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Sediment flux from linear dunes morphodynamics in the Ténéré desert (Niger)

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Linear dune development under complex wind regimes is hindered by our limited comprehension of the underlying mechanisms. Therefore, sand flux calculation in remote areas relies mainly on the migration rate of barchans using remote-sensing data.

Based on more than 50 years of aerial and satellite imagery over the Ténéré desert (Niger), we were able to isolate and therefore show that the observed linear dunes in this area elongate from topographic obstacles in the direction of the resultant sand flux with no lateral migration. These elongating lee dunes are therefore ideal for quantifying the dune growth from extension only.

Using photogrammetric techniques we calculated a sediment flux of $30 m^2/yr$. We also emphasized the development sequences from numerical simulations and show how deposition downstream of low hills results in nucleation and development of bedforms that can later break into barchans and ultimately lead to Segmentation and ejection of linear dunes.

As consequences, similarly to the classical approach using the barchans migration rates under unidirectional winds, we can now take advantage of the morphodynamics of linear dunes experiencing complex wind regimes for sediment flux and wind conditions assessment.