On some effects of India-Pakistan border earthquake on the atmospherics recorded at Tripura

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There are different models on seismic waves and on the generation of electric field within the upper atmosphere due to seismo-ionospheric coupling phenomena during the occurrence of any strong earthquake. The emission and propagation of electromagnetic waves from large earthquakes in the ULF-ELF-VLF bands have been reported. Both precursory and post-seismic variations in ELF-VLF amplitudes and in ionospheric parameters are well-known from satellite-based observations surrounding the earthquake zones.

During the strong seismo-ionospheric coupling processes in the earthquake preparation zone, underground gas discharges carry submicron aerosols with them which enhance the intensity of electric field at the near ground due to the drop in air conductivity created by aerosols. Seismo-electromagnetic emissions have been observed at low frequency bands in the seismically active zones prior to the incidence of any large earthquake which are different from lightning induced and technogenic emissions. On the event of strong earthquakes, the near ground of the atmospheric layer becomes ionized and generates strong electric field which introduces particle acceleration thereby exciting local plasma instabilities.

Ion cluster mass and plasma concentration during the process of lithosphere-ionosphere coupling vary with the vastness of the earthquake. As a result, the seismo-electromagnetic emissions would be expected to cover almost the whole of ULF-ELF-VLF band. In the process, there will be increase of thermal plasma noise along with other types of emissions, eg, Cerenkov and Bremstrallung.

In this work, the results of some significant observations by VLF receivers recorded over Agartala (Lat. 23º N, Long. 91º 24′ E) at 6 kHz and 9 kHz during the India-Pakistan border earthquake occurred on October 8, 2005 at Muzaffarabad (Lat. 34.53º N, Long. 73.58º E), Kashmir (under Pakistan) will be presented. The effects of the vast earthquake (M=7.7) are exhibited through the occurrence of discrete spikes. Numbers of spikes were observed first on September 28, 2005 and & continued upto October 13, 2005. The number of spikes and their intensities as well as durations were found to be changed irregularly and reached the maximum value on the day of occurrence. The signatures ceased gradually and almost ended after October 13, 2005. These commencements may be considered to be precursory and post-seismic effects of this vast earthquake. The records were taken at Agartala which is about 2179 km away from the place of occurrence. The effects at 6 kHz have been found to be more prominent than at 9 kHz records. Observations were taken at Agartala continuously at frequencies 1, 3, 5, 6, 9 and 12 kHz. No such effects had been observed except at 6 kHz and 9 kHz. The data were analyzed and the outcome of the results will be presented.

The earthquake at India-Pakistan border at Muzaffarabad occurred along with 156 after-shocks on the same day and almost at the same place having M: 4 to 5.9. Different quakes due to after-shocks are of various magnitudes and their hypocenters are located at different depths. As a result, the electromagnetic signals which are thought to be generated during the period get attenuated differently for different sources. The uneven distribution of intensity of spikes in Figures 10-12 may be due to anomaly in the after-shock effects which were present during the period.

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