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A comparison of WRF model simulations with SAR wind data in case studies of orographic lee waves over the Eastern Mediterranean Sea

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Two case studies of intense lee waves and wakes generated by the interaction of the atmospheric flow with the orography over an area in the eastern Mediterranean Sea located east of Crete and south of Rhodes islands are analysed using the Weather Research and Forecasting (WRF) model. The model has been implemented in two different configurations, using distinct boundary layer parametrization schemes, the Yonsei University (YSU) and the Mellor-Yamada-Janjic (MYJ) schemes, and three 2-way nested domains, the inner one covering the area of interest with a horizontal resolution of 1 km. The model-derived wind field has been compared statistically with the sea surface wind extracted from an Envisat Advanced Synthetic Aperture Radar (ASAR) image, from which the wind has been retrieved using a methodology based on the two-dimensional continuous wavelet transform. The trains of atmospheric gravity waves, individuated by the signature in the ASAR image are realistically simulated in the two model runs, although some appreciable differences are present.

The normalized frequency distributions of wind speed and direction from the two model runs and from ASAR are compared. The sea surface wind field measured by the scatterometer onboard the QuikSCAT satellite is also considered as an additional term of comparison. The shape of the different wind speed distributions comes out to be similar in both case studies.

Also, the wavelength spectra of the wind speed from ASAR and the two WRF runs have been calculated along different transects in the area of the atmospheric gravity waves. The agreement is satisfactory, and the difference in wavelengths among the different wave trains generated by the orographic obstacles is well represented in the model runs.