



Desert megadunes: a product of interactions between various parameters?

Xiaoping Yang, Tao Liu, Bingqi Zhu, Hongwei Li, and Ziting Liu

Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China (xpyang@mail.igcas.ac.cn)

The aeolian system sediment state is defined by three key components: (a) sediment supply, (b) sediment availability, and (c) the transport capacity of the wind (Kocurek and Lancaster, 1999). And the waves generated on the dune surface can produce a series of new smaller dunes, preventing sand seas from merging into a single giant dune (El-belrhiti et al., 2005). Consequently, the development histories of sand seas should reflect the changing patterns of interactions between various geomorphological processes (supplying and transporting sediments) associated with local, regional and global environmental conditions. The aim of this paper is to investigate the distribution patterns of dunes and their triggering factors in the Badain Jaran Desert located in the western Inner Mongolia of China. Using satellite imageries, supported by ground controls, the forms of dunes in this ca. 50,000 square kilometer large sand sea are interpreted. The taller sand dunes, probably the highest on Earth, occur only in the southeastern portion of the region. Detailed geometrical survey shows that many of these dunes possess not only a steep lee but also a steep stoss side. The lee is due to the strong northwestern winds associated with Siberian-Mongolian high pressure while the stoss side is related to the southeastern winds controlled to a considerably degree by the pressure system in the Pacific. In addition to bringing moisture, the southeastern winds play a significant role in the shaping of the dunes, as indicated by the steep stoss side. Using geophysical methods, we mapped underground morphology of some megadunes, recognizing that bed rock morphologies have a certain influence on the height of dunes, but not in a linear relationship. Although the sediment availability decreases while the vegetation coverage increases during wetter epochs, the cementation surface formed during wetter periods appears to be advantageous to the increase of dune height while it acts as solid basis for the dunes from later generations. The final size and form of dunes in this desert appear to be decided indeed by interactions of multiple parameters including direction and strength of winds, bedrock landforms, as well as climatic fluctuations related to local, regional and global systems.