
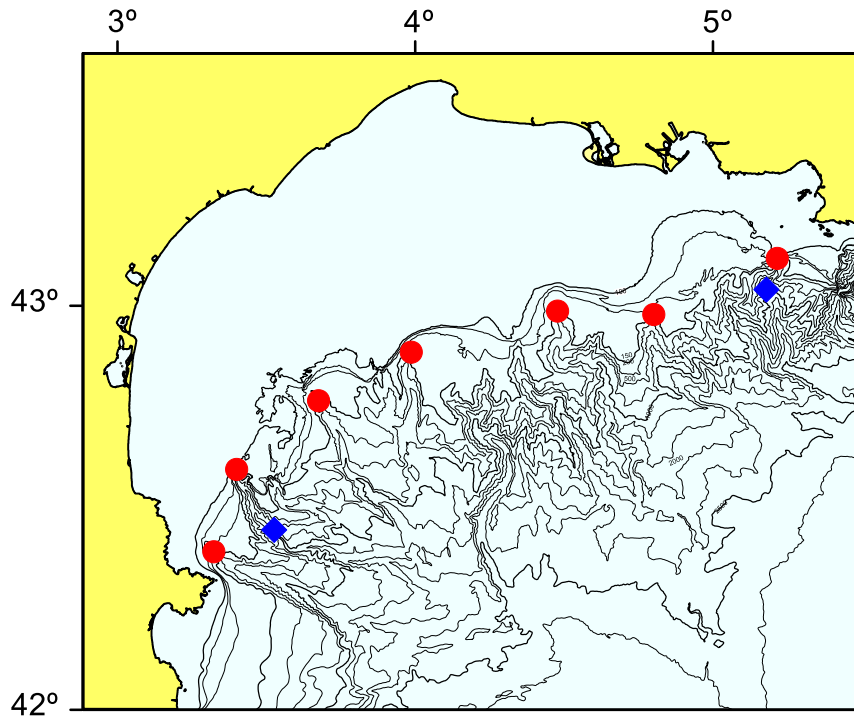
EuroSTRATAFORM monitoring efforts

Winter 2004

- Along-margin

Winter 2005

- Shelf-to-canyon



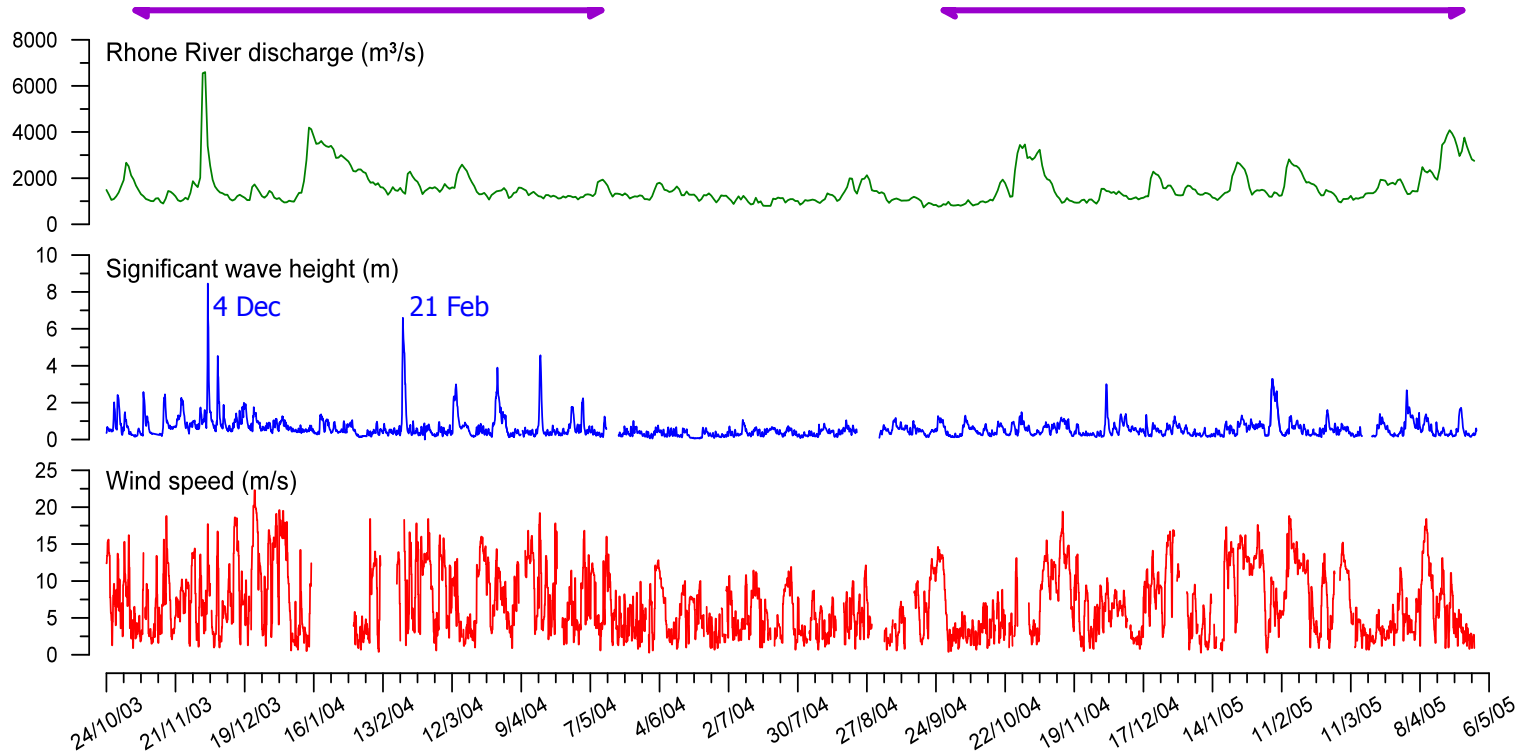
Forcing conditions

Winter 2004

Wave-storms & floods

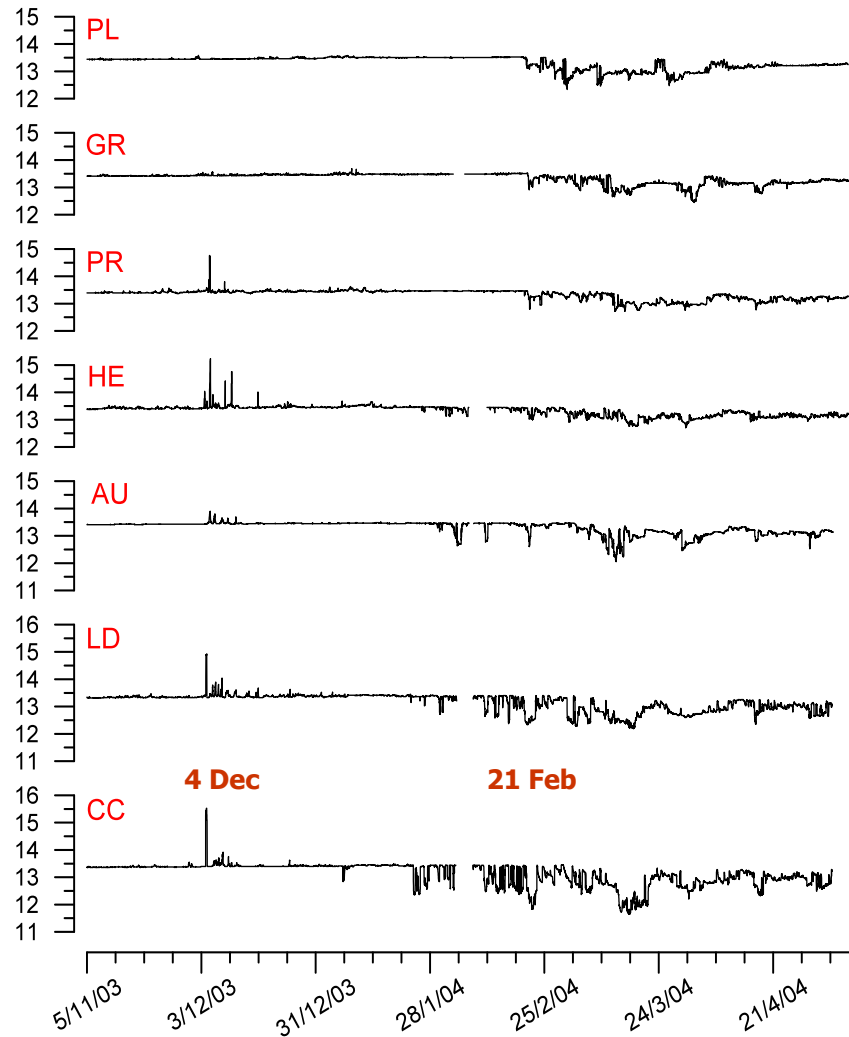
Winter 2005

Continuous northerly winds

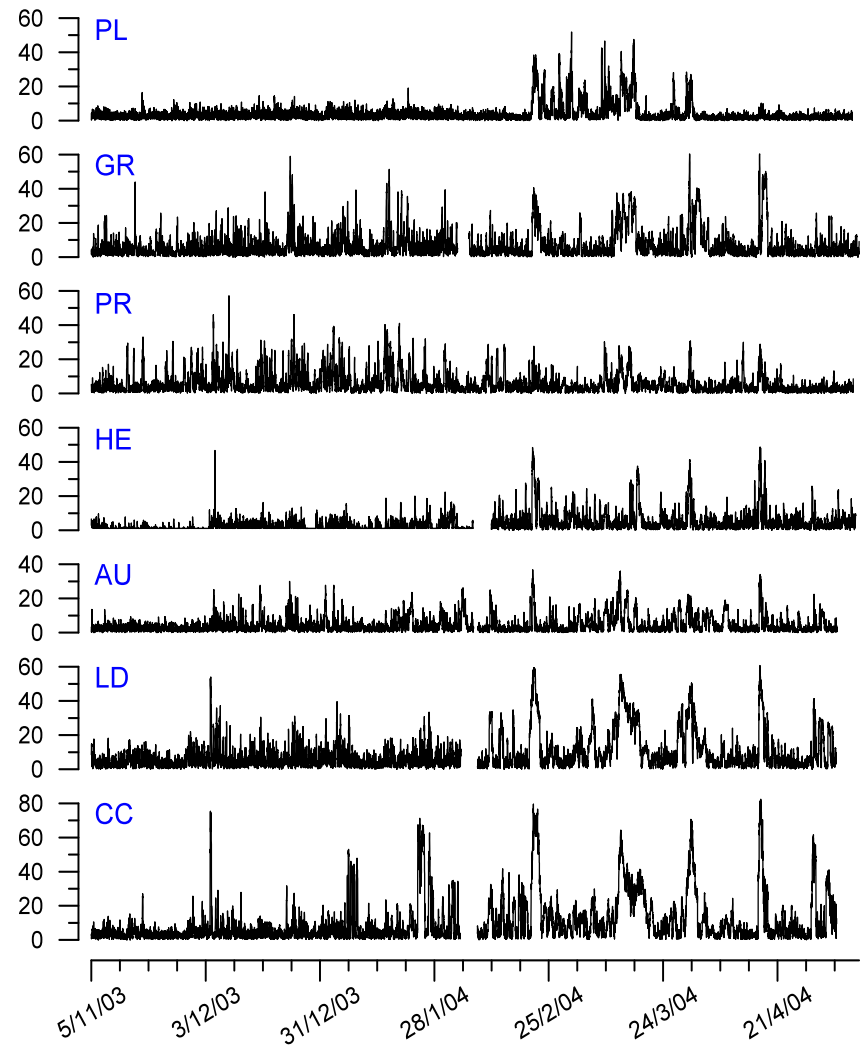


Canyon heads (winter 2004)

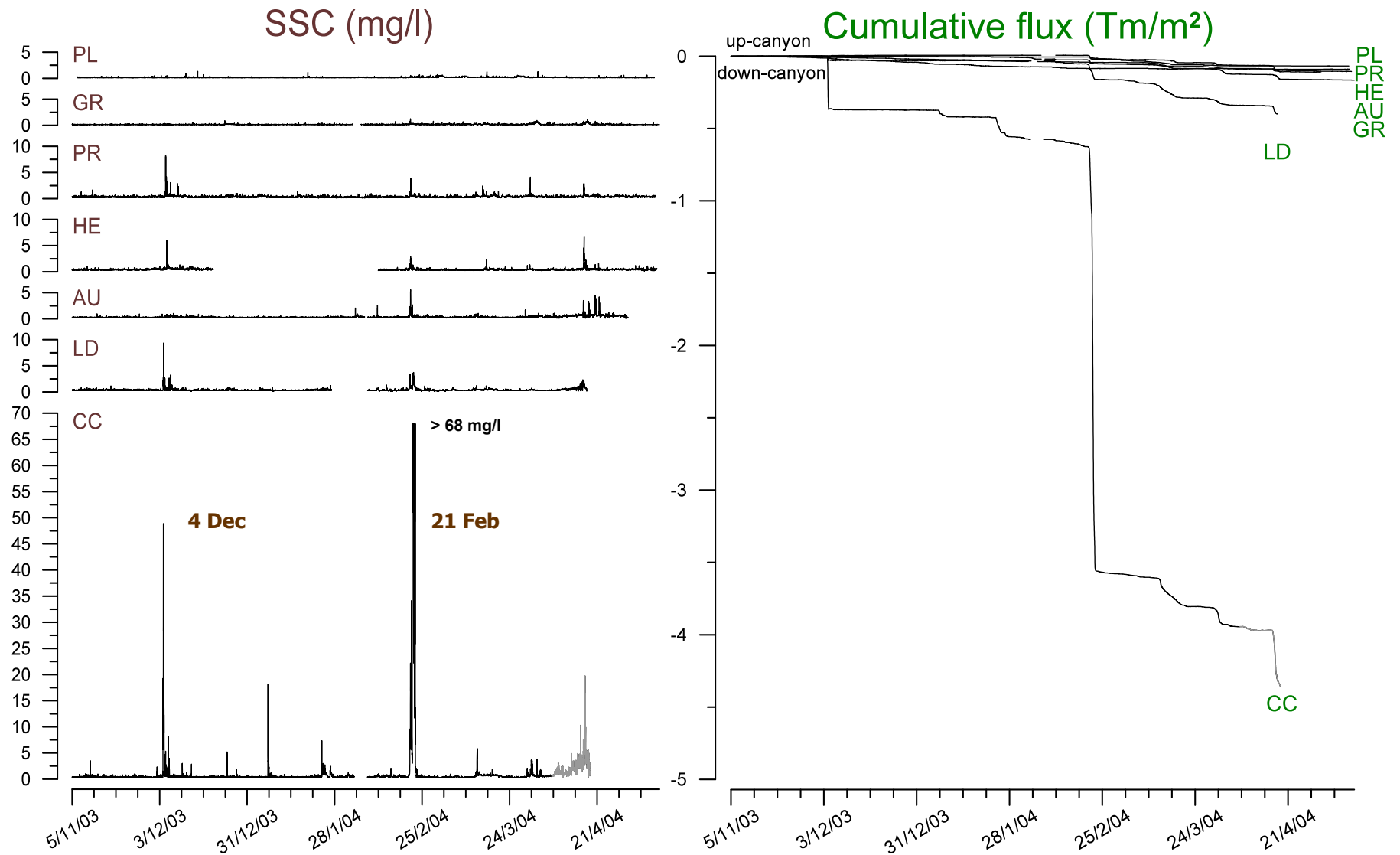
Temperature (°C)



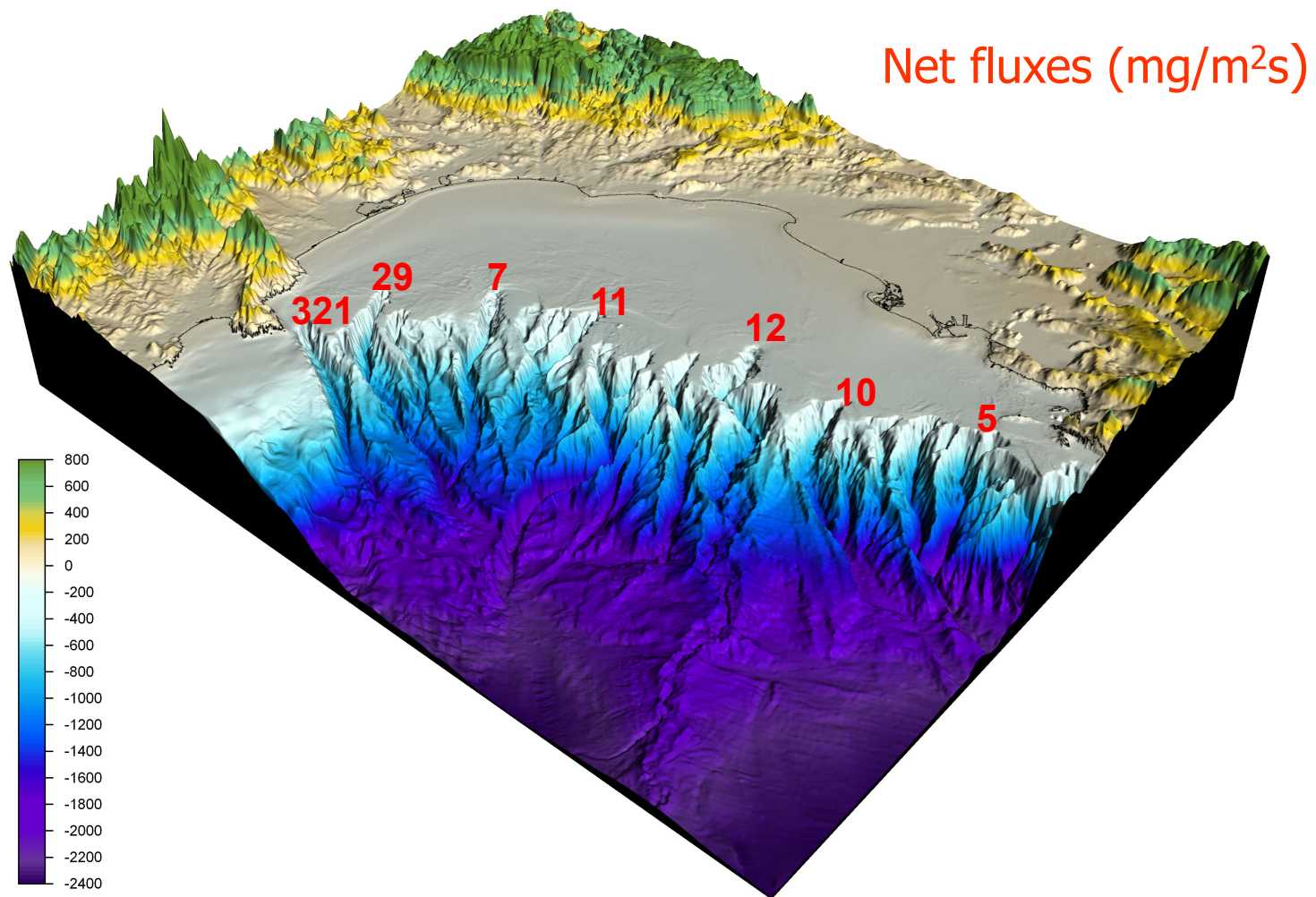
Current velocity (cm/s)



Canyon heads (winter 2004)

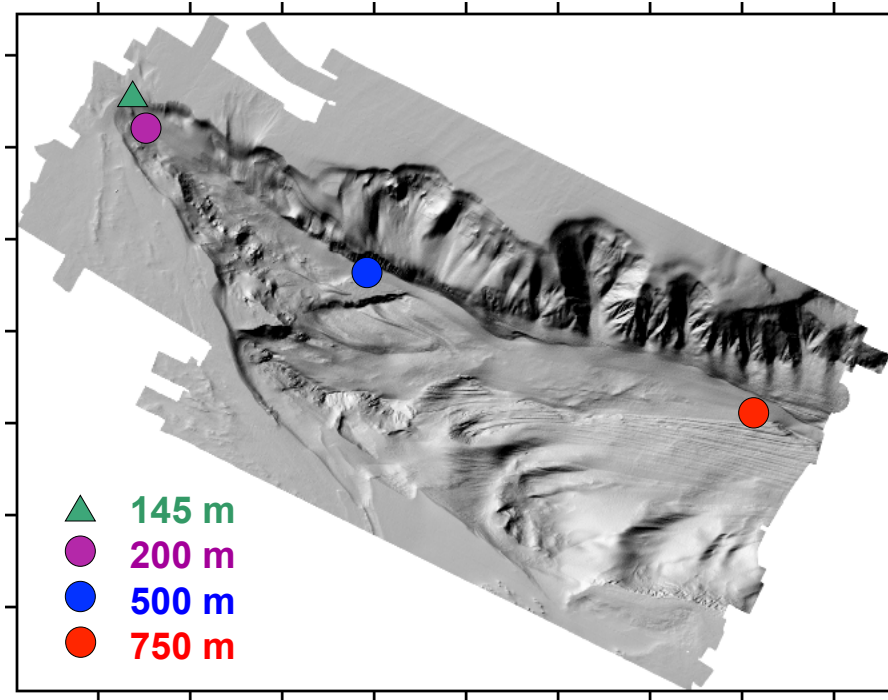
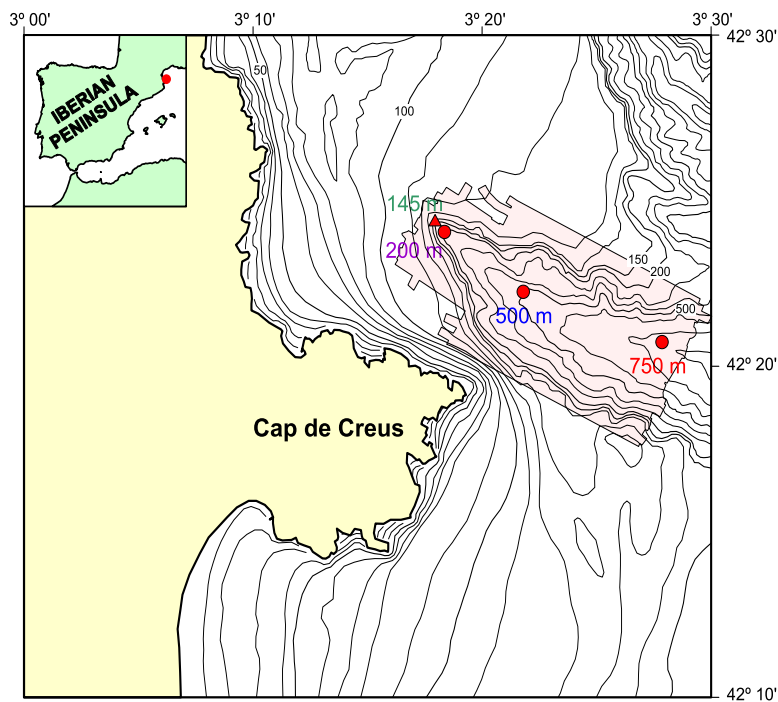


Canyon heads (winter 2004)



Cap de Creus Canyon (winter 2005)

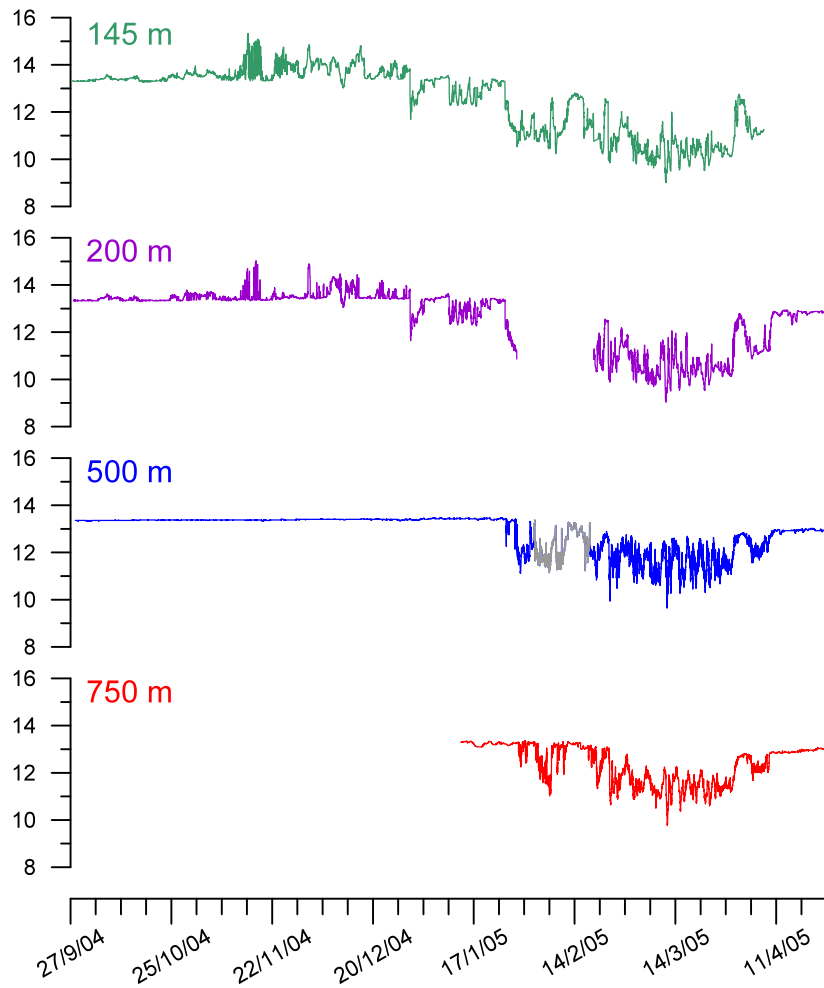
Upper canyon monitoring



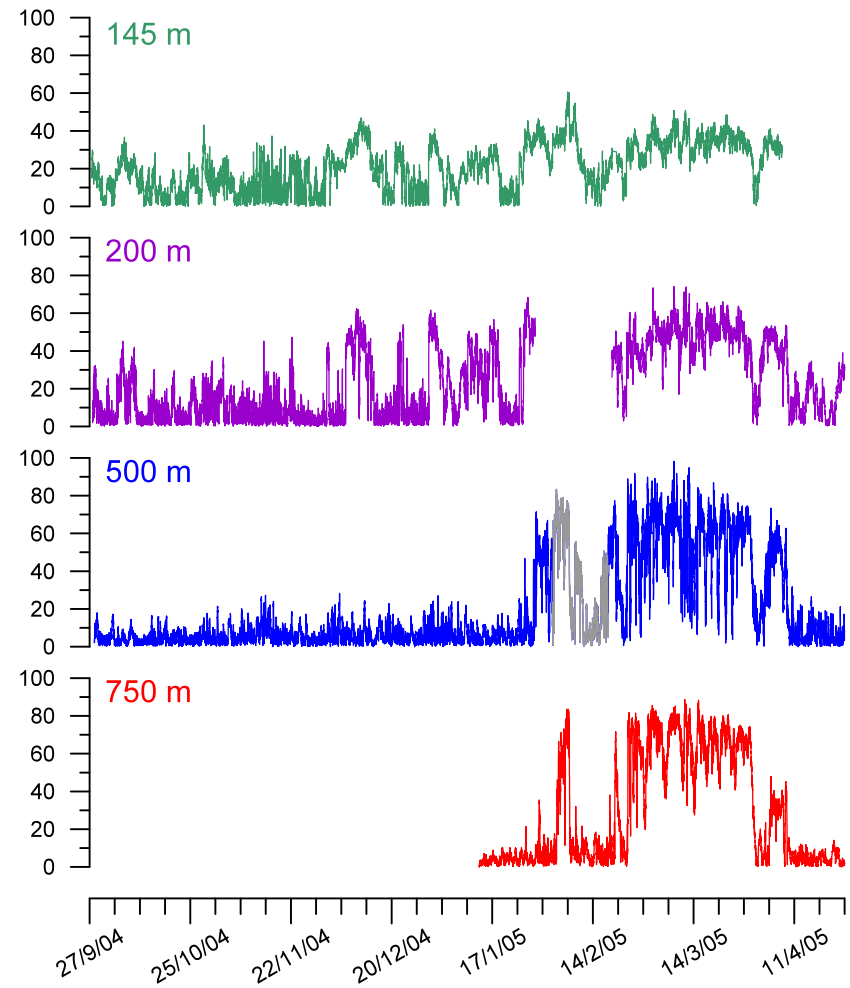
Swath bathymetry conducted by AOA, Fugro and UB

Cap de Creus Canyon (winter 2005)

Temperature ($^{\circ}\text{C}$)

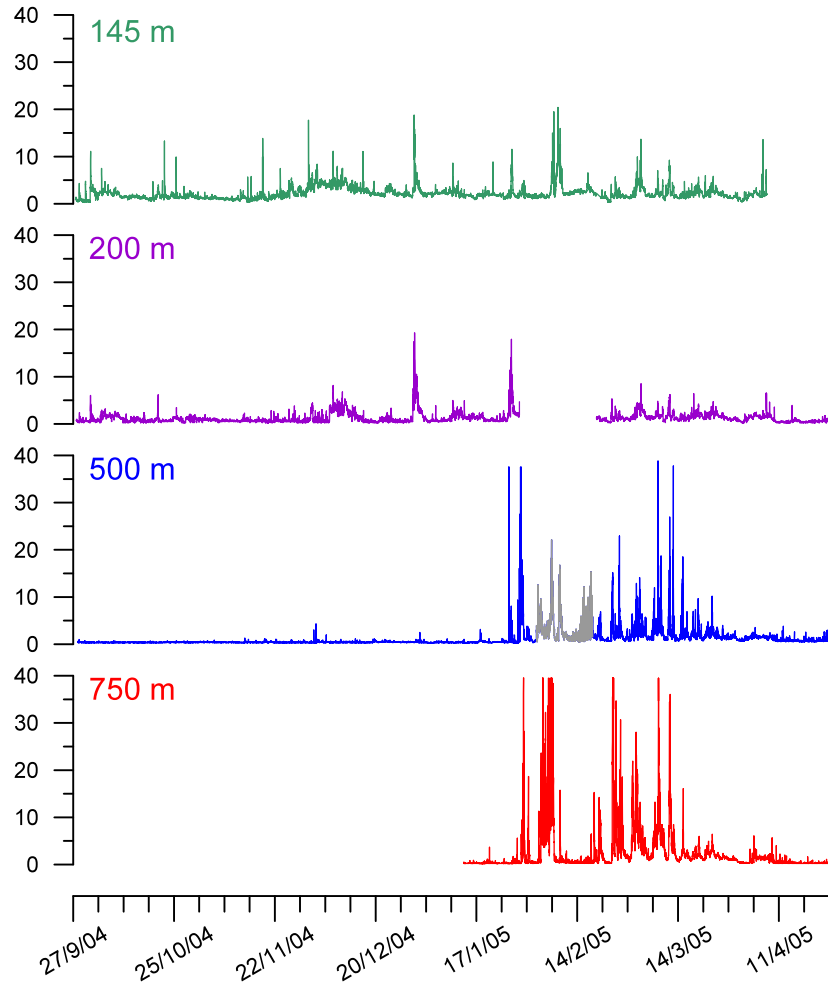


Current speed (cm/s)

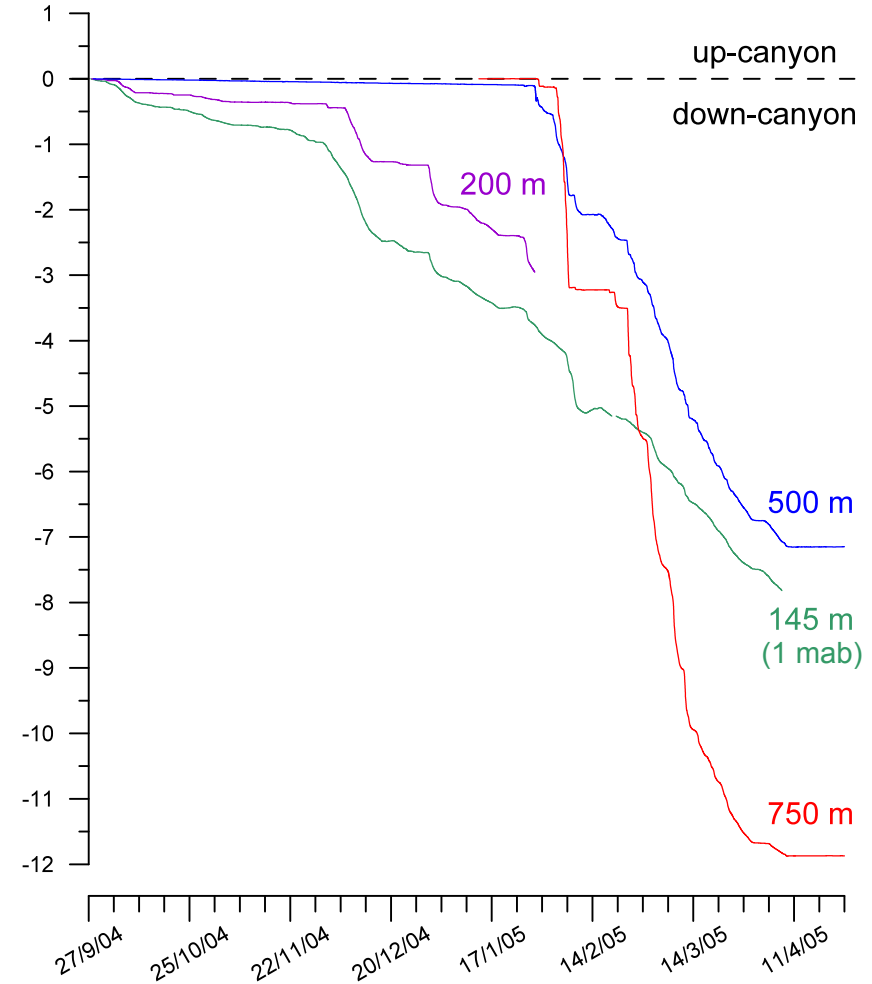


Cap de Creus Canyon (winter 2005)

SSC (mg/l)



Cumulative flux (Tm/m^2)



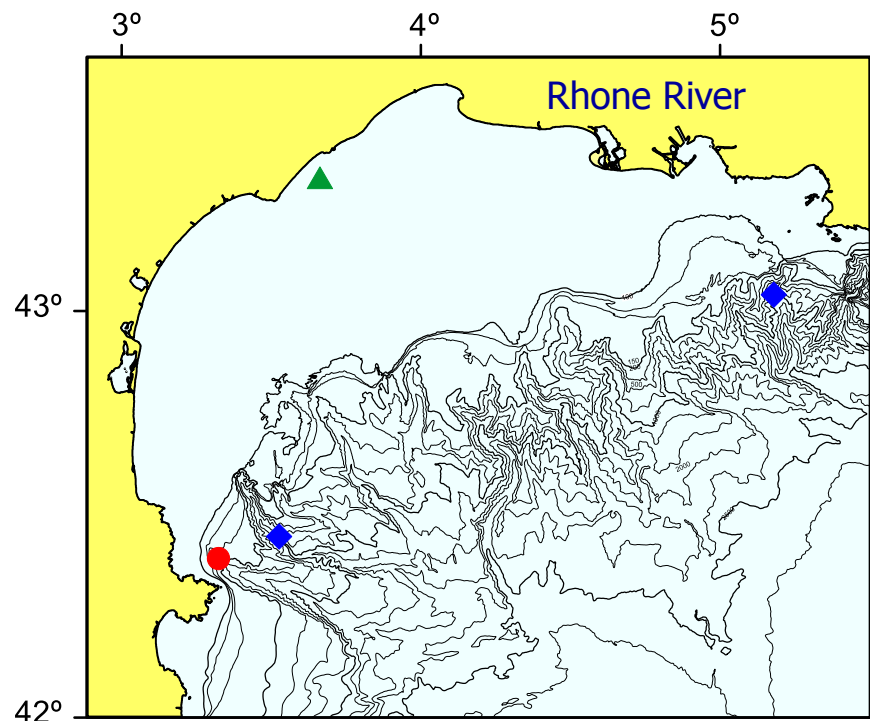
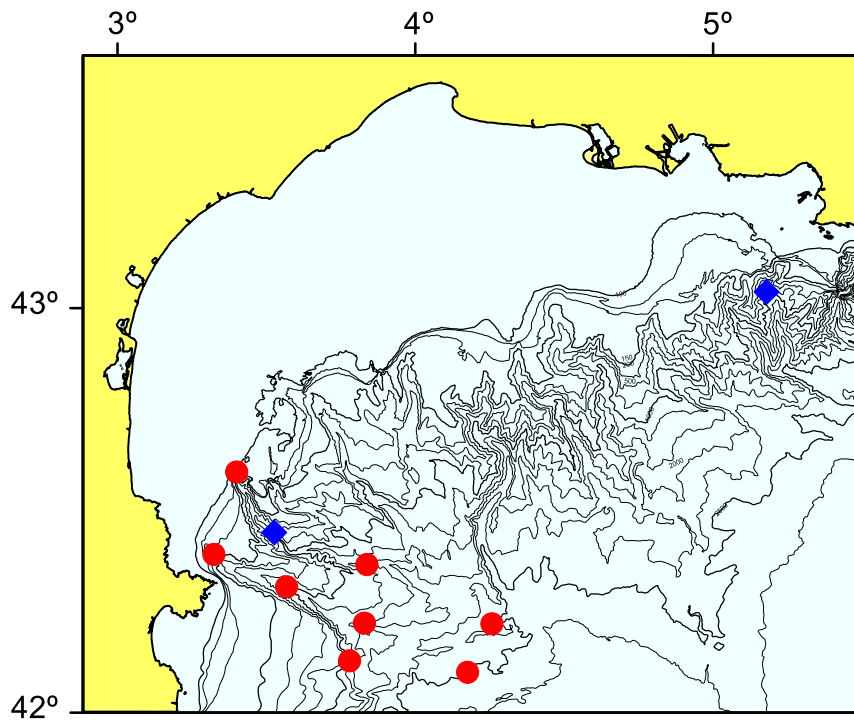
HERMES & HERMIONE monitoring efforts

Winter 2006

- Across-margin

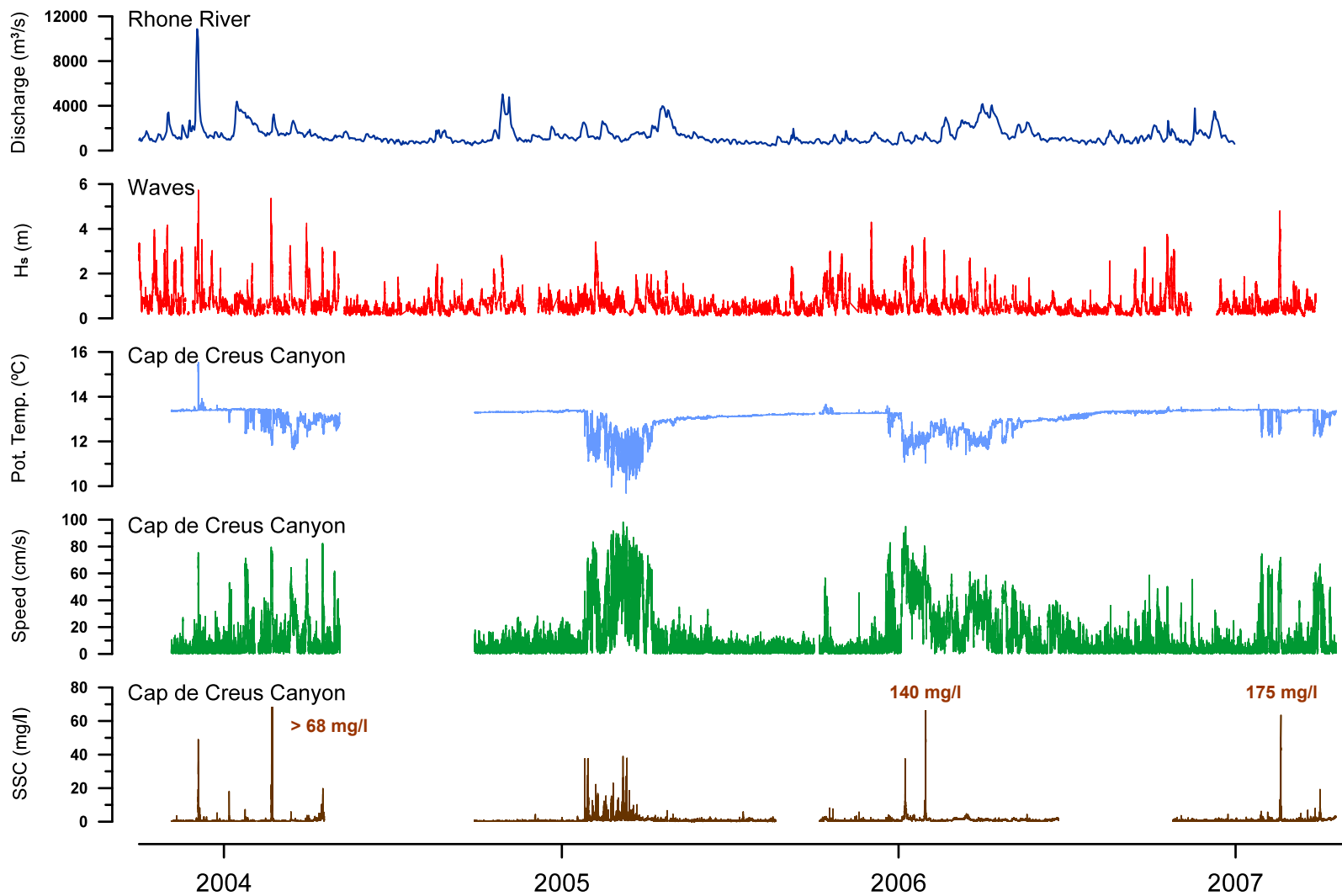
Winter 2007- Present

- Canyon head monitoring

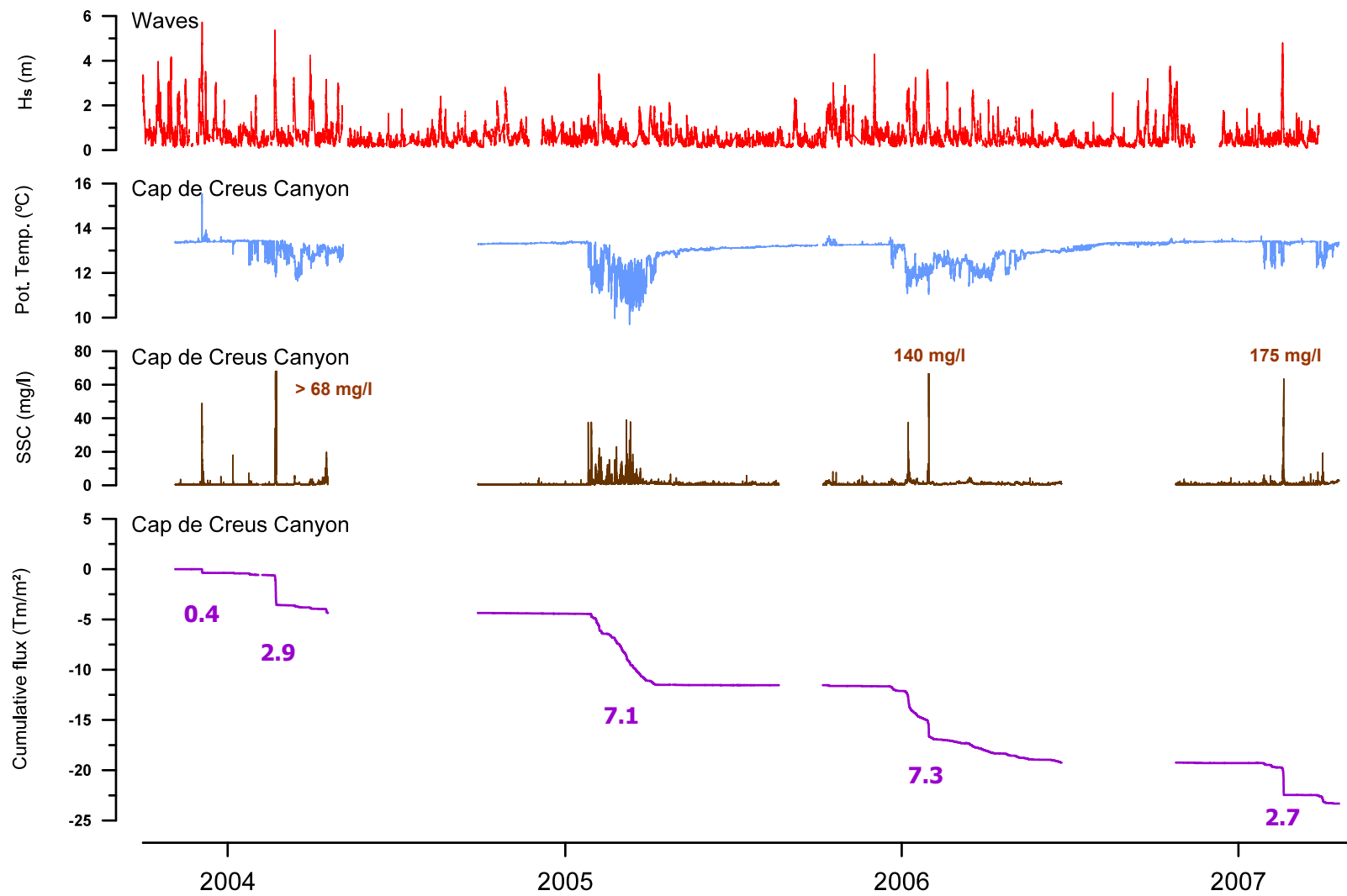


See Palanques et al. poster M-25

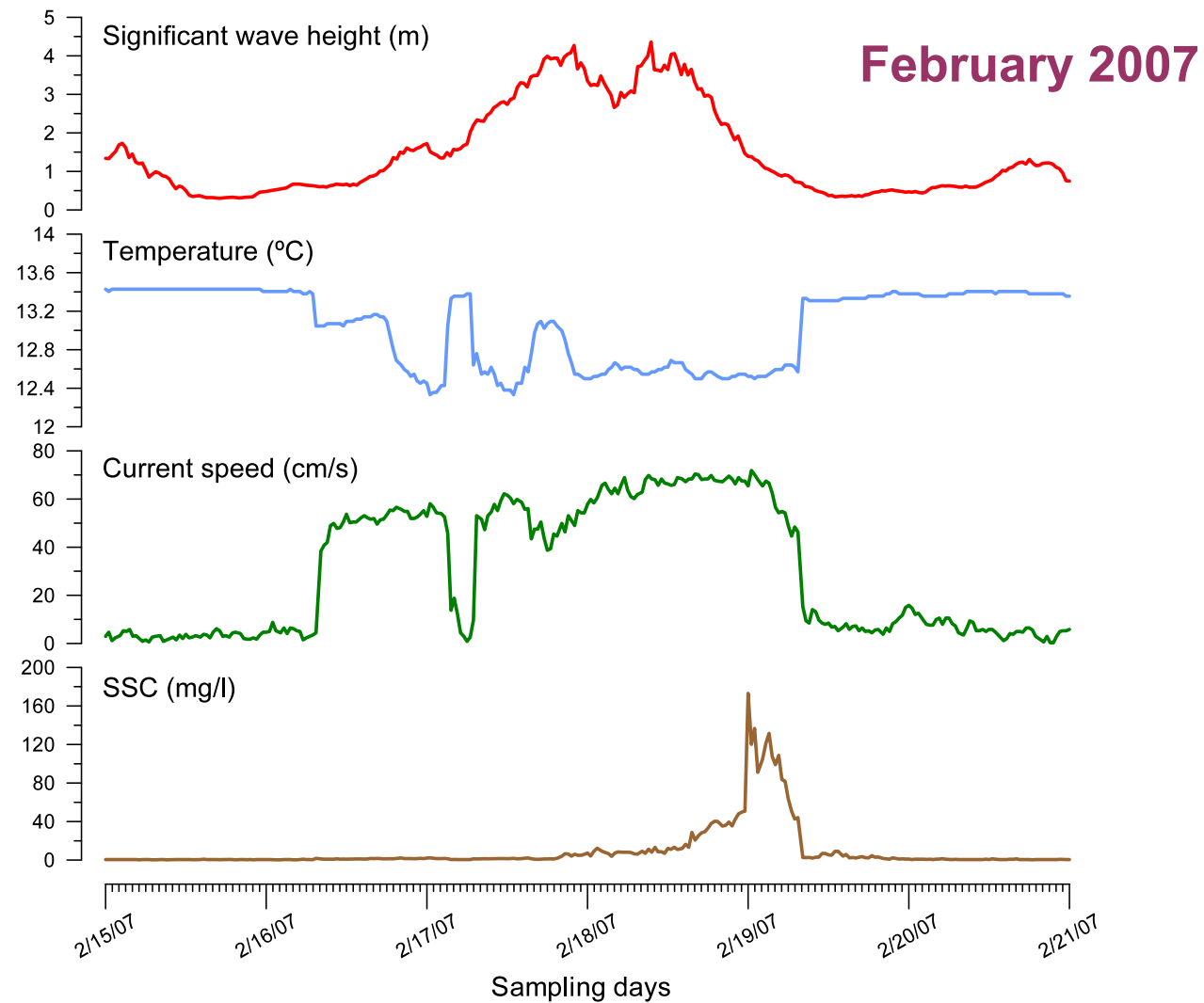
Time series (1)



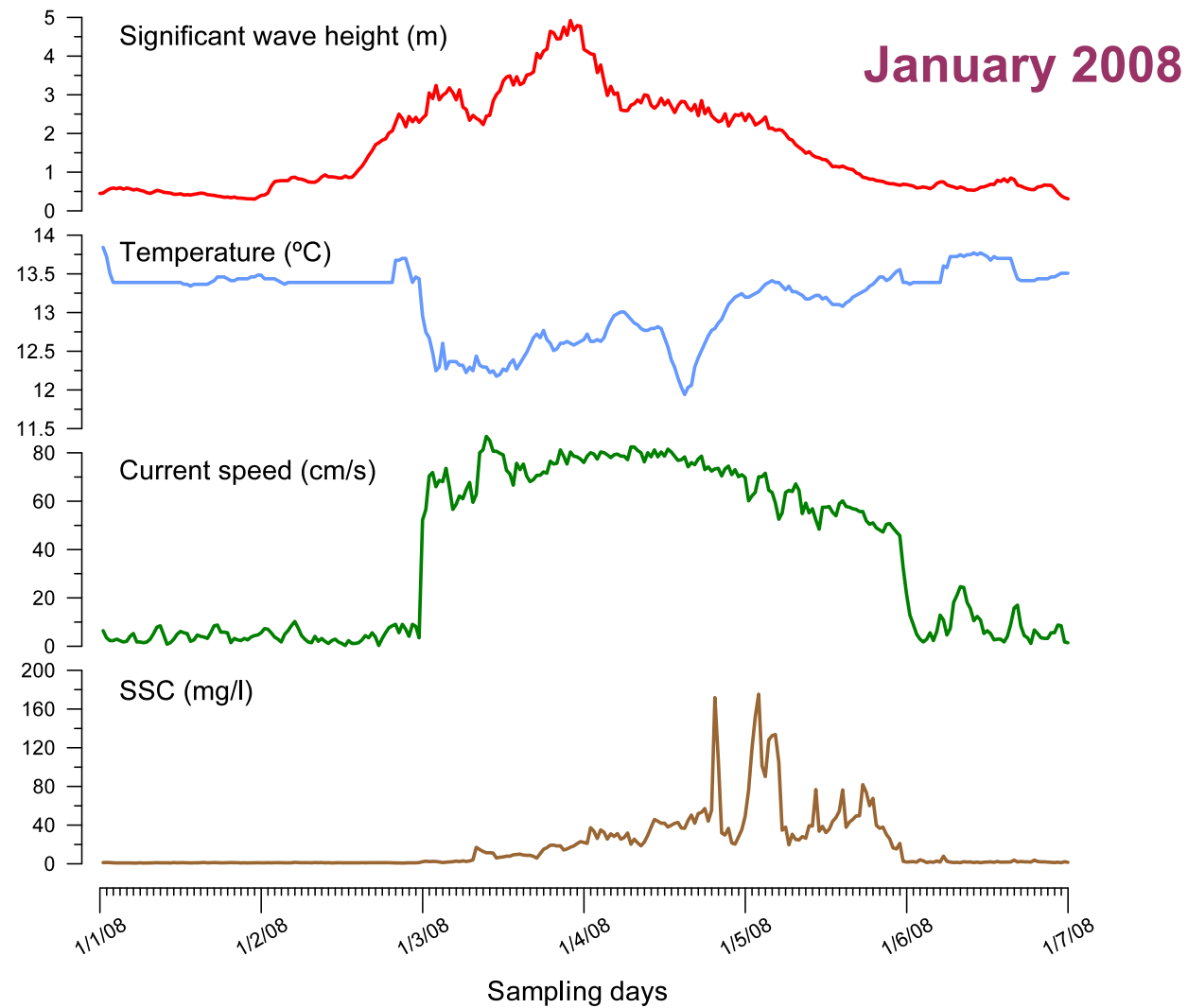
Time series (2)



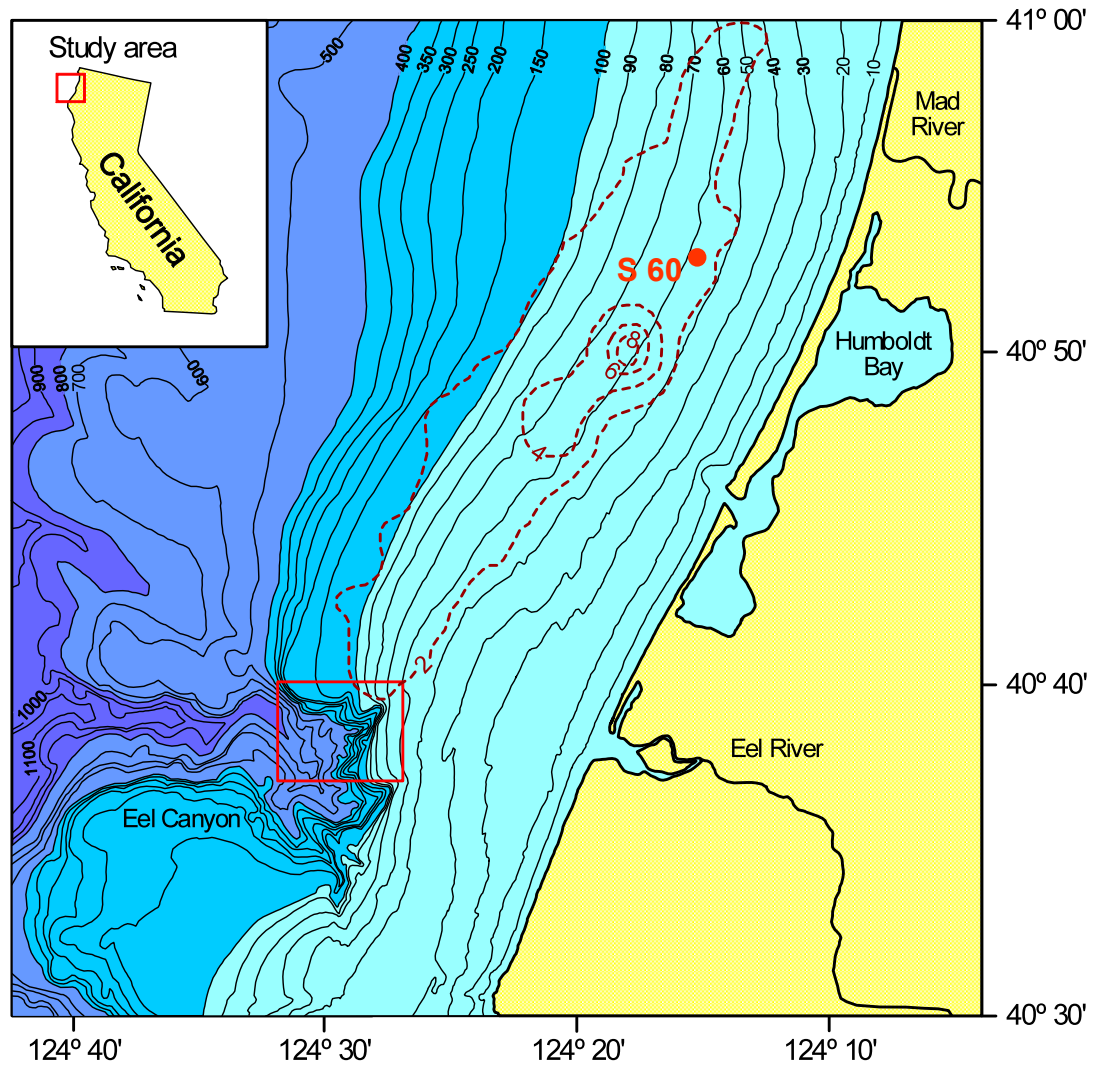
Storm resuspension & cascading advection (1)

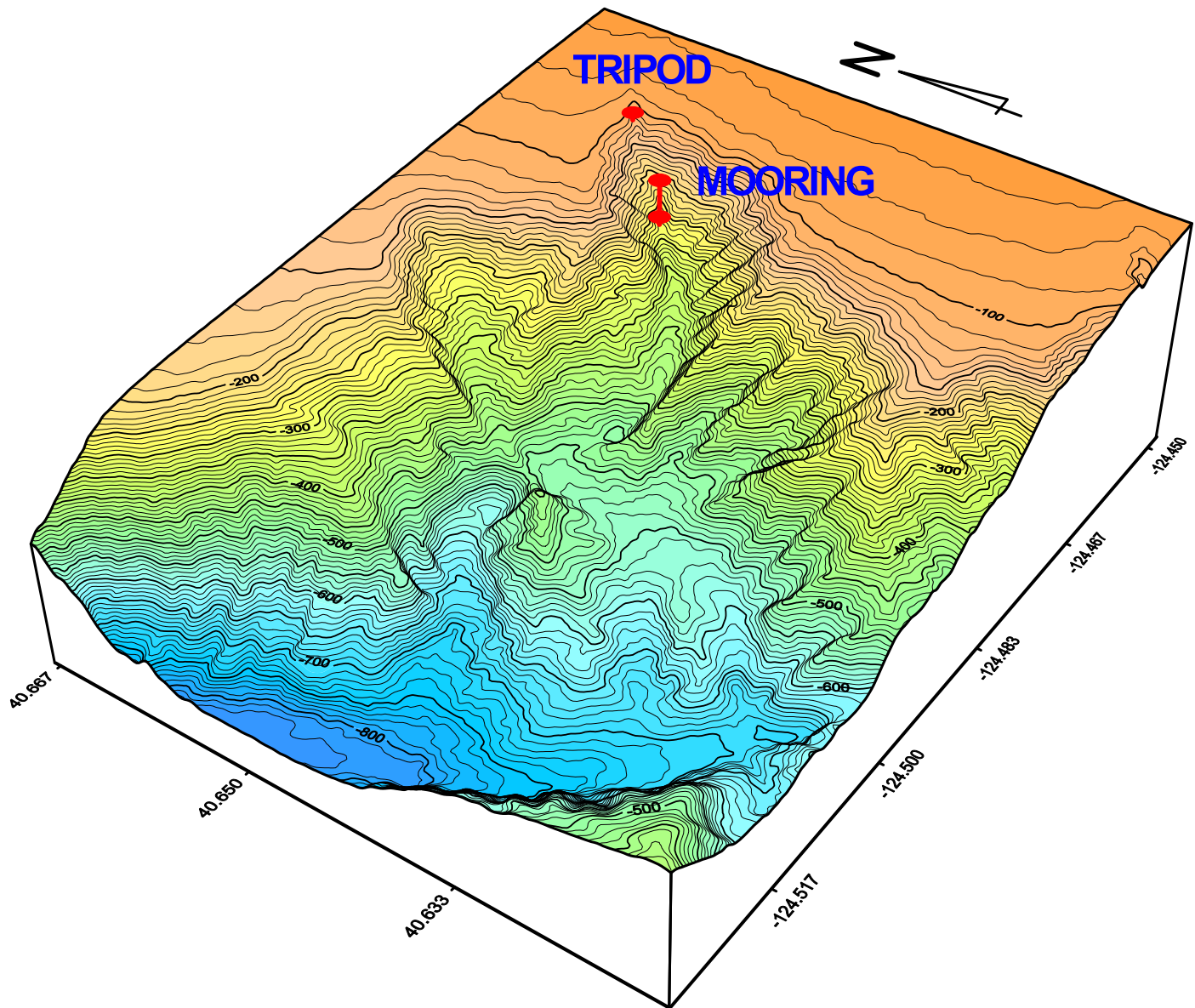


Storm resuspension & cascading advection (2)

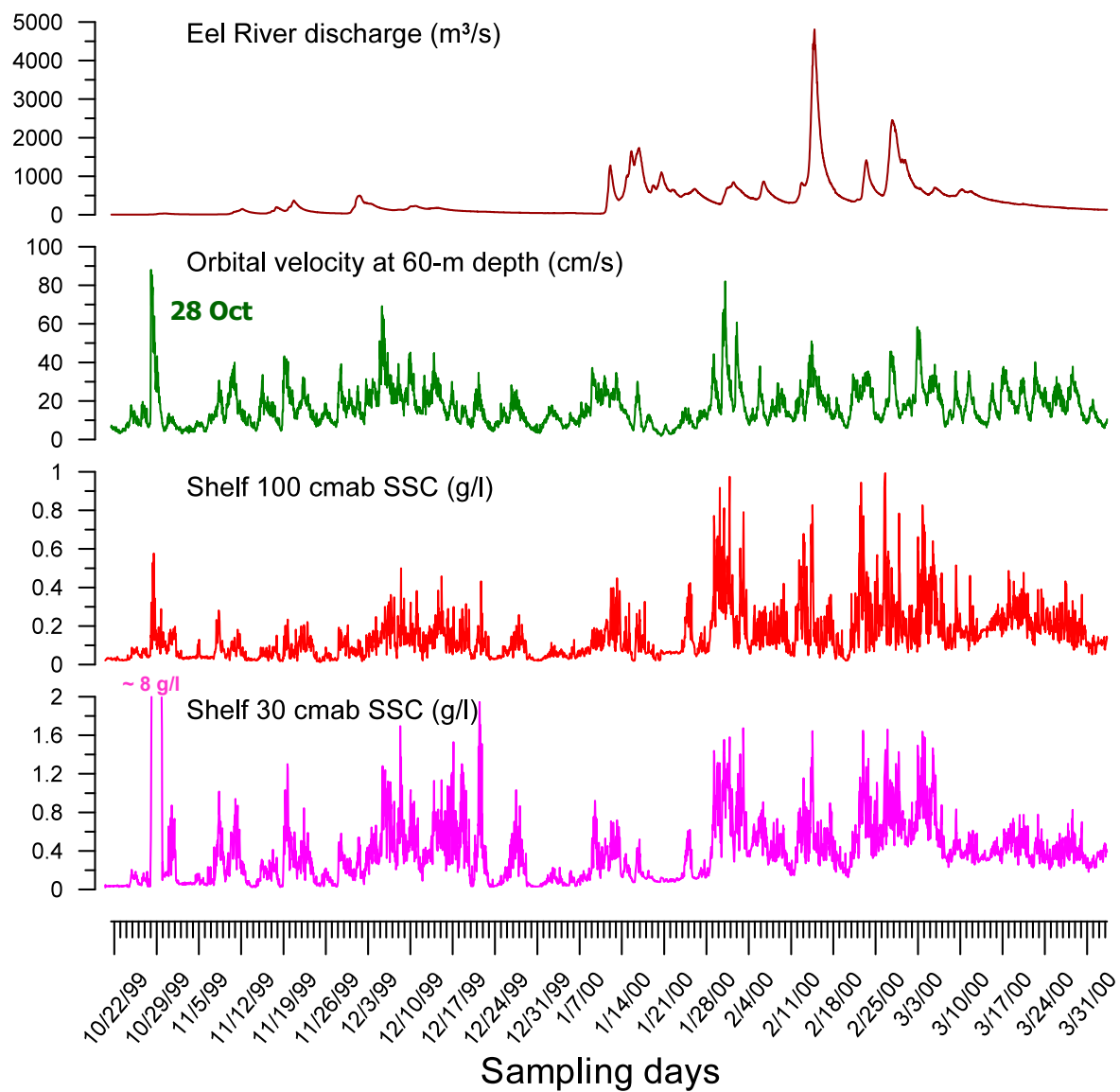


Eel margin

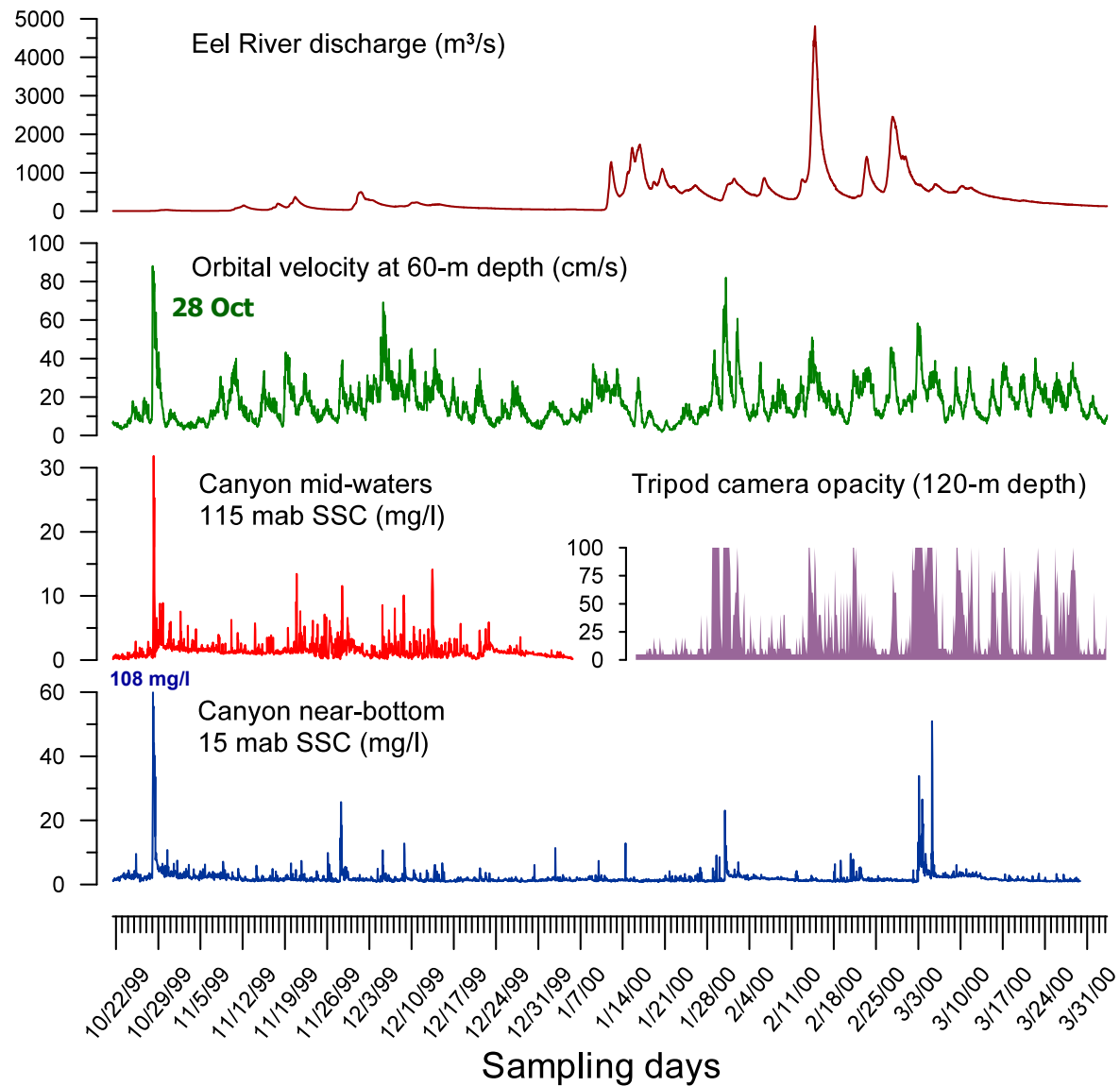




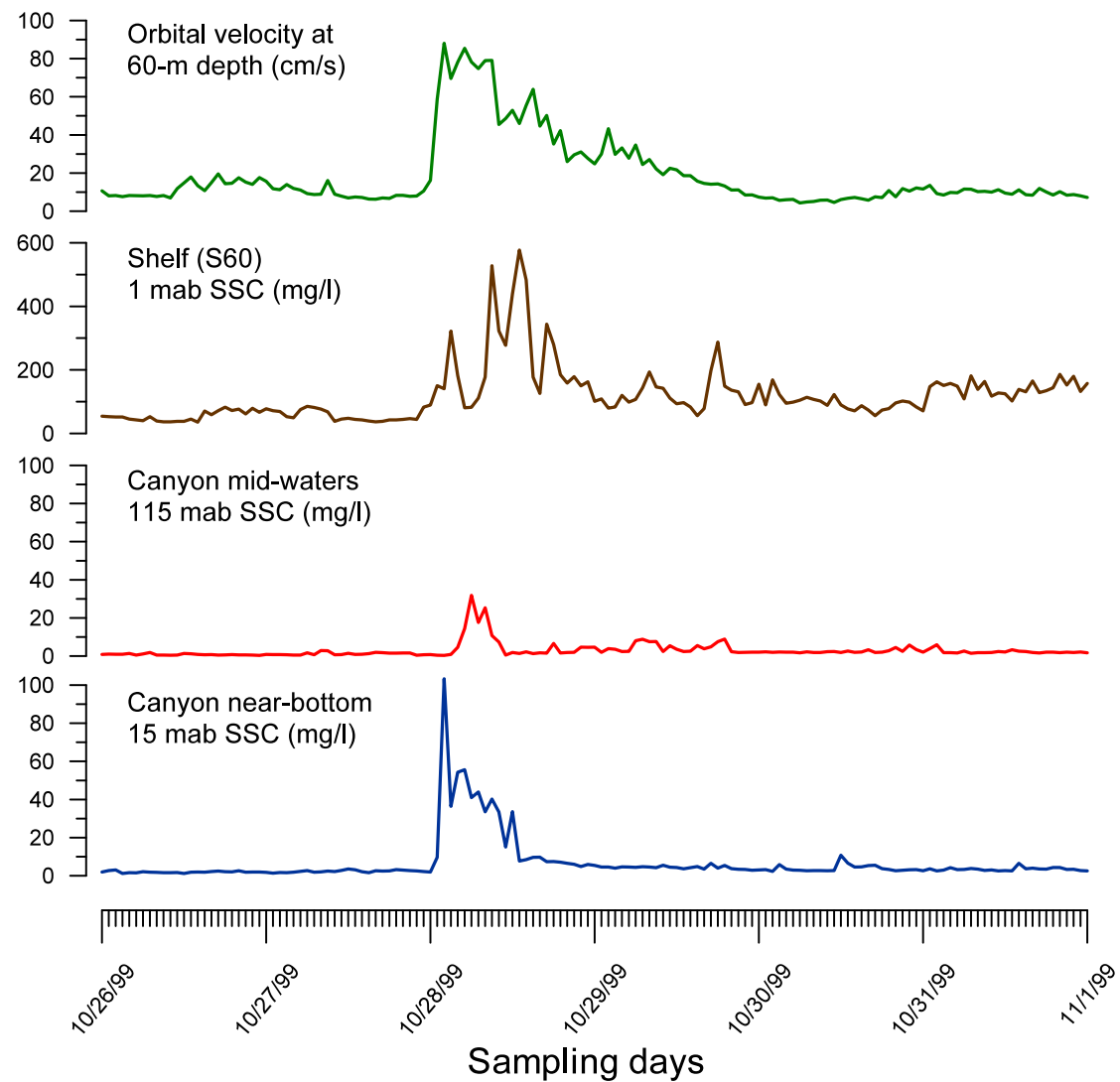
Shelf (S 60) time series



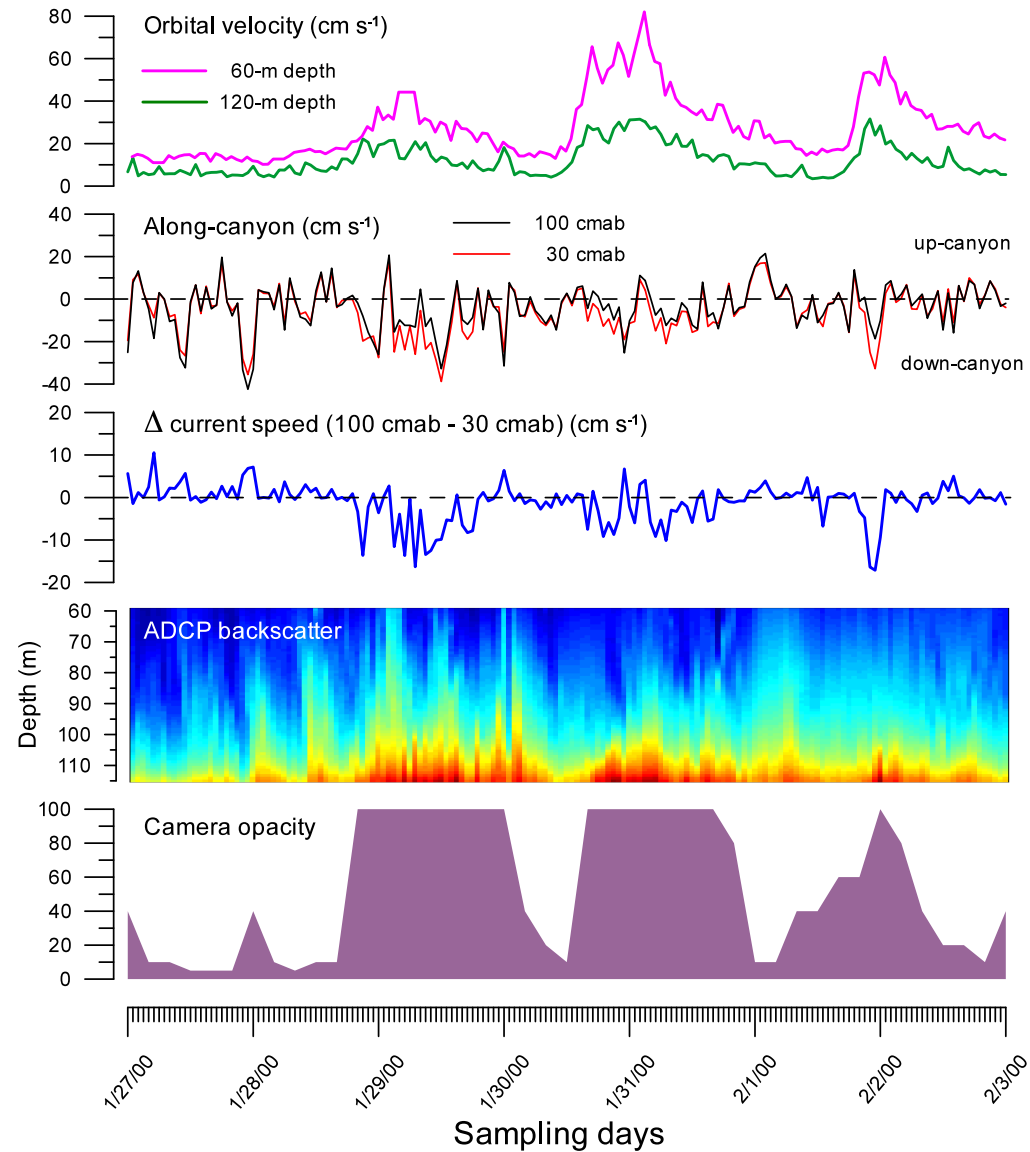
Eel Canyon time series



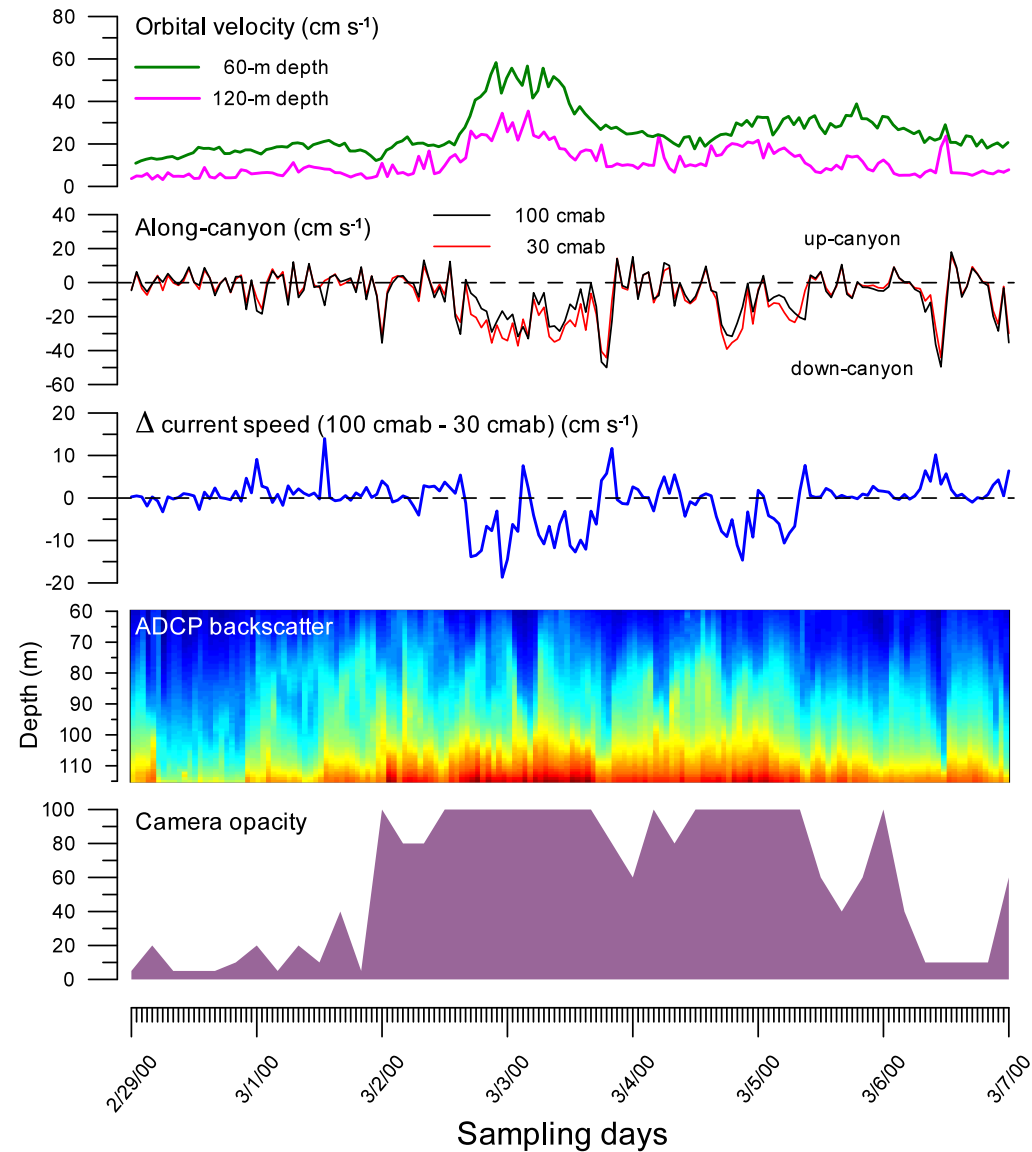
Storm resuspension at the canyon head



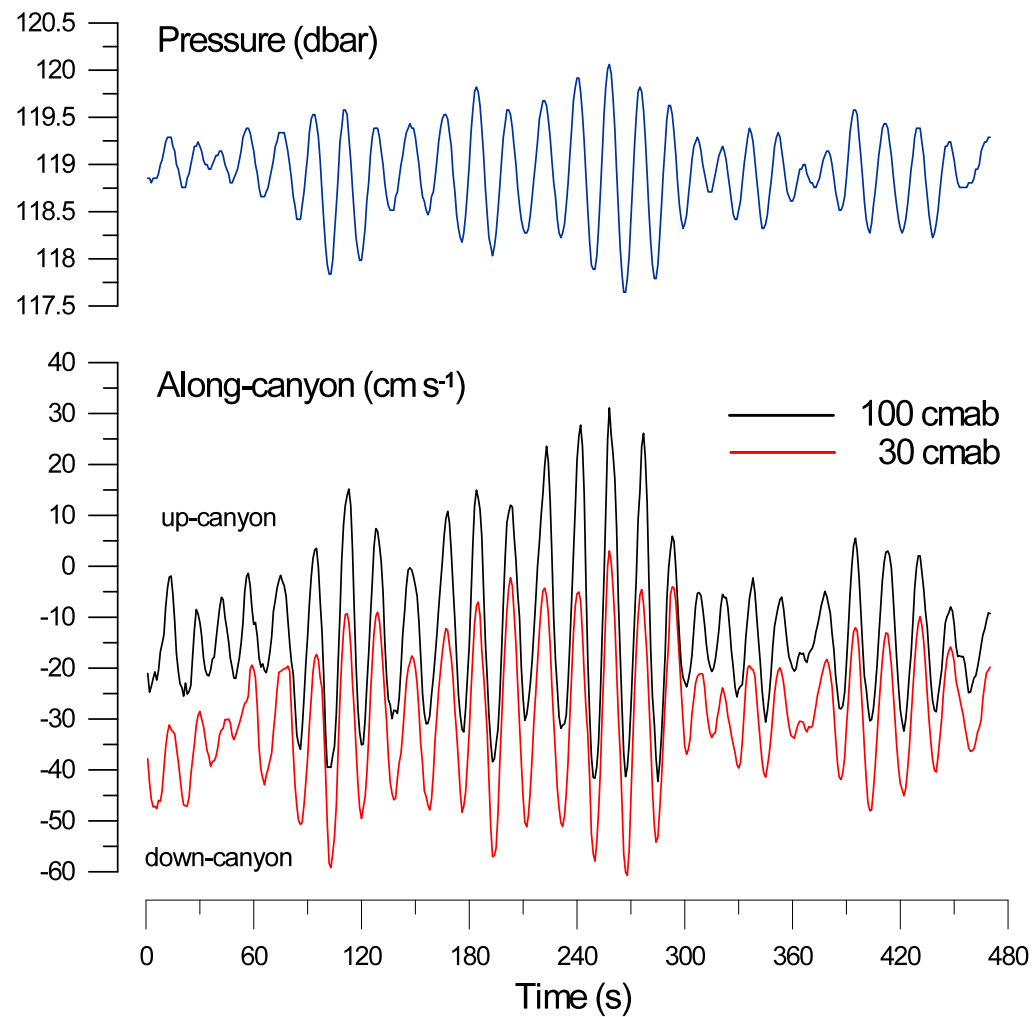
Storm-induced sediment gravity flows (1)



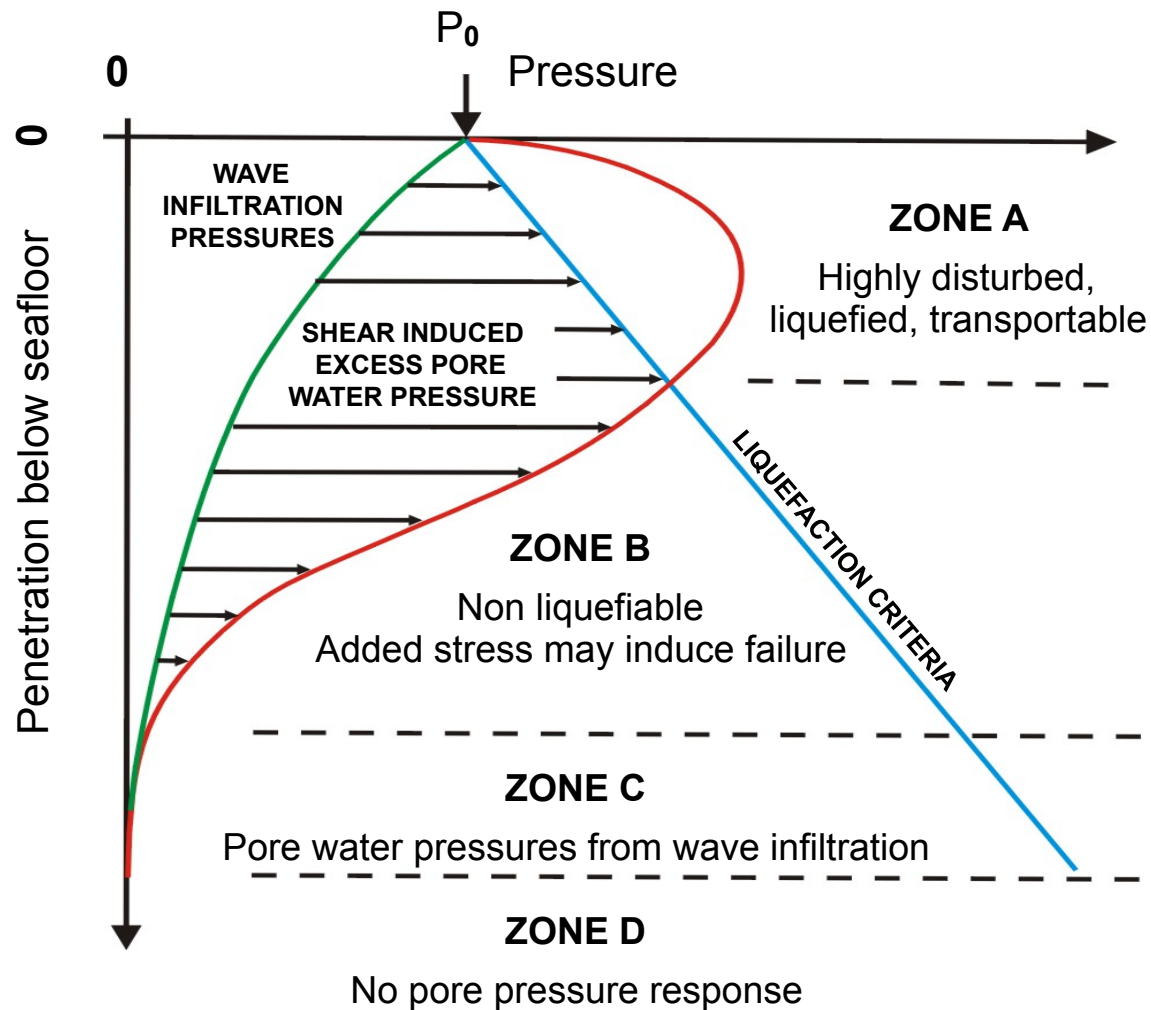
Storm-induced sediment gravity flows (2)



Wave-supported sediment gravity flows



Liquefaction by excess pore water pressure



From: Clukey et al. 1985. Geo-Marine Letters, 5: 177-183

Conclusions

- Contemporary shelf-to-canyon sediment supply in the studied margin is controlled by event-driven transport processes.
- Wave-storm resuspension events concurrent with dense shelf water cascading are the major contemporary shelf-to-canyon sediment transport mechanisms in the Gulf of Lions margin, while deep cascading events contribute to redistribute the sediment deposited in canyon head regions down to deeper parts of the margin (see Palanques et al. poster M-25).
- Wave-storm events are also the main shelf-to-canyon sediment transport process in the Eel margin, but the supply mechanism is controlled by wave-load sediment liquefaction at the shelf edge and upper canyon head regions.