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Nowcasting extreme weather events over Greece

Petros Katsafados (1), Vera Nomikou (1), Elias Mavromatidis (1), Anastasios Papadopoulos (2), Konstantinos Lagouvardos (3), and Vassiliki Kotroni (3)

(1) Harokopio University of Athens, Dpt. of Geography, Athens, Greece (pkatsaf@hua.gr), (2) Institute of Marine Biological Resources and Inland Waters, Hellenic Centre for Marine Research, Greece, (3) Institute of Environmental Research and Sustainable Development, National Observatory of Athens, Greece

Accurate and consistent very short-term prediction (nowcasting) of high-impact weather events can lead to significant improvement in warnings and advisories providing a direct impact on the risk management. To this end, an advanced mesoscale meteorological data assimilation tool, the Local Analysis and Prediction System (LAPS), has been implemented in order to serve as an early warning system. LAPS incorporates surface and upper air observations (METAR, SYNOP, satellite, soundings, radar, aircraft etc) into large-scale gridded data (as background fields) and produces high spatial and temporal resolution analysis fields and early forecasts.
This study presents the performance of the LAPS system in describing two unusual events of hazardous weather conditions over Greece. The first case study is characterized by the passage of a cyclonic system accompanied with cold fronts over Southern Greece. Heavy downpour, lightning and flooding were the main characteristics of the storm that affected Athens metropolitan area on February 22nd 2013. In the second case study the passage of a cold front over SE Aegean Sea led in a destructive and deadly flash flooding that affected the Northern areas of Rhodes Island on November 22nd 2013. This second flash flood event was triggered by the extreme precipitation (almost 100 mm in 4 hours) and killed 4 people making it the deadliest ever for the area.
For both case studies, the conventional numerical weather prediction models operating at various research institutes and universities provided a rather insufficient spatiotemporal estimation of the extreme precipitation. For these cases, the LAPS-based nowcasting procedure has been applied with and without the ingestion of high resolution remote sensed precipitation estimates. The LAPS outputs have been evaluated against independent observations obtained from a dense network of surface meteorological stations. Results indicate that LAPS outputs were better than those obtained from the conventional operational forecasts. Also, the use of the satellite information improved the LAPS-based hourly Quantitative Precipitation Estimates in terms of amount, timing and localization.