



Far-field synoptic wind effects extraction from sea-level oscillations: The Venice lagoon case study

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We analyze the sea-level oscillations at eight mareographic stations of the ISPRA network located in the Venetian lagoon considering four years from 2008 to 2011. The aim is to study the acqua alta phenomenon (i.e. the average increase in flooding levels higher than 79 cm), on different time scales by using a nonlinear method (Independent Component Analysis). We show that it is possible to extract from the water-level oscillations, on the time scale of the year, a long period component, which has a high correlation with the wind recordings (>0.8). Three tidal constituents are extracted by ICA including astronomical and meteorological effects. In particular, a long period component, peaked at two months, is ascribed to the wind effect on synoptic scale; indeed it shows a high correlation with the wind stress signal. According to the ICA model, that component is linearly superimposed on the extracted astronomical tides. These results allow us to estimate the tide superelevation due to the wind stress at each station and so to improve the forecasting model of acqua alta, e.g., by introducing the proper wind effect correction at each station.