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Correlation of major earthquake sequences on the eastern and northern boundaries of the Bayanhar block, China, and the tectonic dynamics of the block

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The Bayanhar block is one of the southeast-ward extruding active tectonic blocks on the eastern Tibetan plateau. The northern, eastern and southern boundaries of the block are the NWW-trending to nearly W-E-trending east Kunlun fault zone, the NE-trending Longmenshan fault zone and the NW-trending Xianshuihe fault zone. The M=8.0 Wenchuan, Sichuan, China, earthquake of 2008 occurred on the on the eastern boundary of block. Based on analyzing data of active tectonics, focal mechanism solutions, GPS surveys, and ruptures of major historical and modern earthquakes, our study shows that since the late 19th century, a sequence of at least 8 major earthquakes of left-lateral strike-slip type faulting has occurred on the east Kunlun fault zone, the northern boundary of the Bayanhar block. In the sequence, the time intervals between major events have been getting shorter, suggesting that the occurrence of the 8 major earthquakes in the sequence has been gradually accelerating. This accelerating-occurred sequence of major earthquakes on the northern boundary of the Bayanhar block suggests that the block could have been speeding up its SE-ward motion since the late 19th century at latest. It is also found that another sequence of 5 major earthquakes of thrust-type or reverse- and right-lateral strike-slip type faulting has occurred on the eastern boundary of the Bayanhar block since the early 18th century. In this sequence, a gradually acceleration occurrence has been taking place since the 3rd events. The accelerating sequence of major earthquakes on the eastern boundary of the Bayanhar block seems to have started several decades later than that accelerating sequence on the northern boundary of the block mentioned above. Therefore, the accelerating sequence of major earthquakes on the eastern boundary of the block should be actually a response of that accelerating sequence of major earthquakes on the northern boundary of the block. The M=8.0 Wenchuan, Sichuan, China, earthquake of 2008 should be the most recent major event in the response accelerating sequence of major earthquakes on the eastern boundary of the Bayanhar block.