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An integrated sea monitoring system based on a X-band wave radar to support the removal activities of the Costa Concordia wreck.

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The planning and management of different types of operations at sea requires a number of sea state data as much in real-time as possible, for rapid and effective response to different situations. This need is particularly strong in emergency management practices, in accidents due to man-made or natural causes, that require the planning of civil protection activities (such as search-and-rescue, cleaning of pollution, ship recovery), transport planning etc. The use of X-band radar technology nowadays provides great advantages over traditional in-situ and satellite-based techniques for sea state measuring, to update information on waves and currents over a sea area with high spatial and temporal resolution. Other advantages include a good spatial coverage around the area of interest, the flexibility of use, the capacity to provide, on-demand and when necessary, complementary information (possible oil spills detection, integration with VTS, etc.). X-band coastal radars (so-called "wave-radars") are widely used in the monitoring of large marine areas, in integration with in-situ measurements, satellites and other radar types (HF), as a key element of the observational component of present operational oceanography systems. Outside of these systems, the use of this technology to support emergency management practices is very promising for both the quality and quantity of available parameters, and for an easy integration with all other available monitoring and forecasting tools.

A case study particularly relevant is offered by the presence of the Costa Concordia ship near the Giglio Island. The management of this disaster has requested at an early stage a large number of data to support the monitoring of marine environment around the ship, e.g. to optimally plan water samples. In the next and present phase, to support the highly risky and costly activities linked to the wreck removal, which are extremely sea-state dependent, the installation of a wave-radar allows to detect, in real-time and with high revisiting time, waves and currents in the area surrounding the wreck. In addition wave spectra measures allow to check the reliability of present wave forecasting models, which are unlikely to represent the local and coastal scales of interest and therefore require a continuous process of verification, calibration and quality control. Similar considerations can be made for the reconstruction of marine currents at a local scale, whose uncertainty is inherently greater. The integration of X-band radar data with in-situ data has allowed to optimally calibrate the data itself (especially for what concerns the significant wave height) and to provide a local scale observation system which proved to be fundamental to support the work of continuous sea state monitoring and forecasting around the area of the disaster.

The observation system at Giglio is a kind of laboratory unique in its kind, to test the reliability of the wave and hydrodynamic models at a local scale, to assess our present ability to use X-band radars for emergency management activities, and to evaluate the response capacity of such practices to the actual needs of involved stakeholders and private users.