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Modeling the barotropic response of the Mediterranean sea level to atmospheric pressure forcing

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An important characteristic of the Earth's atmosphere with direct impact on the marine environmental and Earth's gravity field are the variations of atmospheric pressure as it often determines wind and weather patterns across the globe. Variations in atmospheric pressure and especially low atmospheric systems affect the values of radar altimeter sea level anomalies (SLA). This response of sea level is closed to the Inverse Barometer (IB) correction given by the altimeters within their geophysical data records. In this work, altimetric data sets from the satellite remote sensing mission of Jason-2, along with their total IB corrections acquired by the on-board altimeters, have been used for a period of forty days between October and November 2013. This period was characterized by extreme low-pressure fields over the Mediterranean Sea and especially in the area of the Ionian and Adriatic Seas and over the island of Rhodes, Greece. The Jason-2 along-track records of the SLA have been used to study both the sea level response to atmospheric pressure change over short time scales (such as ten days) and examine if the barometer correction (local and global) given by the altimeter is close to the expected response (-1 cm/mbar) of sea level to atmospheric pressure change. For the latter, atmospheric pressure data for the period under study were available from the Live Access Server (LAS) of NOAA, as well, provided at four times per day intervals in a grid format. From the LAS atmospheric pressure data, the IB effect was computed and compared with the one provided by the altimeter for its external evaluation. Finally, a regional multiple regression analysis between sea level anomalies, the LAS atmospheric pressure and wind speed components is carried out to model the barotropic response of the Mediterranean to atmospheric wind and pressure forcing.