

SEMINARIO DEL GIOVEDÌ  
CETEMPS

**“Remote sensing analysis of sediment plumes: from  
spectral signature to coastal morphodynamic  
diagnosis”**

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**ABSTRACT**

Several coastal regions have been increasingly affected by intense, often catastrophic, flash floods that deliver significant amounts of sediment along shorelines. A crucial question regards the impact of these impulsive runoffs in terms of coastal sedimentation and sediment characteristics (i.e., grain-size): are flash floods more efficient in delivering fine-to-coarse sediments along the coasts? By taking advantage of an intense flood occurred in the Mississippi River (USA) and in the Tiber River (Italy), we present a satellite-based analysis that quantifies fate and distribution of Suspended Sediment Concentration (SSC) and, for the Tiber River particle size distribution (PSD), also relating this satellite-based parameter to different discharge stages (i.e., erratic vs. persistent). We estimate PSD through satellite retrieval of the particle backscattering coefficient spectrum. A monthly analysis of twelve-year datasets reveals that erratic stages are prone to deliver coarser sediment with respect to the persistent stages. We demonstrate that coastal plumes generated by flashy events would give an effective contribution to coastal geomorphology by supplying the coarse material. Finally, we provide a first example of coastal morphodynamic application of a synergic satellite and numerical modelling approach that shows the potential of remote sensing in diagnosing causes of coastal erosion.

**Biografia.**

Federico Falcini, degree in Physica with a dissertation in Physical Oceanography; during the PhD studies in Earth Science, he focused on sedimentary processes, developing an analytic, inverse problem for paleo-flow reconstruction from the sedimentary record. At Boston University (USA), as a post-doctoral fellow, he worked on shelf sediment-gravity currents and wave-induced sediment re-suspension. Then, he moved to the University of Pennsylvania (USA) as post-doctoral investigator and lecturer, where he theoretically described different river sedimentation patterns in coastal environments. He coordinated a project for an ongoing interdisciplinary effort aimed to learn how the flooding Mississippi River discharges water and where it deposits its sediment load from remote sensing (featured in Nature News on 13 May 2011). At the Saint Antony Falls Laboratories (University of Minnesota), within the framework of the US National Center for Earth-Surface Dynamics, he developed theoretical and experimental approaches to relate internal fluid flow properties with sedimentary processes. At CNR-ISAC he currently works on coastal remote sensing for environmental studies, pursuing also research on coastal plume dynamics.