

EGU22-6876

<https://doi.org/10.5194/egusphere-egu22-6876>

EGU General Assembly 2022

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## Characteristics and Risk Assessment of Debris Flow Disasters along the Northern Sichuan-Tibet Highway

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The Sichuan-Tibet Highway spans the Qinghai-Tibet Plateau and the Sichuan Basin. Due to its special geological and geographical environment of steep, cold, high earthquake intensity and high ground stress, it is one of the most typical areas characterized by most serious natural disasters in China. In particular, frequently occurred debris flow disasters seriously affect the distribution of highway lines, the stability of subgrade slopes, road traffic safety, etc. In order to better serve the early warning, forecasting and disaster prevention and mitigation works in disaster-prone areas, it is necessary to carry out risk assessment. Comparatively, the southern traffic line of Sichuan-Tibet Highway was more convenient with more relating researches. At present, little attention has been paid to the northern line of Sichuan-Tibet Highway. However, the northern line passed through Dege, Sichuan and Changdu, Tibet, which is of great value to the traffic and life of the local Han and Tibetan people. At the same time, the northern line passed through Ganzi-Luhuo earthquake zone, and a large section of the line was distributed in parallel along Xianshuihe fault zone, so the risk of debris flow disaster cannot be avoided, and the research significance of the northern line of Sichuan-Tibet Highway was evident. Therefore, in this paper, focus on the debris flow along the northern Sichuan-Tibet highway, combined with field investigation and GIS technology, the characteristics and pregnant environment of debris flow along the highway were analyzed, and the risk assessment of debris flow was carried out by the method of evidence weight. Based on the idea of "discretization", highway vulnerability assessment was carried out for highway structures and moving disaster-bearing bodies. Based on above researches, the debris flow risk zoning along the northern line of Sichuan-Tibet highway was completed. The results shown that: (1) There were 235 debris flows along the northern line of Sichuan-Tibet Highway, of which 136 were hidden danger spots and 101 were disaster spots, which are distributed in Daofu-Luhuo, Dege-Jiangda and Qamdo Karuo. (2) The hazards of debris flow on the northern line of Sichuan-Tibet Highway mainly include blocking culverts, impacting bridges and burying roads. Among the existing 136 hidden danger points of debris flows, 44% of which directly affect culverts, 39% of which were bridges, and 17% were hidden danger points or damaging roadbed/roads. (3) The risk

zone of debris flow in the northern Sichuan-Tibet highway indicated that the middle and high-risk road sections taking part of 63.30%, more than half of which were mainly distributed in Jiangda County, dege county and Luhuo-daofu county, which were basically in consistent with the distribution of major debris flow disaster points in the study area and verified the reliability of the evaluation results in this paper. The risk zoning map obtained from this research provided references for risk avoidance, disaster prevention and mitigation of debris flow along the northern Sichuan-Tibet highway.