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New developments of luminescence dating for understanding landscape evolution in Atacama Desert, Chile

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Establishing patterns of frequency and magnitude of erosion events is key for understanding landscape evolution. For that purpose, luminescence dating is one of the most useful techniques as it can provide accurate chronology for sediment deposition. In this study, it has been applied to two stratigraphic profiles at the slopes of the Salar Grande, Atacama Desert, Chile, where extreme aridity limits any recent sediment mobilisation.
The most reliable methods of luminescence dating are commonly applied on quartz grains but the volcanic origin of the quartz in this area prevents the use of standard protocols. New developments in the technique, involving the use of violet stimulation, have been tested and implemented in this study. The robustness of this new method has been confirmed through dose recovery experiments. Ages have been estimated for ten samples from these two profiles in order to provide enough resolution for establishing patterns of morphodynamic hillslope activity.
In addition, ages of the same samples have also been estimated using standard protocols of infrared stimulated luminescence (IRSL). Again, the suitability of this approach has been validated through a series of dose recovery test. Both chronologies present good agreement with the stratigraphy showing the potential of luminescence dating in studying dry environments.
Given the morphodynamic inactivity of hillslopes under recent climate conditions, luminescence chronologies of depositional activity phases might inform about long-term climate variations in the hyper-arid core of the Atacama Desert during the Pleistocene.