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ABSTRACT

The east coast of the Black Sea is an area where several pronounced local wind fields are encountered. Here the Black Sea is bordered by a coastal mountain range of variable height having several gaps and valleys through which airflow from the east can blow onto the Black Sea. In the northern section, near Novorossiysk, strong offshore coastal winds are often encountered which can attain speeds of more than 30 m/s and can be quite hazardous, especially for coastal ship traffic and harbor operations. They are called Novorossiyskaya Boras in analogy to Adriatic Boras which are often encountered at the east coast of the Adriatic Sea. Due to the blocking of easterly airflow by the high mountain range south of Tuapse, the boras often give rise to the generation of cyclonic atmospheric eddies in the south eastern section of the Black Sea and subsequently also to oceanic eddies.
In the southern section of the Black Sea, also strong winds are often encountered which are associated with Foehn events. They result from airflow passing from the east over Likhi Ridge in Georgia and advancing through a broad valley, called Kolkhida Lowland, onto the Black Sea.
In this paper we study these wind fields over the sea by using synthetic aperture radar (SAR) images acquired by the Advanced Synthetic Aperture Radar (ASAR) onboard the European Envisat satellite. We compare these radar images with scatterometer data from the American Quikscat satellite and the European METOP satellite, with MODIS data from the American Terra satellite, and with meteorological data from the weather stations. The near sea surface wind is retrieved from SAR images via measurement of the sea surface roughness. The wind modifies the sea surface roughness and thus the radar backscattering. Because of the high spatial resolution of SAR, the near surface wind field is resolved by SAR with a spatial resolution of typically 500 m. Quantitative information on the near-surface wind field is derived from the SAR images by using the CMOD4 wind scatterometer model for converting radar backscatter values into wind speeds. In particular, the SAR images reveal details on the extent and structure of 1) wind jets, wakes, and atmospheric eddies generated by the interaction of winds with coastal topography, 2) boundaries between the coastal and the ambient wind fields, and 3) atmospheric gravity waves.