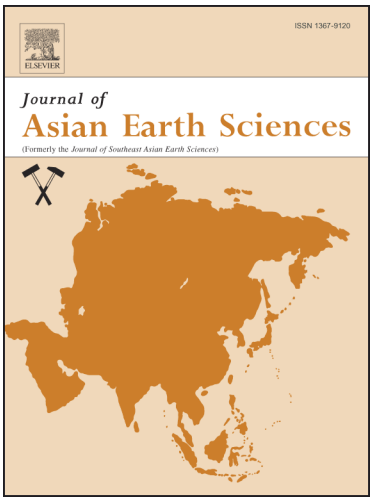

Full length article

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Influence of a meteorological cycle in mid-crustal seismicity of the Nepal Himalaya,

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Abstract

The process of interseismic strain accumulation across the Nepal Himalaya is associated with micro seismicity (also called mid-crustal seismicity) which occurs along the mid-crustal ramp on the Main Himalayan Thrust (MHT). The seismicity shows strong annual periodicity in response to the annual stress variation of hydrological loads. We report dominance of annual periodicity in the eastern Nepal as compared to that of western Nepal, and overall annual periodicity dominance in the small magnitude earthquakes (Mw 0-3). Rainfall seismicity cross-correlation is significantly higher in the eastern Nepal region as compared to that of western Nepal with a prominent phase lag of 5-6 months with respect to the occurrence of monsoonal rainfall. Seasonal modulation can be explained by Coulomb failure stress model and fault resonance hypothesis induced by meteorological cycle. This new observation upholds the existing hypothesis that evaporation induced unloading in the Himalayan foothills and adjacent Indo-Gangetic plains during the post-monsoon period (i.e., during winter) add significant component of horizontal compression to the interseismic contraction at the MHT, which is the main driving mechanism for the seasonal modulation.

Keywords: Main Himalayan Thrust, mid-crustal seismicity, Coulomb failure stress, Indo-Gangetic plains.

1. Introduction

Earth's surface processes have the potential to modulate crustal deformation and seismic activity (Heki, 2001, 2003; Bettinelli et al., 2008; Steckler et al., 2010; Fu and Freymueller, 2012; Fu et al., 2012; Wahr et al., 2013; Chanard et al., 2014; Matsuo and Heki, 2010; Jianget et al., 2010;