## Crustal Deformation Studies by GPS Measurements in Kachchh, Western India

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The Institute of Seismological Research (ISR) is running a network of 25 permanent GPS stations and 11 campaign stations in Gujarat, Western India starting 2006.

The velocities of 3 permanent stations and 8 campaign stations run for 3 years show average velocity of  $49\pm1$  mm/yr towards NNE with respect to ITRF05 frame which is same as expected from plate tectonics. To estimate local deformation in this region, the Indian plate motion was subtracted from these measurements, taking ISR permanent station (ISRG) as reference. All sites show very small movement of the order of 2- 5 mm/yr. The station Lilpar (LLPR) in Wagad area exhibits a velocity of about 4 mm/yr towards SE. Stations, Dudhai (DUDH) and Chandrani (CHAN) near KMF show 2-3 mm/yr movement towards NNW or NW. Stations, Khavda (KHAV) and Amrapar (GIBF) south of IBF in the west side show 2-5mm/yr movement towards West while Gadhada (GADH) on east side shows 2-3 mm/yr movement towards SE. It appears that the area east of longitude 70.5°E is moving towards SE, west of this longitude movement is towards west.

Displacements of two ISR campaign stations, namely Dudhai (DUDH) and Amrapar (GIBF) for the period 2006 onwards are computed. DUDH is close to DHAM station of IIG while GIBF is close to RATN. The IIG stations were run for the period 2001-2006. The reference station is Gandhinagar (ISRG) for ISR and Ahmedabad (AHMD) for IIG. Hence it is possible to combine two data sets and infer the movement at these places from 2001 onwards. The rate of movement towards NW was fast at Dudhai which is close to the epicenter. It exponentially reduced being 12, 6, 4 and 3 mm for four consecutive 6 months periods of 2001-2002 and between 2-3 mm/yr at present. At Amrapar, 50 km north of 2001 epicenter, the rate of movement was 1/3 <sup>rd</sup> and decaying exponentially.

It has been observed that the aftershocks in the 2001 Mw=7.7 rupture zone in Kachchh are continued at M $\leq$ 5 level and seismicity has migrated up to 60km NE of the 2001 Bhuj earthquake aftershock zone in the last 9 years. The shear deformation for adjustment process in Bhuj earthquake zone is now negligible as deduced from only 2-3 mm/yr movements of GPS stations. The viscoelastic process /rheology change appears to be the probable mechanism for long distance and delayed triggering of earthquakes.