



Geomagnetic anomaly at Lunping before the 1999 Chi-Chi earthquake (Mw=7.6)

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A strong earthquake with a magnitude of 7.6 ($M_L=7.3$) occurred on September 21, 1999 in central Taiwan. In order to discern any potential precursors before this earthquake, geomagnetic data at Lunping (LNP), Taiwan, Geomagnetic Observatory situated 100 km from the epicenter are examined using two methods, i.e. the traditional induction arrows and Complex Demodulation (CD). Our results show that the remarkable time changes of real induction arrows appear to be strong prior to the great earthquake over the previous 24 months. After the great earthquake the magnitudes of induction arrows decreased to the normal (mean of eight years) levels. In other words, the direction of real induction arrows of the periods 30 and 20 min rotated 85° and 40° anticlockwise, respectively, before the Chi-Chi-earthquake and returned to mean direction of last ten years after the earthquake. A horizontal source field model using the finite difference method for 3-D shows that the variation of the real induction arrows might be ascribed to the conductivity variation body, which is 5 km buried at the epicenter area of the Chi-Chi earthquake, changing its conductivity from 0.002 S/m to 0.06 S/m. The ratios of modulus (demodulated by using the complex demodulation method) over a period 12, and 8 hr relative to the period of 24 hr reveal a remarkable change which appeared 4.5 months prior to this strong earthquake. They increased gradually from the beginning of 1999 to August 1999 and decreased again to a (eight year) mean level after the strong earthquake occurrence. We consider that the variation of the induction arrow might be ascribed to the conductivity anomaly, which is buried 5 km at the south-east side of LNP with a conductivity change of 0.06 S/m. We propose that this elevation might be related to the preparation process of the great earthquake.