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Comparison of sea surface wind fields derived from WRF model and ASAR images over eastern Mediterranean Sea

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In Synthetic Aperture Radar (SAR) imagery the discernible signatures of coherent atmospheric structures, due to sea surface roughness modulation by air-sea interaction, are usually well detected. In the present study, the features of the wind fields derived from SAR are compared with those from a regional atmospheric model: some case studies have been analysed over an area located in the eastern Mediterranean Sea, extending southward of Crete and Rhodos islands. This is a region subject to complex wind patterns, due to the interaction of the almost steady northwesterly Etesian wind with the islands orography: areas of high winds produced by funnelling effects, areas of low winds due to the island sheltering effects and large areas sweeped by the atmospheric lee waves propagating downwind from the islands, are often present.

The Envisat Advanced SAR (ASAR) Wide Swath images, covering a square of about 400 km by 400 km with a spatial resolution of 75 m, provide datasets at exceptionally high resolution for investigating the mesoscale phenomena on the marine atmospheric boundary layer, allowing the retrieval of wind field and quantitative information on the atmospheric gravity waves texture. Both have been obtained with a methodology based on the 2-D Continuous Wavelet Transform, suitable to isolate the backscatter patterns on the base of energy and scale considarations.

Numerical simulations with the Weather Research and Forecasting (WRF) model have been performed using three 2-way nested domains, the inner one covering the area of interest with a resolution of 1 km. Simulations using different diffusion and boundary layer parameterisation schemes have been performed in some case studies corresponding to interesting wind patterns detected in the ASAR images. The 10 m wind fields simulated in the numerical experiments are compared each other and with those retrieved from ASAR, both quantitatively and qualitatively, in order to analyse the correspondence of the observed with the simulated wind structures, and thus possibly identify an “optimal” model configuration.