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Study of precursory signature of shallow earthquakes in Pakistan using ground based ionosonde foF2 measurements: prediction of earthquake

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This study employs the data of ionospheric parameter foF2 at Karachi and Islamabad pertaining to the four shallow earthquakes, which hit the coastal and mountainous areas in the years of 1985, 2001 and 2005. Two of the four earthquakes occurring at Karachi on Dec.17, 1985, and Jan. 26, 2001 were of the moderate (M= 5.4R) and strong (M=6.5 R) categories respectively, while that occurring at Islamabad on Feb. 25, 2001 and Oct.10, 2005 were of the strong (M= 6.0 R) and major (M= 7.6 R) categories in order. This study has revealed that the upper & / or lower anomalous signals of more than 0.55 MHz can be observed on 1-6 days before the earthquake. These signals have been classified into three categories: (i) An upper &/or lower noticeable anomalous signal (i.e. 0.50 MHz $<$ Δ foF2 $\leq$ 1.5 MHz), (ii) An upper &/or lower more noticeable anomalous signal (i.e. 1.50 MHz $<$ Δ foF2 $\leq$ 2.5 MHz), and (iii) An upper & / or lower most noticeable anomalous signal (i.e. Δ foF2 $>$2.5 MHz). It was observed that at a costal city, the upper & / or lower anomalous signals are much stronger on pre-earthquake days for moderate earthquake than that of the strong / major earthquake. On the days of the moderate and strong earthquakes, the effect of an earthquake on foF2 dominates the effect of a magnetic storm.