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Estimating contribution of high-frequency sea-level oscillations to the extreme sea levels in the Adriatic Sea

Krešimir Ruić¹, Jadranka Šepić¹, Maja Karlović², and Iva Međugorac³

¹Faculty of Science, University of Split, Split, Croatia

²Hydrographic Institute of the Republic of Croatia, Split, Croatia

³Department of Geophysics, Faculty of Science, University of Zagreb, Zagreb, Croatia

Extreme sea levels are known to hit the Adriatic Sea and to occasionally cause floods that produce severe material damage. Whereas the contribution of longer-period ($T > 2$ h) sea-level oscillations to the phenomena has been well researched, the contribution of the shorter period ($T < 2$ h) oscillations is yet to be determined. With this aim, data of 1-min sampling resolution were collected for 20 tide gauges, 10 located at the Italian (north and west) and 10 at the Croatian (east) Adriatic coast. Analyses were done on time series of 3 to 15 years length, with the latest data coming from 2020, and with longer data series available for the Croatian coast. Sea level data were thoroughly checked, and spurious data were removed.

For each station, extreme sea levels were defined as events during which sea level surpasses its 99.9 percentile value. The contribution of short-period oscillations to extremes was then estimated from corresponding high-frequency ($T < 2$ h) series. Additionally, for four Croatian tide gauge stations (Rovinj, Bakar, Split, and Dubrovnik), for period of 1956-2004, extreme sea levels were also determined from the hourly sea level time series, with the contribution of short-period oscillations visually estimated from the original tide gauge charts.

Spatial and temporal distribution of contribution of short-period sea-level oscillations to the extreme sea level in the Adriatic were estimated. It was shown that short-period sea-level oscillation can significantly contribute to the overall extremes and should be considered when estimating flooding levels.