Geomagnetic precursors to high-seismicities in Taiwan-Variations in the direction of magnetic vector

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In order to examine whether or not the electrical conductivity of the crust changes in association with earthquakes, application of Conductivity Anomaly (CA) studies of short-period geomagnetic variations have been carried out in northern Taiwan. Using geomagnetic data with a sampling interval of one minute, the traditional transfer functions of wide period range (from 6 min to 600 min) at Lunping Magnetic Observatory are obtained day by day, making use of power spectrum analysis as developed by Everett and Hyndman. Monthly means are statistically obtained from these daily values of transfer functions. Monthly transfer functions during 156 months from Jan. 1988 to Dec. 2000 showed four sensitive frequency ranges in 1.98-2.02, 2.82-2.90, 4.10-4.18, and 5.39-5.51 cycles/hour (period ranges in 29.7-30.3 (P1), 20.7-21.3 (P2), 14.4-14.6 (P3), and 10.9-11.1 (P4) min). After removing the seasonal changes, the time changes of induced arrows (major axis and minor axis) respecting to these sensitive periods are derived. The average major axes of these sensitive periods are S78^{o}W, S74^{o}S, S89.4^{o}W, and S89.8^{o}W. It indicated that there is a significant resistivity structure anomaly in the southeast of Taiwan. The related energy releases by earthquakes occurring within 150 km from Lunping, summed month by month, are correlated to these time changes. Our results show that the remarkable time changes of major axis in P1, P2, P3, and P4 appear to be strongly relative to the high seismicities, with 55 and 18 months prior to the high seismicities. The first precursor of major axes increased gradually from 1989 to 1990 and decreased from 1991 to 1992. The second precursor increased from 1997 to the end of 1998 and decreased from 1998 to 1999 while the high seimicities began. After the high seismicities, the magnitudes of major axes decreased to the normal level again. Less significant variation was detected in time changes of the minor axes. In other words, the major axis rotated anticlockwise 25^{o}and 20^o backwards the seismic occurrence region in the intervals of 1989-1990 and 1997-1998. We consider that the variation of the major axis might be ascribed to the elevation on the top level of a conductivity anomaly, which is deeply buried at the southeast side of the Lunping observatory. We propose that this elevation might be related to the preparation process of high seismicities.