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Towards improving the dating of wave-emplaced coarse clast deposits: OSL surface exposure dating of coastal boulders at the Rabat coast, Morocco

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Wave-emplaced blocks and boulders represent unambiguous sedimentary evidence of cyclone and tsunami flooding over Holocene time scales. However, event chronologies based on the dating of coarse-clast deposits may be biased by the difficulties inherently related to common dating approaches such as the marine 14C-reservoir effect and reworked organisms. This contribution aims to overcome the limitations of existing dating techniques and to discuss the potential of applying the recently developed optically stimulated luminescence (OSL) surface exposure dating technique [1] to wave-emplaced coastal blocks and boulders. OSL surface exposure dating may help to provide depositional ages and, ultimately, to improve event chronologies based on the dating of coarse-clast deposits. We therefore applied the OSL surface exposure dating technique to coastal boulders from the Rabat coast, Morocco, which were either relocated by tsunami-induced flooding (e.g. during the 1755 Lisbon tsunami) or by exceptional winter storms [2]. The sampled boulders were clearly overturned during wave transport according to downward-facing bio-eroded surfaces, are composed of quartz-containing sandstones with adequate luminescence signals, and were transported during the Holocene, i.e. in the appropriate range of OSL surface exposure dating. We measured the depth-dependent resetting of luminescence signals in the rock surfaces of numerous boulders from different sites that were exposed during the wave-induced transport. Preliminary results show that (i) all measured boulders are indicated by a typical bleaching profile; (ii) the bleaching profile is restricted to the upper $\sim$10 mm of the rock surface; (iii) bleaching trends are reproducible for individual clasts; and (iv) bleaching profiles vary between different clasts. Comparison with the signal-depth profiles of known-age samples (modern storm boulders, artificially exposed surfaces) will help to model direct depositional ages for boulder transport. The approach may even allow to decipher more complex transport histories of boulders that were relocated and overturned repeatedly, thus experiencing multiple phases of exposure and burial.

References

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