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Dynamics of short-living filaments and their relationship with intense rainfall events and river flows

I. Iermano (1), G. Liguori (2), D. Iudicone (1), B. Buongiorno Nardelli (3), S. Colella (3), A. Zingone (1), V. Saggiomo (1), and M. Ribera d'Alcalà (1)

(1) Stazione Zoologica Anton Dohrn, Naples, Italy , (2) Departamento de Física, Universidad de Alcalá, Alcalá de Henares, Spain, (3) Istituto di Scienze dell'Atmosfera e del Clima, CNR, Rome,Italy

Coastal filaments are generally short-living, non-linear structures that are highly efficient in exporting coastal water and therefore of great relevance to the biogeochemical budget of a basin. Nevertheless, the dynamics governing the formation, maintenance and modification of these structures is complex and not completely understood.
We present a systematic analysis of the recurrence of filaments after intense rainfall events along the Southern Italian coast. Filament characteristics were drawn from the analysis of daily high resolution satellite images 1997–2007 of the eastern boundary of the central Tyrrhenian Sea. The intensity and persistence of filaments were determined using mainly SeaWiFS satellite images, together with satellite SSTs and altimetric sea level anomalies. The SeaWiFS images show a high number of filament-like and mushroom-like structures of pigment-rich water extending offshore as convoluted jets, usually rooted at capes and headland. Despite some similarities, there are large spatial and temporal variations in the filament patterns. In general, the filaments are narrow 0 (5-10 km) and typically extend offshore for about 80 km, with cases reaching 130 km, and appear to be warmer with respect to surrounding waters. The analysis of sparse simultaneous in situ data suggests that the material export associated with these filaments is of great importance to physical and biological properties of the analyzed region.
Winds, precipitations, river nutrient loads and transport can affect filaments formation and evolution. The filaments are clearly related to the passage of atmospheric perturbations, which in turn are associated to intense precipitations and high westerly winds. The interplay between the anomalous wind-driven circulation and the buoyancy excess due to the impulsive freshwater seems to promote the convergence of shelf waters at capes and the subsequent offshore jet formation. In some cases, the filaments are instead associated only to the freshwater pulse, which result in mushroom-like structures occurring at the river mouth.
Preliminary results from ROMS model simulations will be also presented to better constrain the filaments dynamics.