



The formation of Mega-dunes along eastern shore of the Qinghai Lake, China

Lihui Tian (1), Wangyang Wu (2), Dengshan Zhang (1,2,3), Chao Zhao (4,5), and Mingyuan Zhang (2)

(1) State Key Laboratory of Plateau Ecology and Agriculture, Qinghai University, Xining, Qinghai Province, China (lhtian@qhu.edu.cn [U+FF09]), (2) Key Laboratory of Environmental Changes and Natural Disaster, Ministry of Education, School of Geography, Beijing Normal University, Beijing 100875, P.R. China, (3) Qinghai Academy of Agricultural Forestry Sciences, Xining 810016, P.R. China, (4) State key Laboratory of Resources and Environment Information System, Institute of Geographic Sciences and Natural Resources Research, CAS, Beijing 100101, P.R. China, (5) University of Chinese Academy of Sciences, Beijing 100049, P.R. China

As the biggest saltwater lake in China, located in the northeast of the Qinghai-Tibet Plateau, Qinghai Lake plays a vital role in maintaining ecological balance between the east zone dominated by typical monsoon and alpine desert-grassland zone mainly controlled by cold and arid climate. The eastern shore is the largest sandy land around the Qinghai Lake and the major distribution of the mega-dunes on the alluvial plain of Riyue Mountains. Regarding the source and formation of mega-dunes, there have been two viewpoints. One is that sediments exposed in cold period when the Qinghai Lake was smaller in Holocene, then accumulated on the eastern shore. The particle-size of deposits is fine on deltas in western shore of the lake, up to 92%. While the medium-sand is the main content of the sand dunes on eastern shore of the lake, the contents of heavy mineral was also different in two areas. The silt might be carried by river or the sand barriers underwater mainly formed by the deposits transported by westerly wind from deltas at west and north of the lake. The other argument is that deposits accumulated because of Riyue Mountains block off the strong westerly wind carried sediments from the alluvial-lacustrine of the Holocene epoch in valley-mouth delta in western and northern of the lake, and most researchers are supported by this.

According to my observation, I thought the pattern of sandy land on eastern shore of the Qinghai Lake was formed when water gradually reduced in Holocene, nevertheless, the formation of mega-dunes and dune morphology can't do without westerly wind's effect. Simultaneously, the terrain under dunes couldn't be ignored especially mega-dunes. Since located in the middle latitude in the Northern Hemisphere, prevailing westerly winds prompts the growth and morphology of dunes, finally, primarily distributed with transversal dune. The lake ices over during November to April, in addition, average wind velocity is 7 m/s, sand-driving wind, and prevailing direction is mainly west, finally, the sediment discharge is 26.38×10^4 t/a from western to eastern shore. Even though the wind didn't carry fine to move 70 km from west to east, over and over, they would be landing at the sand dunes on the eastern shore before ice broken. Erosion and accumulation happened time and time again interior of sand dunes on eastern shore, eventually, mega-dunes and climbing dunes formed in front and on the slope of mountains. Evidence is that elevation of a sand dune in center of sandy land in 2009 summer was 3190 m, while in the summer of 2013, it became 3186 m. The crest has been made flat even a hollow under westerly wind. Certainly, we couldn't ignore other directs of wind affected by "Lake Effect", i.e. northeasterly wind in Summer and Autumn, for all, the morphology of mega-dunes to be as it is today.

Acknowledgements

This research was supported by National Science Foundation of China (NSFC 41461002, 4166010097), and Science Foundation of Qinghai Province (2018-0302-ZJC-0055).