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On the effect of sea level increases during the Storm Gloria

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The final extent of coastal impacts during extreme events depends on a complex combination of factors (coastal morphology, infrastructures, population, economic activities), and meteorological and oceanographic variables interacting at different spatial and temporal scales (e.g.: precipitation, atmospheric pressure, wind, waves, currents and sea level). Coastal sea level is a key driver of most of these impacts, starting by the increased vulnerability of worldwide coastlines due to mean sea level rise. In January 2020, the storm Gloria hit the Western Mediterranean Sea causing severe coastal damages, destruction of infrastructures, flooding and several casualties. The dynamic evolution of sea level during this storm is presented, demonstrating its contribution to the mentioned impacts at different timescales: long-term sea level and seasonal changes, tides and storm surges, and higher frequency oscillations of the order of minutes, associated with different forcing agents like wind-waves, wind and atmospheric pressure variations or edge waves. Tide gauge data are used as the main source of information including the detection and characterization of record-breaking high-frequency oscillations, (infragravity waves, meteotsunamis, resonance effects), thanks to a new software that operationally characterizes these processes from 2Hz raw data. The storm surge component, that also beat the record along Valencia coastline, is analyzed with in-situ data and model outputs from different operational forecasting systems in the region. The exercise shows the difficulty of disentangling different wave, wind and atmospheric pressure contributions to sea level increase during a storm.