ABSTRACT

This thesis reports the results of a study of the geomagnetic variations at sunspot minimum conditions. The study may be divided into two sections:

(i) An auto-spectral and cross-spectral analysis of the daily ranges of the H-field (ΔH).

(ii) An analysis of the semi-annual variation of ΔH.

Fifty "record-years" of geomagnetic data for stations distributed throughout the world have been spectrally analysed for the period January-December,1964. The spectrum of the geomagnetic variations showed significant activity in certain frequency bands. These corresponded to periods of approximately 29, 14, 9 and 7 days. The 14-day variations, a fortnightly tide, was the most outstanding spectral component. It is a luni-solar variation produced by the semi-diurnal lunar air tides. Surprisingly large 14-day spectral components have been found in the vicinity of the equatorial electrojet and in the region of the Sq focus. The latter has been attributed to 14-day oscillations in the position of the Sq focus. Latitudinal and longitudinal profiles of the 14-day variations are presented and discussed.

The seasonal changes of the 14-day variations were investigated for certain stations along the

equatorial electrojet. It was found that these variations reached a maximum during the winter solstice months (northern hemisphere) and a minimum during the summer solstice months (northern hemisphere). This variation is explained by the existence of similar seasonal changes in the thickness of a mesospheric barrier through which the lunar tidal energy has to tunnel in getting to the dynamo region.

The semi-annual variation of ΔH has been investigated for a global network of stations. Magnetic variations along the electrojet and at other latitudes have a marked simi-annual variation with maxima near the equinoxes and minima in the solstices. It was found that the semi-annual increase, in ΔH, for electrojet stations near the magnetic dip equator was in excess of the assessed semi-annual increase in the conductivity of the equatorial dynamo region. The physical explanation for the semi-annual variation is not clear but possible causes are discussed.