Post-IR IRSL290 dating of K-rich feldspar sand grains in a wind-dominated system on Sardinia

Post-IR IRSL290 dating of K-rich feldspar sand grains in a wind-dominated system on Sardinia

The reliability of a post-IR elevated temperature IRSL (290 °C; pIRIR290) is tested on wind-blown, sand-sized (180–250 μm) K-rich feldspar grains. The pIRIR290 ages were compared with quartz SAR-OSL data, other independent age controls and historical information. Three study areas along the coast of Sardinia (Italy) were selected: the south Alghero coast, the Bue Marino cave (E Sardinia) and the Alghero bay (NW Sardinia). Along the south Alghero coastline a thick dunefield system is widely recognised in the literature to represent the beginning of the last glacial phase (post 80 ka).

From a single block sand-sized grains for quartz SAR-OSL and K-feldspar pIRIR dating were collected. The natural quartz SAR-OSL sample lies below the saturation limit of the dose response curve (D0 < 2xD0) giving a reliable age of 76 ± 6 ka. The fading-uncorrected pIRIR290 age of 73 ± 5 ka is in good agreement with the quartz result. A further test on older samples was carried out on the sedimentary succession at Bue Marino cave, which includes a sandy wind-blown unit, enclosed between two calcareous crusts. U-series dates of crusts constrain the aeolianite formation between ~130 and ~86 ka. The quartz SAR-OSL signals for aeolianite samples lies close to saturation and the resulting ages underestimate the independent age control. Instead, uncorrected pIRIR290 ages on K-feldspar extracts point to a formation of the wind-blown unit between ~100 and ~80 ka, in good agreement with the U-series data. The bleachability of the pIRIR290 signal was further investigated using samples from a modern coastal barrier system backing the Alghero bay. The dunefield was stabilized by plantation during the 1950s. The quartz SAR-OSL ages span from 2450 ± 170 years to 60 ± 13 years ago, consistent with the known coastal barrier stabilization. The pIRIR290 ages indicate an offset up to ~1000 years. We can conclude that the pIRIR290 method on sand-sized K-feldspar grains shows great promise for samples at or beyond the quartz OSL age limit but should not be applied to Late Holocene or modern deposits.