



## **Distribution pattern and classification of climbing-falling dunes system in Qinghai-Tibet Plateau**

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Climbing-falling dunes system plays an important role in aeolian landforms and has the potential to provide rich environment evolution information in arid and semi-arid regions. However, there are relatively few researches on distribution pattern and classification of climbing-falling dunes system in the Qinghai-Tibet Plateau. This study provides a data-rich examination of the distribution rule of dunes system. The location, geological characteristics, underlying topography, type, climbing height, orientation, distance between dunes and rivers of 689 climbing-falling dunes are recorded based on the Google Earth image. The total area covered by climbing-falling dunes in the Qinghai-Tibet Plateau is about 8328km<sup>2</sup>, which represents 2.8% of the total area of aeolian landforms in the plateau, and 0.03% of the entire plateau area. The climbing-falling dunes were densely distributed in Qaidam Basin, Gonghe Basin, Kumkol Basin, foothills of Qilian Mountains, foothills of the Altun Mountains, the Southern Tibet Valley and the source area of Yellow River and Yangtze River. The dunes mainly cover the piedmont alluvial fan, concave slope, denuded monadnock, river terraces, wide valleys, the bend of the river and the foothills around lakes and reservoirs. The average height of climbing-falling dunes in the Plateau was 216m, with the maximum and minimum climbing height being 1416m and 2m, respectively. The climbing-falling dunes in the Qinghai-Tibet Plateau mainly distributed in 10 watersheds, the dunes are within 4km of the nearest channel and 21km of the main channel and mainly vertical to the rivers flow. According to digital elevation models, the climbing-falling dunes are densely distributed in the range of 0-45 degrees in slope and 3000-4500m in elevation, dunes mainly on the north/shady slope, followed by the south/sunny slope. Dunes of the internal flow area are on the shady slope, while the outflow are on the sunny slope. The types of dunes at higher elevations are simple, while those at lower elevations are complex. Field investigation and database are used to determine the classification of the climbing-falling dunes, we think the climbing-falling dunes are distributed in piedmont zone, river valley regions, the surrounding of lake and reservoirs. The underlying landforms of climbing-falling dunes distribution are divided into the six categories: piedmont sediment, denuded monadnocks, bedrock, fluvial sediment, bedrock and alluvial deposits, ancient dunes.