EGU2020-202
https://doi.org/10.5194/egusphere-egu2020-202
EGU General Assembly 2020

High-resolution analysis of Vegetated Linear Dune construction - The northwestern Negev dunefield, Israel

Lotem Robins[1,2], Joel Roskin[2], Lupeng Yu[3], and Noam Greenbaum[1]

[1]Haifa University, Geography and Environmental studies, Israel (lotemrobins@gmail.com, noamgr@geo.haifa.ac.il)
[2]Geomorphology and Portable Luminescence Laboratory, the Leon Recanati Institute for Maritime Studies (RIMS), University of Haifa, Haifa, Israel (yoelr@post.bgu.ac.il)
[3]Luminescence Laboratory, School of Resources and Environmental Sciences, Linyi University, Linyi, China (yulupeng@gmail.com)

Vegetated Linear Dunes (VLDs) are common in arid environments such as in Australia and southern-Africa. They propagate in a linearly fashion in accordance with strong unidirectional winds. Their elongation and accumulation mechanisms are not well-understood (Telfer, 2011). Here we report on VLD construction based on high-resolution Portable Optically Stimulated Luminescence (POSL), particle-size distribution (PSD), Optically Stimulated Luminescence (OSL) and inorganic carbon content of a rare, exposed and consolidated 8-m high section of a VLD axis, at the margins of the northwestern Negev dunefield, Israel.

The POSL profile results of sand (<300µm) samples (25 cm interval) in the Infra-Red (IR) and Blue (B) spectra display a similar pattern and are differentiated into three statistically distinct clusters, using an unclassified clustering (Mean-Shift) algorithm. Mean values and standard deviation of the B net values (Sanderson & Murphy, 2010) of the three clusters are: 858.1±62 [10^3], 702.8±39.5 [10^3] and 552.9±50.7 [10^3] counts. ANOVA single factor analysis illustrate significant variation between the groups ($p.<0.05$). These discrete clusters plotted with depth, nicely fit observed stratigraphic units and $CaCO_3$ content, interpreted to represent episodes of sand accumulation. PSD analysis shows a (classic for Negev VLDs) unimodal distribution for sand (peak at 225mm) of the upper unit but a bimodal pattern (peaks at 65-70mm and 200-225mm) for samples of the two lower units. This rare bimodal pattern suggests short-distance fine-grained aeolian contribution from exposed sediments of dune-dammed water bodies that developed around the construction time of the VLD.

OSL ages fit previous studies (Roskin et al., 2011) but could not be discretely differentiated into the three units since both the middle- and upper-units date to the Younger Dryas event. Partial bleaching of some of the samples may have impaired dating accuracies. OSL ages of the lower unit date to the time of the Heinrich 1 event.

The finds, the first of their kind in high-resolution with POSL, demonstrate that VLDs accrete in discrete accumulation phases. The results strengthen the prevailing hypothesis based on lower resolution OSL dating (Roskin et al. 2011, 2014), advocating VLD construction in the Negev by

several rapid phases of sand accumulation during periods of high wind power.

- Telfer, M. W. 2011. Growth by extension, and reworking, of a south-western Kalahari linear dune. Earth Surface Processes and Landforms, 36: 1125-1135.
- Roskin, J., Tsoar, H., Porat, N., & Blumberg, D. G. 2011. Palaeoclimate interpretations of Late Pleistocene vegetated linear dune mobilization episodes: Evidence from the northwestern Negev dunefield, Israel. Quaternary Science Reviews, 30(23–24), 3364–3380.
- Roskin, J., Blumberg, D. G., & Katra, I. 2014. Last Millenium development and dynamics of vegetated linear dunes inferred from ground-penetrating radar and optically stimulated luminescence ages. Sedimentology. 61: 1240-1260.
- Sanderson, D. C. W., & Murphy, S. 2010. Using simple portable OSL measurements and laboratory characterisation to help understand complex and heterogeneous sediment sequences for luminescence dating. Quaternary Geochronology, 5(2–3): 299–305.

How to cite: Robins, L., Roskin, J., Yu, L., and Greenbaum, N.: High-resolution analysis of Vegetated Linear Dune construction - The northwestern Negev dunefield, Israel, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-202, https://doi.org/10.5194/egusphere-egu2020-202, 2019