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Testing portable luminescence reader signals against late Pleistocene to modern OSL ages of coastal and desert dunefield sand in Israel

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Rapid assessment of luminescence signals of poly-mineral samples by a pulsed-photon portable OSL reader (PPSL) is useful for interpreting sedimentary sections during fieldwork, and can assist with targeted field sampling for later full OSL dating and prioritize laboratory work. This study investigates PPSL signal intensities in order to assess its usefulness in obtaining relative OSL ages from linear regressions created by interpolating newly generated PPSL values of samples with existing OSL ages from two extensive Nilotic-sourced dunefields.

Eighteen OSL-dated sand samples from two quartz-dominated sand systems in Israel were studied:(1) the Mediterranean littoral-sourced coastal dunefields that formed since the middle Holocene; and (2) the inland north-western Negev desert dunefield that rapidly formed between the Last Glacial Maximum and the Holocene. Samples from three coastal dune profiles were also measured.
Results show that the PPSL signals differ by several orders of magnitude between modern and late Pleistocene sediments. The coastal and desert sand have different OSL age - PPSL signal ratios. Coastal sand show better correlations between PPSL values and OSL ages. However, using regression curves for each dunefield to interpolate ages is less useful than expected as samples with different ages exhibit similar PPSL signals. The coastal dune profiles yielded low luminescence signal values depicting a modern profile chronology.

This study demonstrates that a rapid assessment of the relative OSL ages across different and extensive dunefields is useful and may be achieved. However, the OSL ages obtained by linear regression are only a very rough age estimate. The reasons for not obtaining more reliable ages need to be better understood, as several variables can affect the PPSL signal such as mineral provenance, intrinsic grain properties, micro-dosimetry and moisture content.