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The polar wind: solar illumination, seasonal variations, and north-south asymmetry

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Solar illumination is the main driver of the polar wind. Since many of these outflowing ions can escape into the interplanetary medium – and contribute to atmospheric erosion – or end up in the plasma sheet – where they can affect magnetospheric dynamics – it is interesting to study the dependence of the polar wind flux on solar illumination. However, the bulk of these ions flowing out above the polar cap have very low energies and temperatures. This makes them very difficult to measure by a satellite crossing their path in the magnetospheric lobes. UV-radiation will cause the spacecraft to acquire a positive charge, repelling the ions, making those with too low energy invisible to the onboard detectors.
An alternative method, using both of Cluster's electric field experiments, can exploit this fact to quantify the flux of the outflowing ions. This is done by André et al. [2015], and we use this data set in this study. It is extensive running over multiple years, during multiple months, with a large amount of measurements, allowing us to find effects of solar illumination despite the very large natural spread.
We will show that solar illumination indeed has a strong control over the outflowing flux and that this results in seasonal variations. A difference between the flux from the northern and southern hemisphere is also found, which may be caused by an asymmetry in the magnetic field.