Mapping Embankment Deformation on the Qinghai-Tibet Railway using a small Baseline InSAR Time-Series Technique

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Permafrost and seasonal frozen ground cover ~2.41 million km2 of the Qinghai-Tibet Plateau, while approximately 550 km of the Qinghai-Tibet railway passes through this region. Seasonal bulging of the frozen ground and subsidence generated by thawing processes pose a significant threat to the stability of railway embankments throughout the region. To assess this problem, a Small Baseline Interferometric Synthetic Aperture Radar technique is employed to accurately map and quantify the deformation of embankments affected by permafrost in the Beiluhe segment of the Qinghai-Tibet railway line. The small baseline InSAR technique is used to process one descending and one ascending track of Envisat C-band data with the aim of generating a mean velocity map and associated time-series plots of the railway. By comparing the two Envisat tracks of data, the results can be verified without the need for ground data. The small baseline InSAR technique is shown to be very effective at measuring precise surface changes over large areas and these results should help to minimize the effect of embankment deformation along the Qinghai-Tibet railway.

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