

# **Cusp diamagnetic cavity observations: A new challenge for theory and simulation**

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Cusp diamagnetic cavities have been observed at prenoon in the northern hemisphere associated with a duskward interplanetary magnetic field (IMF) component under different solar wind and geomagnetic conditions. The conditions could be normal solar wind speed (about 450 km/s) during geomagnetically quiet time, or be fast solar wind streams (about 900 km/s) with substorms, or be slow solar wind flows (about 380 km/s) with geomagnetic storms. These observations are unexpected by the existing models and MHD simulations. The simulations predict that a duskward IMF component should move the cusp into postnoon in the northern hemisphere due to the magnetic reconnection. The observations of the cusp diamagnetic cavities at prenoon in the northern hemisphere under a duskward IMF component condition provide a new challenge for the current theory and simulations.