2

Solid Earth Modelling Programme (SEMP)

Global Positioning System (GPS) based Geodesy had become capable of yielding sub-cm precision in location by the early 1990s and the possibility of it being used to determine crustal strain rates in India was recognised at C-MMACS in 1993 following the Khillari earthquake. Research at C-MMACS has since yielded fairly well constrained figures for the velocity of the Indian plate and partitioning of strain from Kanya-Kumari to Ladakh in the trans-Himalya. Over the years C-MMACS has also taken up the ardous task of setting up GPS stations in remote locations in the country to generate required data base, and to extend application of GPS technology to other areas.

Highlights

The year 2005-06 for SEMP has seen a spectrum of activities in the areas of seismic data analysis, study of tectonics in the Himalayan region and applications and analysis of GPS data. C-MMACS had also carried out a quick response analysis of GPS measurements in Andaman Nicobar Islands following the devastating Sumatra earthquake of 26th December, 2004.

Inside

2.1 Site Response in Ahmedabad City using Microtremor Array Observations: A Preliminary Report

The spate of earthquakes in our country has awakened the sensitivity of administrators, engineers and even the common people to risks due to earthquakes. On January 26, 2001, one of the most destructive earthquakes (Mw=7.7) ever to strike India occurred in the Kutch region of Gujarat. The damage due to this earthquake was spread over a radius of 400 kilometers including major cities like Ahmedabad, Bhawnagar and Surat at distances more than 250 kms. Ahmedabad, a city of historical value and one of the most industrial and economically developed cities in India, is still under seismic threat due to ongoing seismic activities in the Kutch region. Looking into the importance of the subject, Department of Science and Technology, Govt. of India has sponsored a project to C-MMACS for detailed site characterization of Ahmedabad city.

In the present report, a preliminary result is presented on site-effects and shear velocity structure of sub-surface soil using microtremor arrays at twenty different sites in the city. To get the first order response of site characteristics, the most commonly used Nakamura (H/V ratio) technique has been adopted using the ambient noise recorded by an array of seven Lennartz 5 sec seismometers. Most of the sites have shown a fundamental resonance frequency at 0.6 Hz. Very few sites have the peak frequency between 2 - 6 Hz, however, the first peak at 0.6 Hz is also explicit on these sites. This indicates that the thickness of the upper soft soil is very deep (several hundreds of meters) which corresponds to the frequency of 0.6 Hz. The phase velocity dispersion curve is also estimated by frequency-wave number (f-k) and spatial auto correlation (SPAC) methods using microtremor arrays of 7 stations recording ambient noise for at least one hour at each site. Phase velocities have been inverted to obtain the 1-D shear velocity at each site. Generally, the top layers 0.1 to 20 meters show shear velocities between 150-300 m/s and later the velocities vary between 400 to 800 m/s till 100 meters of depth. The estimated shear velocity can be used as an input for the simulation of strong ground motion looking into the influence of source, rupture, propagation path and directivities etc. on the site-effects.

Imtiyaz A Parvez and K Madhukar