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Marine Drift under Topographic Constraints: the Case of a blown-away Windsurfer in 29. 10. 2018 Scirocco Storm in the northern Adriatic

Matjaz Licer (1) and Anja Fettich (2)

(1) National Institute of Biology, Marine Biology Station Piran, Slovenia (matjaz.licer@nib.si), (2) Slovenian Environment Agency, Ljubljana, Slovenia

We investigate several marine drift simulation strategies to obtain an accurate trajectory of an actual windsurfer, lost at sea in the northern Adriatic for 30 hours under strong gale scirocco on 29. 10. 2018, until ultimately beaching alive and well (all things considered). Marine drift computations during strong wind events are challenging on the shallow northern Adriatic shelf for several reasons. Firstly, northern Adriatic shelf is land-locked, with lateral boundaries acting as strong circulation constraints over basin scales. Secondly, under strong wind conditions, the Eulerian current shear is very low due to surface mixing, but Lagrangian shear is substantial due to Stokes drift - a general circulation model without wave information therefore underestimates the surface currents. And thirdly, it is far from clear in advance how to weight respective contributions of currents, winds and waves to the surface drift of an active person, paddling on the windsurf.

The aforementioned surfer's 30-hour drift offers an opportunity to calibrate our marine drift model for similar situations in the future. We conducted an in-depth interview with the survivor to assess to what extent his active paddling contributed to his overall trajectory. The chain of numerical models used for the trajectory computation is as follows. The circulation model is NEMO, the atmosphere model is ALADIN and the wave model is WAM. Marine drift was computed with our own individual-particle based Lagrangian model, which takes into account Eulerian circulation and wind and Stokes drifts. Stokes drift was computed using deep-water dispersion relation and WAM significant wave height, mean wave direction and mean wave period. We obtain the best representation of the surfer trajectory by rotating the wind induced drift for 20 degrees to the right of the wind and with a Stokes drift component at 0.5 m depth. Our results speak in support of multidirectional atmosphere-ocean-wave coupling strategy with explicit wave-current interactions to facilitate more efficient search-and-rescue missions in the future.