



Solar eclipse effect in geomagnetic induction parameters

(A possible cause of the scatter in induction parameters)

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The August 11, 1999 total solar eclipse had been studied using a large array of stations in Central Europe (Bencze et al. 2005). According to the result of this study, the amplitudes of the field line resonance (FLR)-type pulsations decreased in and around the dark spot by about a factor of 2, and this decrease moved with the velocity of the dark spot in the same direction. This decrease was interpreted as a switch-off of the FLR-type pulsations due to a change in the eigenperiod of the field line as consequence of a change in the charged particle distribution along the field line. An effect was also found in the phase of the (magnetic or electric) perpendicular components.

At the Nagycenk (NCK) observatory lying in the zone of totality, both magnetic and electric records were available. The magnetotelluric (MT) sounding curve computed by the usual method for the eclipse interval (0800-1400 UT) fits excellently the previously known standard curve. During the eclipse, however, impedance values in the FLR period range were highly scattered. The scatter remained as long as the eclipse lasted. Coherence values between magnetic and electric components decreased significantly. In contrast, an earlier similar switch-off of the FLR-type activity on the same day did not cause a similar scatter in spite of comparably low coherence. Thus the lack of FLR-type activity disturbed the usual MT connection between magnetic and electric components.

The induction vector (tipper), especially its real part shows a clear effect of the eclipse

in the FLR period range (24 – 29 s), too. Both at NCK and at Bad Bergzabern (BBZ, westernmost station and longest FLR period)) a definite decrease of the real tipper was ascertained during the totality. The average direction of the tipper did not change.

Concerning both parameters, a random effect cannot fully explain the observed phenomena. The scatter of the EM induction parameters is most likely due to the switch-off of the FLR activity. The possibility of such an effect should be considered in induction studies. Pilipenko and Fedotov (1993) supposed an inverse effect and emphasized lower quality data if resulting from FLR-type pulsations, while we claim high quality data just from such an activity.