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Ivica Vilibić, Jadranka Šepić, Natalija Dunić, Florence Sevault, Sebastian Monserrat, **Gabriel Jordà**,
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Proxy-Based Assessment of Strength and Frequency of Meteotsunamis in Future Climate.

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Abstract: A climate synoptic meteotsunami index has been constructed using synoptic variables for the Balearic Islands. The index allows for the very first assessment of atmospherically driven intense sea level oscillations at the tsunami timescale (minor than 2 hr) in future climates. The index has been computed using outputs from evaluation, historical, and three scenario MED-11_CNRM Med-CORDEX regional atmospheric climate runs. The reliability of the index has been verified against reanalysis simulations and on documented meteotsunami events. No significant changes in the index are projected under RCP2.6 and RCP4.5 scenarios, while the yearly number of days with meteotsunamis is expected to increase by 34% under the RCP8.5 scenario by the year 2100. This increase will dominantly occur during the summer season (May–August), being contemporaneous with maximum index values. The presented results are relevant for assessment of sea level extremes worldwide, since high-frequency sea level oscillations may contribute up to 40% of the total range.

Plain Language Summary: The study aims to develop the proxy methodology to be used for assessment of meteotsunamis—atmospherically driven waves in a tsunami frequency band—in the future climate, as the present climate models are far from reproduction of processes on a minute and a kilometer scale. The proxy estimates are based on connecting synoptic parameters and patterns to the high-frequency sea level observations. The methodology is successfully verified for Ciutadella harbor, a known hot spot for meteotsunamis, on state-of-the-art reanalysis data. It seems that meteotsunamis are likely not to increase in all but business-as-usual (RCP8.5) climate scenarios, where the increase is matching the season when meteotsunami reach their maximum (spring–summer). The methodology might be useful for assessing meteotsunami hazard in future climates, while being applied at places where meteotsunamis are driven dominantly by a single atmospheric process. Global and regional

analyses indicate that these might encompass the majority of midlatitudal regions.

Keywords: