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## Development of early warning system for linear engineering - a case study on highway in Sichuan, China

Ruihua Xiao

For the recent years, highway safety control under extreme natural hazards in China has been facing critical challenges because of the latest extreme climates. Highway is a typical linear project, and neither the traditional single landslide monitoring and early warning model entirely dependent on displacement data, nor the regional meteorological early warning model entirely dependent on rainfall intensity and duration are suitable for it. In order to develop an efficient early warning system for highway safety, the authors have developed an early warning method based on both monitoring data obtained by GNSS and Crack meter, and meteorological data obtained by Radar. This early-warning system is not each of the local landslide early warning systems (Lo-LEWSs) or the territorial landslide early warning systems (Te-LEWSs), but a new system combining both of them. In this system, the minimum warning element is defined as the slope unit which can connect a single slope to the regional ones. By mapping the regional meteorological warning results to each of the slope units, and extending the warning results of the single landslides to the similar slope units, we can realize the organic combination of the two warning methods. It is hopeful to improve the hazard prevention and safety control for highway facilities during critical natural hazards with the progress of this study.

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