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Alphonse Nahon, Vincent Marieu, Déborah Idier, Nadia Senechal, Julie Mugica, Cyril Mallet

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Swash Bar Effects On The Response Of A Large Barrier-Spit Terminus To Extreme Wave Climate: The Cap Ferret Example

Nahon A ^{1,2}, Marieu V ², Idier D ¹, Senechal N ², Mugica J ¹, Mallet C ¹

¹ BRGM, France, a.nahon@brgm.fr, d.idier@brgm.fr, j.mugica@brgm.fr, c.mallet@brgm.fr

² UMR CNRS 5805-EPOC, University of Bordeaux, 33405 Talence, France. vincent.marieu@u-bordeaux.fr, nadia.senechal@u-bordeaux.fr

The succession of severe storms in the North-Eastern Atlantic during the 2013-2014 winter has generated exceptional erosion along the Gironde coast (SW France). Meanwhile, at the Southern extremity of this 110-km long sandy coastal stretch, the Cap Ferret barrier-spit terminus remained relatively stable. The spit terminus is flanked by the Bay of Arcachon tidal inlet which generates strong tidal currents that help local waves to build massive swash bars. Such a bar is seen as the main explanation to the contrasting behaviour observed throughout the winter.

Since early December 2013, monthly and post-storm topographic surveys of the spit terminus have been carried out. Over a 2.5-km long area (Fig. 1), 16 beach profiles are measured to capture the spatial variability of the intertidal zone and upper beach dynamics. Surveys from January 3rd to April 28th 2014 highlighted the protective role of a 1 x 0.2 km² swash bar. The bar prevented severe erosion of the region in its shadow, and then welded to the upper beach, allowing a rapid recovery.

Two LIDAR surveys (Sept. 2013; Oct. 2014) complete this topographic dataset and allowed carrying out a sediment budget analysis of the beach and dune, confirming spatial discrepancies in erosion and recovery. A method for interpolating topographic profiles into precise DEMs was also developed and validated against LIDAR estimates of the upper beach volumes. DEMs were then used to study spatial differences in the timing and intensity of erosion and recovery.

In the following autumn, up to 2.5 m beach lowering and above 5 m dune foot retreat, compared to March 2014 data, revealed the vulnerability of the spit terminus in the absence of such massive swash bars.

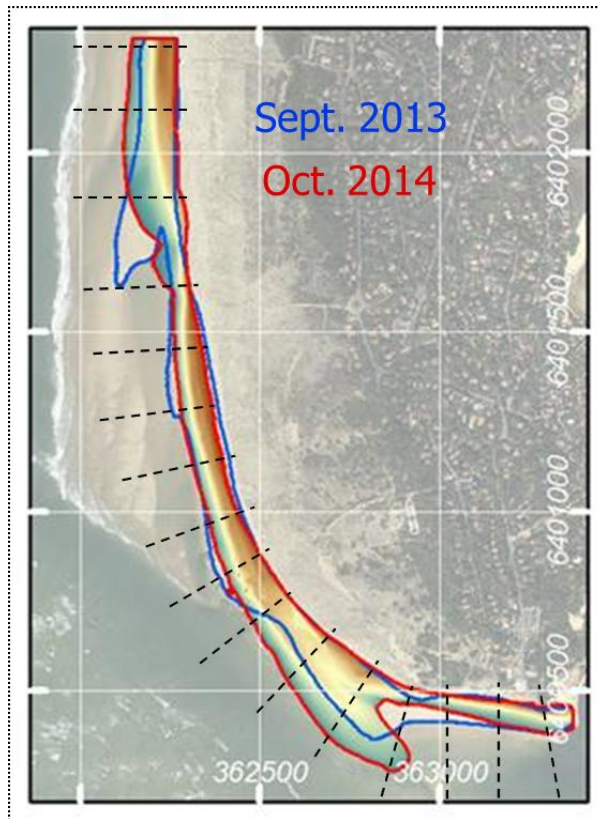


Figure 1. LIDAR data of the upper beach (0m to 5m NGF); dashed lines indicate the position of the monthly surveyed beach profiles.