Geophysical Research Abstracts
Vol. 19, EGU2017-18774, 2017
EGU General Assembly 2017

Interaction between Posidonia oceanica meadows upper limit and hydrodynamics of four Mediterranean beaches

Sandro De Muro, Andrea Ruju, Carla Buosi, Marco Porta, Marinella Passarella, and Angelo Ibba
Università degli Studi di Cagliari, Dipartimento di Scienze Chimiche e Geologiche, Cagliari, Italy (demuros@unica.it)

Posidonia oceanica meadow is considered to play an important role in the coastal geomorphology of Mediterranean beach systems. In particular, the importance of the meadow in protecting the coastline from erosion is well-recognized. Waves are attenuated by greater friction across seagrass meadows, which have the capacity to reduce water flow and therefore increase sediment deposition and accumulation as well as beach stability. The P. oceanica meadow upper limit usually occurs within the most dynamic zone of the beach system. Considering the great attention paid in the literature to the connection between the growth of P. oceanica and coastal hydrodynamics (Infantes et al., 2009; Vacchi et al., 2014; De Muro et al., 2016, 2017), this study aims at extending the previous work by investigating the combined influence of hydrodynamic parameters (e.g., wave-induced main currents and wave orbital velocity at the bottom) and different types of sea bottom (e.g., soft sediment, rocky substrates) on the position of the upper limit of the P. oceanica meadow. We applied this approach to 4 Mediterranean beach systems located on the Sardinian coastline (3 on the South and 1 on the North) and characterized by a wide range of orientations and incoming wave conditions. On these beaches, the extension of the P. oceanica meadows and the bathymetry have been obtained through detailed surveying campaigns and aerial photo analysis. In addition, high spatial resolution wave hydrodynamics have been reconstructed by running numerical simulations with Delft 3D.
Offshore wave climate has been reconstructed by using measured datasets for those beaches that have a nearby buoy whose dataset is representative of the incoming wave conditions for that particular stretch of coast. Whereas, for those beaches with no availability of a representative measured dataset, wave climate has been analyzed from the NOAA hindcast dataset. From the whole range of incoming wave directions in deep waters, we retained for analysis only the most energetic sectors. Successively, we identify extreme wave conditions using a statistical approach. Delft 3D is used to propagate these wave conditions towards the shore and then reconstruct the main hydrodynamic patterns in order to study its effects on the extension of P. oceanica.
Preliminary results show that in all investigated beach systems the meadow interruptions were found where intense (rip and longshore) currents occur as a result of all simulated storm directions; and the P. oceanica meadow leaves space for sand-dominated substrate. In conclusion, the new approach presented here is a useful tool to estimate the location of the P. oceanica upper limit induced by hydrodynamics and it has important consequences for coastal zone management, as P. oceanica meadow is protected by EU legislation including the Habitat Directive and the Water Framework Directive.

References
De Muro et al. (2016). Journal of Maps 12, 558-572.
De Muro et al. (2017). Journal of Maps 13(2), 74-85.
Infantes et al. (2009). Botanica Marina 52, 419-427.
Vacchi et al. (2014). Marine Pollution Bulletin 83, 458-466.