Emergence of oblique dunes in a landscape-scale experiment

With the support of the National Natural Science Foundation of China, Lü Ping et al., belonging to Prof. Dong Zhibao's research group from the Key Laboratory of Desert and Desertification, Cold and Arid Regions Environmental and Engineering Research Institute, CAS, reported the emergence of oblique dunes in a landscape-scale experiment, which was published in *Nature Geoscience* (2014, 7: 99—103).

The landscape-scale experiment was conducted in the Tengger Desert and the evolution of bed-forms under asymmetric bimodal winds was examined. It is revealed that the orientation of dune crests is controlled by the combination of the normal contributions of the two dominant winds, with respect to their relative strength and direction, such that crests form an oblique angle of 50°. Oblique dune is the key link in the transitional process from transverse dunes to linear dunes. They found that the sediment availability had a key role in shaping dunes, which could be summarized as two models: the linear model with insufficient sediment availability that is characterized by dunes that are aligned with the mean sediment transport direction, and the non-linear model with sufficient sediment availability that is characterized by dune alignment normal to sediment fluxes. This finding provides a basis for evaluating global circulation models from the morphology of modern dunes.

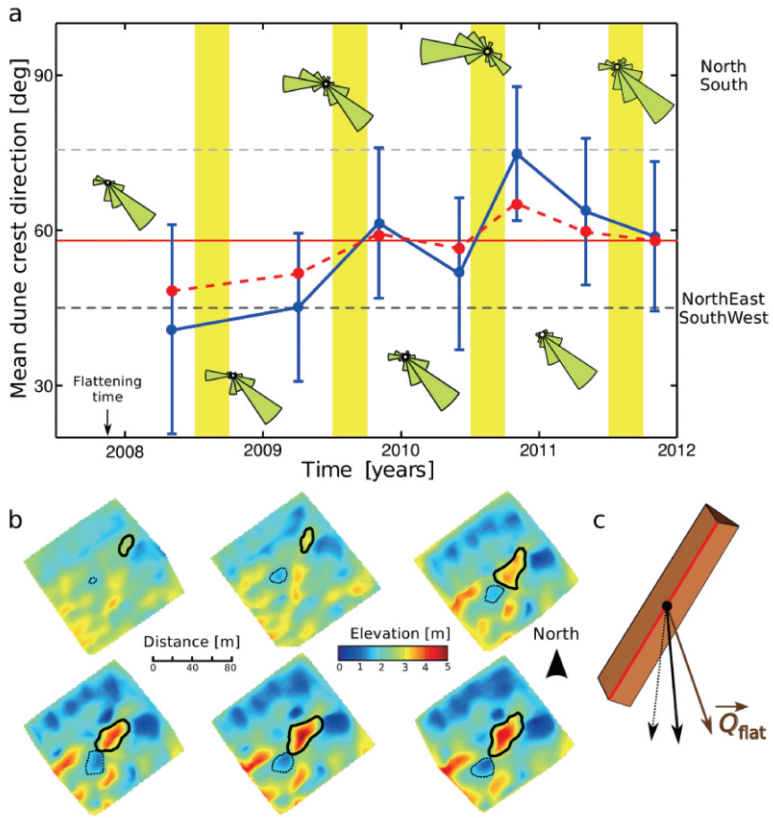

Figure Oblique bed-form alignment. a, Observed (blue) and predicted (red) dune orientations using topographic surveys and the gross bedform-normal transport rule with the local wind data from the flattening time. b, Evolution of topography in the situ area. Contours highlight the positions of a dune (solid) and a trough (dashed). c, Angle difference (50°) between the resultant sand flux direction (brown vector) and the crest alignment (red line).