

Self-affinity analysis of BHGP and RCHI GPS position time series data using rescaled range

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Rescaled range (R/S) analysis has been implemented to analyse the self-affinity of the GPS position time series data at the two sites, Bhagalpur (BHGP) and Ranchi (RCHI). These sites have suffered an insignificant displacement of 3 ± 3 mm due to Gorakha, Nepal earthquake occurred in April 2015, whose epicentre is within 500-600 km radius from these two sites. The Hurst exponent ($H_{R/S}$) values obtained from the time series data of BHGP site is varying between 0.5 to 1.0, which depicts the self-affine fractal behaviour of the GPS data. Whereas, at RCHI site the values of $H_{R/S}$ are greater than 1.0, which violates the criteria of self-affinity. The reason for this discrepancy in the value of $H_{R/S}$ may be the geological settings of the both sites. The site BHGP is situated in the southern banks of Ganga river in the Indian states of Bihar. The Indo-Gangetic plain is a broad, monotonous, level expenses built-up of quaternary alluvium which conceals the solid geology of its floor. The RCHI site belongs to the state capital of Jharkhand, India. Which is largely defined by Chotanagpur plateau and represents a part of Indian Peninsular Shield which is a stable cratonic block of earth crust. Though it is a part of stable block, it is being rocked by mild to medium tremors but now it is assumed that it is free from any type of tremors or cratonic movement. Evidence of regional tectonic movements in the plateau area is preserved in the form of faulting, folding, joints etc. in the rock.

Keywords: GPS, Time series, R/S analysis, Hurst exponent

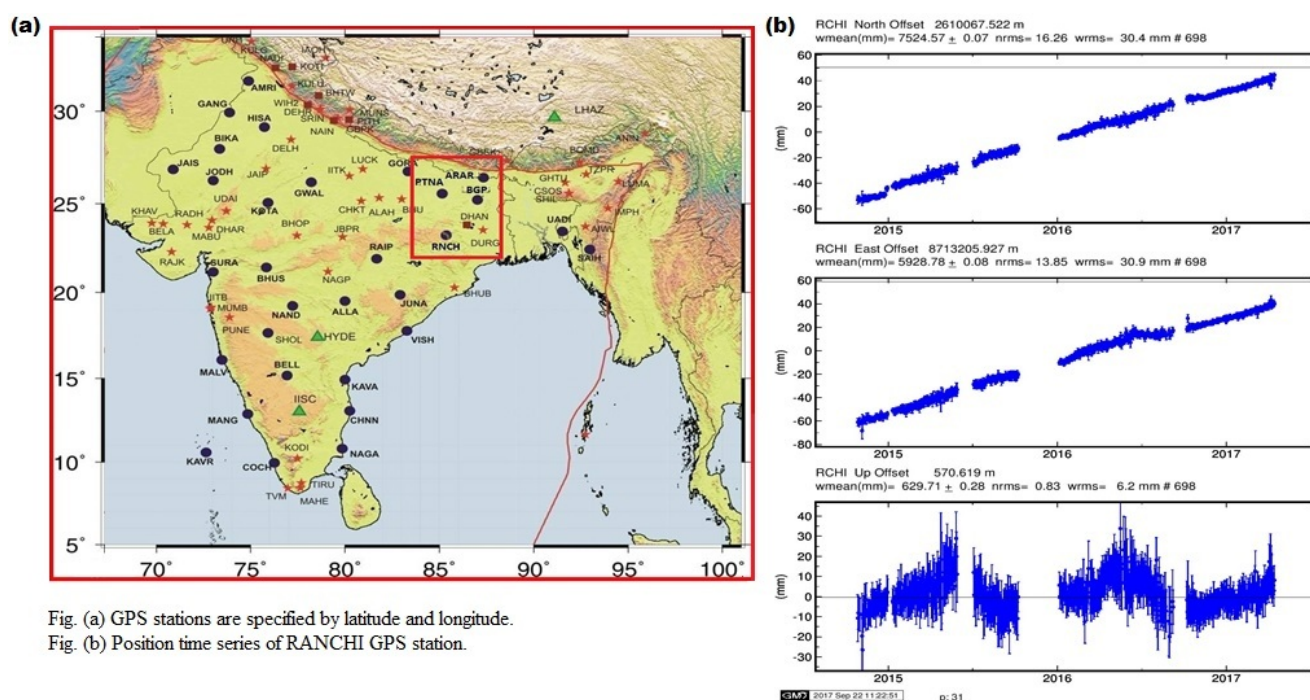


Fig. (a) GPS stations are specified by latitude and longitude.

Fig. (b) Position time series of RANCHI GPS station.