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Does the solar wind north-south velocity component affect the hemispheric precipitation power?

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During a substorm sequence on March 28-29, 1998, the electron precipitation power as determined from nitric oxide measurements and a global MHD simulation (GUMICS-4) showed a hemispheric antisymmetry with more power depositing to the Southern Hemisphere. The ground magnetometers on conjugate Northern and Southern Hemisphere stations corroborated that the substorm was more intense in the Southern Hemisphere. As the event occurred during equinox and the dipole tilt was nearly zero, the cause of the antisymmetry was searched from the solar wind parameters. It was found that the solar wind north-south velocity component (vz) was negative during the event. Theoretical experiments (synthetic runs) with controlled solar wind input and zero tilt angle carried out with the GUMICS-4 simulation revealed that during negative (positive) solar wind vz, the Southern (Northern) Hemisphere received more precipitation power. Here, we examine using statistical methods whether the hemispherical antisymmetry resulting from the solar wind vz is visible in the polar cap index (PCI), which is linearly correlated with the AE index and obtained from a magnetometer station on Northern and Southern magnetic poles. Using results from the GUMICS-4 simulation, we speculate about the cause of the antisymmetry by coupling the tail dynamics to the ionosphere.