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Submarine Canyon and Slope Suspended Sediment Transport in the Western Gulf of Lions During an Intense Cascading Period

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Recent studies have demonstrated that most of the off-shelf suspended sediment transport in the Gulf of Lions occurs in its westernmost sector, preferentially through the Cap de Creus submarine canyon. Based on this previous knowledge, a focussed monitoring strategy was designed to better constrain the contemporary sediment transport processes in this region. A network of mooring lines equipped with current meters and turbidity sensors at 5 m above bottom were deployed between 300 m and 1900 m depth along the axes of the two Lacaze-Duthiers and Cap de Creus neighbor canyons, as well as across the southern open slope from October 2005 to October 2006.

Recorded data indicate that dense shelf water cascading was the main shelf-to-slope sediment transport process in the area, acting from January to April-May 2006. The dense water and sediment transport was not only through submarine canyons, but also along the southern open slope. The most important suspended sediment transport event was due to the intense cascading pulse occurring in January 2006, which produced a strong sediment flux increase along the Cap de Creus Canyon down to 1900 m depth and also along the open slope at 1000 m depth. A significant sediment flux increase also occurred in March-April 2006 due to another intense cascading pulse. In this transport event, suspended sediment concentration only increased at 1000 m depth in the Cap de Creus Canyon and on the open slope, but not at the canyon head, suggesting a redistribution of sediments previously deposited at mid-canyon depths. Deeper than 1000 m, net fluxes show that most of the suspended sediment left the canyon and flowed along the southern open slope towards the Catalan margin, whereas a small part flowed downcanyon and was exported basinward through the canyon mouth. Additionally, the increase of the deep-sea near-bottom currents induced by open-sea convection processes, combined with the arrival of deep cascading pulses, also generated moderate but continuous suspended sediment transport at deeper slope regions.