

# The utility of portable optically stimulated luminescence (OSL) readers in providing temporal contexts in clastic depositional systems: opportunities in geomorphology

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The recent development of functional portable optically stimulated luminescence (POSL) readers has ushered in new opportunities in geomorphology. Although POSL readers do not necessarily provide absolute ages as in regular OSL dating, they can be used to readily acquire luminescence signals from clastic sediments [1]. Such signals can be used to construct luminescence profiles which depict the variation of the luminescence signal with depth within a depositional sequence. Luminescence signals depend on dose rate, sensitivity of the mineral grains, mineralogy, degree of bleaching and burial age of the sediments. When all these parameters apart from burial age are held constant, the luminescence profile can serve as a proxy for the chronostratigraphy.

A number of studies we have carried out on the Canadian prairies with a POSL reader developed by the Scottish Universities Environmental Research Centre serves to illustrate the utility of the readers [2, 3]. Their portability means that the device can be carried to the field and analysis can be performed on bulk samples, negating the need for time-intensive mineralogical separations, as is required in regular OSL dating. In one study we used the POSL reader to profile Holocene eolian dune sequences to determine the relative ages of the depositional units as well as ascertain whether any lengthy depositional hiatuses exist within the sequences. In another study we profiled postglacial dunes that overlie glaciofluvial sands in an effort to delineate the interface between the two depositional facies [2]. In a third study we used luminescence profiling to identify eolian dune sands that were still intact from those that had experienced post-depositional mixing [3]. In all three cases, luminescence profiling afforded an enhanced temporal context of the stratigraphy, permitting better sample targeting for regular OSL dating. Overall the studies underscore the breadth of geomorphological settings in which the POSL readers can be used.

## References

[1] Sanderson, D.C.W., Murphy, S. 2010. Using simple portable measurements and laboratory characterisation to help understand complex and heterogeneous sediment sequences for luminescence dating. *Quaternary Geochronology* 5, 299-305.

[2] Munyikwa, K., Brown, S.T., Kitabwalla, Z. 2012. Delineating stratigraphic breaks at the bases of postglacial eolian dunes in central Alberta, Canada using a portable OSL reader. *Earth Surface Processes and Landforms*. DOI: 10.1002/esp.32

[3] Munyikwa, Gilliland, K., Plumb, E., Gibson, T., 2012. Site characterization using a portable optically stimulated luminescence reader: delineating disrupted stratigraphy in Holocene eolian deposits on the Canadian Great Plains. American Geophysical Union, Fall Meeting, 2012, San Francisco.