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Non-tectonic deformation in the NW Himalaya using GPS measurements

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Himalayan belt is rapidly deforming plate boundary zone between India and Eurasia and consist complex tectonics. Past studies on space based measurements confirm the presence of non-tectonic deformation in the Himalaya. Non-tectonic deformation in the Himalaya appears due to the anthropogenic activity, movement of bed rock, redistribution of mass in the continent, ocean and earth's atmosphere, etc. Mass redistribution in the Himalaya generally show annual periodicity and thus known as seasonal variation. Non-tectonic deformation can modulate the stress conditions on the main Himalaya thrust and therefore a quantitative analysis of different processes responsible for non-tectonic deformation is required. We have derived the non-tectonic deformation in the NW Himalaya based on continuous GPS measurements and used the mass redistribution models for the quantitative analysis of the surface deformation caused by continental water loading, atmospheric pressure loading and non-tidal ocean loading. Seasonal variation in the displacement components derived from GPS measurements and mass redistribution models suggest that the seasonal variation in the NW Himalaya is mainly due to the hydrological loading and atmospheric pressure loading. We have identified two future potential landslide zones in Garhwal Himalaya (Phata, Guptkashi and Raithal, Uttarkashi) based on GPS and InSAR observations. We have observed strong seasonal variation at GPS site Kunair, Chamba, situated near to Tehri dam and estimated the elastic deformation at site due to loading and unloading of Tehri reservoir.

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