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Impacts of the Mediterranean Cyclone Harry on coastal cultural heritage: Kamarina and Caucana archaeological sites (Ragusa, southern Sicily) case study

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Coastal cultural heritage in the Mediterranean is increasingly threatened by extreme hydro-meteorological events and intensifying climate-related hazards [1-3]. This contribution analyses the catastrophic event that affected Kamarina and Caucana archaeological sites (Ragusa, southern Sicily), interpreting them as a paradigmatic case of climate-driven risk for coastal archaeological and historical sites. The event was caused by the exceptional Mediterranean cyclone Harry, which struck between 19 and 23 January 2026. Its combined effects — extreme precipitation, storm surge, strong winds, and enhanced wave activity — produced severe impacts on both natural systems and cultural heritage assets.

The study adopts an integrated approach that links large-scale atmospheric dynamics to local-scale geomorphological processes and vulnerability of the sites. Meteorological and marine conditions associated with the cyclone are analysed together with geomorphological evidence and observed damage to coastal infrastructure, archaeological remains, and protective beach systems. Particular attention is devoted to the interaction between exceptional hydrodynamic forcing and pre-existing coastal fragilities, including shoreline modification and urban development, which significantly amplified the impacts of the event. This interaction transformed an intense but short-lived meteorological phenomenon into a complex and long-lasting heritage emergency.

The Kamarina and Caucana archaeological sites case study highlights how coastal cultural heritage located in low-lying environments is exposed not only to direct physical damage, but also to indirect and cascading effects such as accelerated erosion, loss of archaeological stratigraphy, sediment redistribution, and reduced resilience to subsequent events. These impacts demonstrate the limitations of traditional protection and conservation strategies that are often designed for stationary climatic conditions or single hazards.

Finally, Kamarina and Caucana archaeological sites case study is discussed as a transferable example, illustrating how integrated, climate-aware risk management approaches can enhance preparedness, early warning, and long-term resilience of coastal cultural and natural heritage under increasing climate extremes.

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