Transverse instability of megaripples

March 20 2012

Aeolian ripples, which form regular patterns on sand beaches and desert floors, indicate the fundamental instability of flat sand surfaces under the wind-induced transport of sand grains.

Two kinds of sand ripples exist: normal, small ripples and megaripples with wavelengths reaching up to several meters. They differ also in their grain-size distributions (unimodal for sand ripples and bimodal for megaripples).

While sand ripples form almost straight lines, megaripples have greater sinuosity due to their transverse instability, a property that causes small megaripple undulations to grow with time.

The origin of the instability is due to variations in megaripple height, which do not diminish over time, as well as to the inverse dependence of ripple drift velocity on height. Thus, the taller regions of ripples will move more slowly than the adjacent, shorter portions, an outcome that promotes further perturbation growth.

Hezi Yizhaq of Ben-Gurion University of the Negev and colleagues provide an example, based on field work, of the transverse instability of megaripples. The instability growth rate depends on the difference between the heights of the different segments of the megaripple.

Their results suggest a physical mechanism for the transverse instability of megaripples and new insight into the spatial patterns of sand ripples.

More information: Hezi Yizhaq et al., *Geology*, Posted online 19 Mar. 2012; doi: 10.1130/G32995.1