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地磁気静穏日変化振幅の長期変動の特徴について
Characteristics of long-term variation of the geomagnetic solar quiet daily variation

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Characteristics of long-term variation in the amplitude of solar quiet (Sq) geomagnetic field daily variation have been investigated using 1-h geomagnetic field data obtained from 69 geomagnetic observation stations within the period of 1947 - 2013. The Sq amplitude observed at these geomagnetic stations showed a clear dependence on the 10 - 12 year solar activity cycle and tended to be enhanced during each solar maximum phase. The Sq amplitude was the smallest around the minimum of solar cycle 23/24 in 2008 - 2009. The relationship between the solar F10.7 index and Sq amplitude was approximately linear but about 53 % of geomagnetic stations showed a weak nonlinear relation to the solar F10.7 index. In order to remove the effect of solar activity seen in the long-term variation of the Sq amplitude, we calculated a linear or second-order fitting curve between the solar F10.7 index and Sq amplitude during 1947 - 2013, and examined the residual Sq amplitude, which is defined as the deviation from the fitting curve. As a result, the majority of trends in the residual Sq amplitude that passed through a trend test showed negative values over a wide region. This tendency was relatively strong in Europe, India, the eastern part of Canada, and New Zealand. The relationship between the magnetic field intensity at 100 km altitude and residual Sq amplitude showed an anti-correlation for about 71 % of the geomagnetic stations. The decreasing trend of the residual Sq amplitude implies that the ionospheric Sq current intensity tends to weaken due to a decrease of the ionospheric conductivity associated with an increase of the ambient magnetic field intensity. Furthermore, the residual Sq amplitude at the equatorial station (Addis Ababa) was anti-correlated with the absolute value of the magnetic field inclination. The decreasing trend of the residual Sq amplitude in the equatorial region indicates movement of the equatorial electrojet due to the secular variation of the ambient magnetic field.

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