GPS observation of the postseismic crustal deformation, associated with the 2001 western India earthquake

Kaoru Miyashita[1], Teruyuki Kato[2], Yosuke Aoki[3], Vijaykumar Kathamana[4]

[1] Dept. of Environmental Sciences, Ibaraki Univ., [2] Earthq. Res. Inst., Univ. Tokyo, [3] ERI, Univ. of Tokyo, [4] Space & Earth Sci., Grad. School of Sci. & Eng., Ibaraki Univ.

We still have a clear memory of the western India earthquake (Ms=7.9) of Jan. 26, 2001, which caused several tens of thousands of fatalities and collapses of almost all of stone masonry buildings in and around the source region.

As a part of the integrated observation study on this earthquake, supported by a Grant in Aid for Scientific Research, we have constructed a temporal GSP network around the source region in cooperation with Indian Institute of Geomagnetism in order to detect the postseismic crustal deformation. Assuming a low-angle thrust plane dipping in the north for the earthquake fault, we developed many of the observation sites (a total of 14 sites) in the hanging-wall side. We have got the continuous GPS observation data from January 22 to Mar. 4 in the first campaign.

We still have a clear memory of the western India earthquake (Ms=7.9) of January 26, 2001. Eyewitnesses report that this earthquake caused several tens of thousands of fatalities, reaching the maximum of 100,000, and that 90 percent of the stone masonry buildings collapsed in and around the source region, particularly in Bhuj, Anjar and Bachau.

In order to detect the postseismic crustal deformation, we tried to establish a temporal GSP network, consisting of 14 observation sites, in and around the source region in cooperation with Indian Institute of Geomagnetism (IIG). The present GPS observations have been done as a part of the integrated observation study on the 2001 western India earthquake, supported by a Grant in Aid for Scientific Research.

We could not get easily a permission to establish GPS observation sites around the source region, although some of our research members entered into the spot areas soon after the earthquake. It is because the heavily damaged areas were under the military control. Full operation of the present GPS network started on 22 February, though some GPS sites had recorded the data earlier.

We had planned that a configuration of the GPS network should be extended in the direction perpendicular to the fault strike, i.e., in the N-S direction. However, the configuration of the network established, which covers the source area, elongates in the E-W direction, because of the military control just after the earthquake and some topographical problems. Coordinates of the observation sites and dual frequency GPS receivers used are as follows:

Site	(lat., lon.)	Receiver	Site	(lat., lon.)	Receiver
Naliya	23.2571N 68.8352E	Trimble	Rapar	23.5682N 70.6435E	Trimble
Ratanpar	23.8597N 70.3634E	Trimble	Bhuj	23.2542N 69.6540E	Trimble
Dhamdkapir	23.3318N 70.1431E	Trimble	Gandhidham	23.0694N 70.0950E	Trimble
Lodai	23.3937N 69.8916E	Trimble	Rajkot	22.2924N 70.7740E	Trimble
Ahmedabad	23.05N 72.40E	Trimble			
Mandvi	22.8335N 69.3541E	Leica	N.Sarovar	23.6766N 68.5408E	Leica
Hajipir	23.6898N 69.2073E	Leica	Nakatrana	23.3555N 69.2549E	Leica
Bhirandiyar	23.69N 69.89E	Leica			

At each of the observation sites, GPS antenna was set on the roof of the building, which was not collapsed. We made 24-hour observation with a sampling rate of 30 sec and an elevation mask of 15 degrees. First full operation of the GPS network started on Feb. 22 and continued until Mar. 4. Second and third operations will be made by the end of this August.

We will report the preliminary result from the first continuous GPS observation.