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Exploring the application of IRSL rock surface exposure dating of archaeological stone structures in Val di Sole, Italy

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Reconstructing exposure histories of rock surfaces with luminescence dating is a recently developed tool which has proven valuable to chronologically constrain archaeological rock structures (e.g. Sohbaty et al., 2012). Here, we explore the possibility to use infrared stimulated luminescence (IRSL) exposure dating to constrain the period of usage of two dry stone enclosure complexes (MZ001S and MZ005S) in Val di Sole, Trentino, Italy. Archaeological investigations confirm that the enclosures were used to keep livestock and radiocarbon ages and archaeological finds from MZ005S restrain the oldest time of use to the Late Middle Ages or Early Modern Period (Carrer and Angelucci, 2018). One 19th-century potshard has been recovered from MZ001S and interviews with residents indicate that MZ001S may have been in use until the mid-20th century. Mica and quartz-rich gneiss rocks of both structures were sampled, together with calibration rock surfaces which had been exposed for one year. Cores were extracted from the rocks with a water-cooled bench drill and cut with a cooled precision saw. Whole rock slices (approx. 0.7 mm thin) were heated to 180 °C for 100 seconds and were subsequently measured with infrared diodes at 50 °C for 300 seconds to create IRSL-depth profiles. Exposure ages were calculated with the exposure dating model developed by Sohbaty et al. (2011) for which we used de-trapping rates calculated from the exposed calibration surfaces. IRSL-with-depth profiles are presented from both natural and calibration surfaces. Preliminary ages severely underestimate expected exposure ages (decades of exposure, compared to expected centuries of exposure) and precision of the ages is low. More investigations are necessary but possible reasons for this age discrepancy are denudation of the rock surface, heterogenic mineralogy with patches of opaque minerals which locally increase light attenuation, or the calibration samples do not represent good analogues for the rocks from the stone structures. The low precision of the ages appears to originate from variations in the IRSL-depth profiles between different cores cut from the same sample.

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