



Multi-method investigation of star dunes in Morocco (Erg Chebbi): topography, stratigraphy and implications for OSL-sampling

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Complex mega dune forms (esp. star dunes), representing the surface expression of highly multivariate systems, are still poorly investigated and understood. Yet their shape and sedimentological record display aeolian dynamics in past and present times, for example wind dynamics, sediment availability, sediment supply, as well as moisture and vegetation. Accessing this information offers significant methodological challenges due to the size, accessibility, as well as structural and temporal stability of mega dunes and their sediments. Therefore, at the presented study site (Erg Chebbi, $4^{\circ}02'$ to $3^{\circ}56'$ W / $31^{\circ}14'$ to $31^{\circ}04'$ N), where a close interaction of aeolian and fluvial dynamics formed a star dune dominated desert, a comprehensive surface and subsurface mapping of local mega dune forms was tested. Data collection was done via 3D terrestrial laser scanning, real-time kinematic GNSS, electrical resistivity tomography and ground penetrating radar.

We present, for the first time, a high-resolution surface model with 10 cm spatial resolution for a single star dune in combination with the stratigraphy of corresponding sub-surfaces. In case of a single star dune arm up to three dune-building phases are detectable. This enables the description of the different related wind dynamics as well as slope alignments. Based on these data, the development of customized and target orientated sediment sampling strategies, is possible. Especially in regard of dating approaches via luminescence, the localization of subsurface sediment structures with relative ages to corresponding surface positions is mandatory. In consequence, relatively older dune sediments that are located close to the surface are accessible via manageable hand auger sand drillings. In addition, up to now lacking OSL-records for star dunes can be enhanced by well-aimed and purposeful point samplings, which are possible since the broad outer basements of mega dunes and their internal composition are partly ascertainable.