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Numerical modeling and synoptic analysis of an intense coastal erosion event in Thessaly, Greece

Panagiotis T. Nastos (1), Ioannis T. Matsangouras (1,2), Konstantinos Lazogiannis (1,3), and Serafim Poulos (1)

(1) Department of Geography and Climatology, Faculty of Geology and Geoenviroment, National and Kapodistrian University of Athens, University Campus, GR 15784 Athens, Greece (nastos@geol.uoa.gr), (2) Hellenic National Meteorological Service, Hellinikon, GR-16777 Athens, Greece (john_matsa@geol.uoa.gr), (3) Department of Marine Sciences, University of the Aegean, University Hill, 81100 Mytilene, Lesvos, Greece (klazog@gmail.com)

Severe atmospheric phenomena occurring in coastal areas are of high scientific concern, due to their economic, social and ecological impacts that require an optimized management. In this paper, we analyze a case study of an adverse event in the coastal area of Thessaly plain, central Greece. In particular, easterly gale winds, driven by specific synoptic pattern, induced intense wave storm conditions, resulted in significant impacts in the Peneus River mouth morphology. On February 6, 2012, an intense closed cyclonic circulation at sea level pressure over the southern Ionian Sea caused easterly strong gale winds over the northern Aegean Sea, developing significant erosion at mouth spits; an area of approximately 3,000 square meters was eroded, causing a coastline retreat of 15-20 m. The performed analysis utilizes both numerical weather modeling and synoptic conditions, including in situ meteorological measurements and remote sensing data. The numerical simulations were performed using the non-hydrostatic Weather Research and Forecasting model, initialized with gridded data from the European Centre for Medium-Range Weather Forecasts, with telescoping nested grids that allow the representation of atmospheric circulations ranging from the synoptic down to the mesoscale process.

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