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A climatology of Mediterranean cyclones and compound weather extremes

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Mediterranean cyclones are the main driver of surface weather extremes in the Mediterranean region. In this work we establish a new procedure for the attribution of different types of meteorological extremes to Mediterranean cyclones, where we also distinguish the presence of different airflows (warm conveyor belts, dry intrusions) and fronts composing the structure of a cyclone. We apply the procedure to a dataset of rain-wind and wave-wind compound extremes extracted from ERA5 reanalysis in a recent climatological period, and show that the majority of weather compounds occurring in the Mediterranean area is indeed linked to the presence of a nearby cyclone. The association of compound rain-wind events with Mediterranean cyclones locally surpasses an 80% level, while interesting differences between transition seasons and winter are detected. Winter cyclones - generally stronger, larger and distinctively baroclinic - are associated with a higher compound density. The de-construction of the cyclone in airflows and fronts evidences a strong association of rain-wind compounds with regions of warm conveyor belt ascent, and of wave-wind compounds with regions of dry intrusion outflow.