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Inter-hemispheric similarities and asymmetries of the afternoon aurora: an indicator of solar wind-magnetosphere energy transfer

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The dayside magnetosphere responds directly to the incident interplanetary magnetic field (IMF) and solar wind energy. Changes in the IMF and solar wind drive changes in magnetospheric and ionospheric convection. Currents and (in the case of upward currents) aurora respond to these changes. Therefore, the dayside aurora is also a direct indicator of how the magnetosphere responds to IMF and solar wind energy input. Recent observations from space-based auroral imagers have shown hemispheric asymmetries in the morphology and temporal behavior of the dayside aurora. This suggests that asymmetries also exist in the solar wind-magnetosphere energy transfer processes that give rise to the auroral emissions. Since the dayside aurora allows us to monitor the response of the magnetosphere to the IMF and solar wind input, observing dayside aurora in both hemispheres allows us to monitor the asymmetric response of the magnetosphere. Using global auroral images from Polar UVI in the southern hemisphere and IMAGE FUV in the north, we analyze asymmetries in the dayside aurora and relate the observed asymmetries to the IMF and solar wind. The IMF plays a major role in influencing the asymmetrical behavior of the dayside aurora. When the IMF is southward and a significant dawnward component exists, there is an enhancement in the afternoon aurora in the northern hemisphere. If the IMF has a significant duskward component, then an enhancement in the afternoon aurora in the southern hemisphere is observed. When |BY/BZ| is greater than about 2, distinct structure (i.e., a string of pearls configuration) is seen in the hemisphere with enhanced emission. In addition to asymmetries observed during periods of quasi-steady energy input, asymmetries in the dayside aurora are also observed during large scale changes in the IMF and solar wind. The results of this work will lead to new insights into how the dayside aurora, thus the dayside magnetosphere, responds asymmetrically to the solar wind driver.