Comments on the paper entitled "Daily variations of geomagnetic *H*, *D* and *Z*-fields at equatorial latitudes by F. N. Okeke and Y. Hamano"

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Okeke and Hamano (2000) have described the daily variations of geomagnetic field H, D and Z at the equatorial station Kiritimati. Some conclusions by the authors are not correct according to my views and I would like to clarify these points here.

The first conclusion the authors have made is "The pronounced magnitude of Z variations observed in Kiritimati is mainly due to sea induction." Any model of the equatorial electrojet current belt indicates that the latitudinal profile of ΔH during the daytime should show a maximum over the dip equator while the profile of ΔZ would show a minimum around the latitude of the northern fringe and a maximum around the southern fringe of the electrojet belt. Assuming the electrojet to extend between $\pm 3°$ dip latitude, the minimum of ΔZ should occur around 3°N dip latitude or 6°N inclination. Fambitakoye (1971) has clearly shown the simultaneous growth and later decay of the ΔH peak over the dip equator and of the ΔZ peaks at the two fringe regions during the course of the day using data from the central African longitude sectors. Doumouya *et al.* (1998) have described geomagnetic field measurements at a chain of observations stretching across both sides of the dip equator at West African longitudes. A maximum of ΔH was clearly seen close to the dip equator around 1100 local time. The contours of ΔZ showed a minimum around 3°N dip latitude slightly before noon, and a corresponding maximum around 3°S dip latitude. The ΔH and ΔZ values near the northern edge of the electrojet belt were 80 nT and -50 nT respectively. Thus $\Delta Z/\Delta H$ was large near the fringe regions of the electrojet. The geomagnetic latitude of Kiritimati given in the paper is 3.09°N; the inclination estimated from IGRF coefficients is 6.4°N giving the dip latitude as 3.2°N, which is the latitude close to the northern fringe of the electrojet belt. The diagrams of ΔH, ΔD and ΔZ in the paper give a confused impression due to different scale values and a large offset at midnight for ΔZ in some diagrams. A composite diagram showing ΔH, ΔD and ΔZ at Kiritimati with a uniform scale is presented in Fig. 1 constructed from the original diagrams. It is clearly seen that the curves for ΔH and ΔZ for all months are in inverse phase with their peaks occurring at the same time. During October 1998 when ΔH was large, the values of the ranges of H and Z were 128 and -96 nT respectively. The ratio $\Delta Z/\Delta H$ was large similar to that observed in the West African region. Thus the variation of Z at Kiritimati is as expected of a normal eastward flowing electrojet current and there is no abnormality in the data.

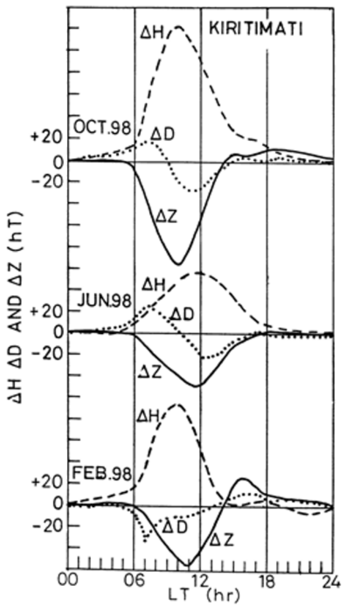

Fig. 1. Diurnal *Sq* variations of at Kiritimati during February 1998, June 1998 and October 1998 (after Okeke and Hamano, 2000).

The second comment is the statement "Seasonal variations with more pronounced equinoctial maxima observed in H than in Z is due to enhanced electron density at equinox." Rastogi (1993) has discussed the relative importance of the ionosphere electron density and electric field based on a long series of data of ΔH and of the peak electron density in the E region (NmE) at Huancayo and Kodaikanal. It was shown that long-term variations of ΔH, like the solar cycle variation, are dictated by the corresponding variation of NmE. But the seasonal variation of ΔH even after correction due to NmE still shows equinoctial maxima and is due to the seasonal variation of the local electric field, not the electron density. Chandra *et al.* (2000) after a coordinated study of the rocket and ground based data of the electrojet have reached the same conclusion that the equinoctial maxima of the electrojet strength are due to the electric field at the electrojet region of the ionosphere.

The daily variation of ΔD is also very normal for equatorial stations where the variation was as expected at a northern hemisphere station with a morning maximum and a midday minimum. During December solstices the variation is reversed as seen at other equatorial stations in Asian Pacific sectors. (Rastogi and Stening, 2002).

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