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The Response of the Dayside Equatorial Electrojet to Step-like Changes of IMF Bz

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The equatorial electrojet (EEJ) is driven by zonal electric fields, which are known to be well correlated with the interplanetary electric field and therefore with the interplanetary magnetic field (IMF) Bz component. In the present study we investigate how the equatorial horizontal (H) magnetic component, and therefore the EEJ, responds to step-like changes of IMF Bz. The reduction of southward IMF Bz (northward turnings) and that of northward IMF Bz (southward turning) are examined separately. The result shows that for the northward turnings, the EEJ immediately starts to weaken with the accuracy of the estimates of the travel times of the IMF changes. The time constant of the response is much longer, and the equatorial H component decreases continuously by 40 nT for 30 min after the northward turnings. In contrast, the response of the EEJ to the southward turnings is far less clear in both magnitude and timing. The difference in the EEJ response to the northward and southward turnings presumably reflects the fact that the magnetosphere-ionosphere system is more sensitive to IMF Bz for southward IMF Bz than for northward IMF Bz. It is suggested that there exists a global current system that connects the auroral electrojets and the EEJ, and the electric field penetrates to the dip equator as the polar cap potential extends to lower latitudes. We also address the effect of night-side substorm activity on the EEJ in the context of IMF Bz changes.