

Dune Pattern interrupted by ephemeral drainages and human activities, on the Ordos Denuded Plateau in China

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Abstract

Dune pattern is considered a concentrated representation of the desert landscape, and its formation and evolution are affected by climatic conditions and regional differences in the sedimentary environment. High-resolution satellite images from 2007 to 2021 were used to quantitatively analyze the spatiotemporal variation of pattern parameters by using the dune pattern analysis method. Combining with meteorological factors and land use changes, this analysis provides insight into the dynamic change of dune pattern and the main controlling factors of population pattern evolution. The results show that ephemeral drainages and roads developed in the plateau uplift belt interrupt the dune agglomeration downwind without significant change in the pattern parameters from west to east and without obvious spatial variation trend of parameters in each area separated by linear obstacles. In the past 14 years, the crestline has been always NE-SW and NNE-SSW, with a counterclockwise deflection that occurred gradually with time. The crestline length and dune height showed a decreasing trend, while the dune spacing and defect density showed an increasing trend. After 2012, a significant rise in precipitation and a drop in wind speed contributed to the recovery of vegetation, promoting the transformation of barchan dunes (chains) to parabolic dunes and breaking the original self-organization evolution of dunes. Therefore, the spatiotemporal evolution of dune pattern in the denuded plateau is driven by natural and human factors and differs from that in the hinterland of mobile deserts.

Keywords The denuded plateau, Dune pattern, Meteorological factors, Human activities