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The motion of auroral oval caused by a solar wind pressure pulse and associated interplanetary magnetic field disturbances

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Global auroral images of the IMAGE satellite were used for a statistical (on the base of 20 cases) study of the motion of the dayside auroral oval and its poleward boundary (POB) following within 20 min after the abrupt increases of solar wind ram pressure (referred as Sudden Impulse, SI). Contributions from the IMF changes associated with the SI have been also investigated. The effects of the IMF and pressure changes were separated with using the multi-factor correlation analysis. The most prominent effect of the solar wind pressure increase is the equatorward shift of the dayside oval within 6 min after SI that was the most significant in post-noon MLT sector. This equatorward shift is consistent with the midday sub-auroral patches above 65 deg. MLAT. Second effect of the solar wind pressure increase is the poleward shift of POB, which indicates auroral intensification at high latitudes in a vicinity of the polar cap boundary. At first 6 minutes the high-latitude auroral intensification is most prominent in the post-noon 12-18 MLT sector and later, at 6-20 min after the SI, it occurs in the pre-noon 6-12 MLT sector, which may indicate a westward propagation of the auroral intensification. The most obvious effect of the IMF changes associated with SI is the IMF By effect on the positions of dayside POB and oval at 6-20 min after SI, which is interpreted as intensification of the most poleward auroras due to IMF By turning to negative (when the oval and POB are moving toward the pole), whereas the IMF turning to positive leads to fading of the most poleward auroras (that is observed as a shift of the POB toward the equator). Such an effect is consistent with the IMF By-related system of field-aligned currents. Thus, in the northern hemisphere, the IMF By increase from negative to positive leads to the shift of POB to lower latitudes. In the southern hemisphere the effect must be reversed.