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How the Geomagnetic Indices Respond to the Interplanetary Parameters, VBz

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It is attempted to show how the geomagnetic indices, AU, AL and Dst, respond to the interplanetary parameters, more specifically, VBz. The AL index shows a significantly high correlation with VBz on an hourly basis. Considering that the auroral electrojet is the combined result of electric field and ionospheric conductivity enhancements, the intensification of these two quantities seems to occur concurrently on an hourly time scale, when the interplanetary magnetic field turns southward. Thus, it is suggested that the AL index behaves more like a convection index rather than a substorm index. Contrary to the general belief, the AU index does not seem to respond linearly to the IMF except during summer, when the ionospheric conductivity is high due to the enhanced solar EUV radiation. This is the reason why the AU shows the maximum during summer for a given level of VBz, indicating that the AU behaves as a convection index only during the summer season. On the other hand, the smaller AL value during summer could be explained by the fact that discrete auroras are suppressed in sunlight (Newell et al., 1996), thus reducing the ionospheric conductivity. As expected, the Dst index tends to become more negative as the VBz gets intensified. Although it shows a significant scatter, the Dst index is always less than 15×VBz (mV/m) + 50, indicating that there seems to be a limit to VBz in activating a storm of a given size in terms of Dst. The significant scatter of the Dst index for a given level of VBz suggests, however, that there is another factor contributing to the development of magnetic storms other than the convection, possibly magnetospheric substorms. The duration of southward IMF would also be a factor to be considered.