



## Reconstructing Boulder Deposition Histories: Extreme Wave Signatures on Malta

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EGU Abstract

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The Maltese archipelago, a group of 5 small island sits in the Central Mediterranean Sea, some 90-100 km directly south of Sicily. It is ideally located to capture evidence of major events through the Mediterranean Sea. Its eastern seaboard, in particular, is able to record tsunamis arising from the Hellenic Arc, some 600 km to the east at elevations up to ~ 20 m asl. We here study extreme wave signatures at Zonqor in SE Malta (the main island), on a strip of coastal terrain unsullied by urbanisation on which tsunami signatures are abundant and well preserved.

The Zonqor coastline displays an exceptional range of geomorphic signatures of extreme sea wave events. This study brings together evidence acquired from field survey, analysis of time-sequential aerial and satellite imagery, and hydrodynamic modelling to investigate the histories of boulder groups identified by their intrinsic and contextual characteristics.

Clear differences are revealed between the distribution of boulders recently moved (Recent Movers) and those evidently of considerable age (Ancient Movers). Tracking the movement of boulders by aerial photography since 1957, and satellite imagery and field observations more recently, confirms that storms of surprisingly frequent interval are capable of driving complex boulder movements. This includes the lifting of boulders of up to 7 m in length. Scrutiny of the ancient boulders, including extreme weathering features is indicative of longterm in-situ post transportation residence. It also reveals fascinating landward-facing (reverse) imbrication indicative of a very powerful return flow, cautiously suggesting tsunami(s) as the agent of their emplacement.

A novel method, including due attention to the Froude number, is developed for depicting velocity decay profiles of hypothetical design waves, thereby overcoming some of the limitations of the Nott approach. Applied here, the wave run-up context further sets the ancient movers apart from their recent mover companions.

The combined evidence implies a palimpsestic landscape where storm waves are regular geomorphic agents that add to and rework the distribution of boulders close to the shoreline, whilst over long time periods the boulder landscape becomes reset by tsunamis, a concept that is of value to agencies in Malta responsible for coastal safety, planning and management.

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01/2021