



Aeolian environments and sand damage along the Qinghai-Tibet Railway, China

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The Qinghai-Tibet Railway (QTR), with a total length of 1956 km, is the world's longest high-altitude railway. Located in the Tibet Plateau, the QTR is frequently damaged by windblown sand because of strong winds and abundant sand. Based on the detailed wind data, in situ observation of wind blown sand and field wind tunnel simulations along the QTR, the aeolian sand environment, involving sand-laden wind, drift potential, sand transport and their spatial variation were investigated. Sand-laden wind presents unidirectional characteristics along the QTR and its prevailing direction is westerly. The annual drift potential along the QTR reaches 970.54 Vector Units (VU), which belongs to a high-energy wind environment. In cold-high environments, sand transport rate increases with increasing wind velocity, but decreases exponentially with increasing height in the wind stream. As the altitude increases, the threshold velocity for sand movement linearly increases with altitude, and the sand transport per unit width decreases gradually. The results can be used to guide the design of sand-control structures both in the study area and in other areas that experience threats from windblown sand.