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A Possible Effect of Ionospheric Perturbations for the Sumatra Earthquake, as Revealed from Subionospheric VLF Propagation (NWC-Japan)

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VLF subionospheric radio sounding has been discussed in a number of recent publications as a prospective tool for remote detection of ionospheric perturbation associated with seismic activity. The observation of subionospheric VLF propagation from the transmitter NWC(Australia) (frequency=19.8kHz) to our three receiving sites in Japan(Chofu, Chiba and Kochi) are used to find a possible precursor of ionospheric perturbations to the Sumatra earthquake(M=9.0 Depth=30[km]) taken place on 26 December, 2004. The epicenter of the earthquake is located in the west coast of the Sumatra islands. It is far away(about 2000km) from the great-circle paths between the NWC VLF transmitter and three Japanese receiving points(Chiba Chofu and Kochi). But, this Sumatra earthquake is extremely huge(M=9.0), so that we expect an extremely large area of ionospheric perturbations for this earthquake. It may be reasonable to anticipate that the VLF propagation path from the transmitter, NWC to Japanese VLF sites is definitely influenced by this huge earhquake. The nighttime fluctuations in VLF propagation data at all three sites have exhibited significant enhancements on 8 December and on a few days around 21 December, 2004 ; These anomalies are found to take place about 18 days before and several days before the earthquake. On these days there have also been observed the anomalies in the TEC measurement in Indonesia(J. Y. Liu, private communication), which is quite consistent with our VLF measurement. Hence the huge magnitude (M=9.0) of the earthquake has yielded an disturbance over an extremely large area(of the order of 2000km (radius)), which means that the VLF propagation paths from the NWC to Japan are disturbed due to this large earthquake.