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Variation of the plasmasheet O+ and H+ density with solar activity and solar wind conditions

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A modulation of the outflow rate of ionospheric ions - among which a high proportion of O+ ions - by solar EUV flux and solar wind conditions has been evidenced in several observational studies. Similarly, the amount of solar wind plasma - mostly H+ ions - penetrating into the magnetosphere also depends on solar wind conditions.
We use long-term measurements from the CODIF ion detector onboard the Cluster spacecraft to quantify the resulting O+ and H+ density variations in the plasmasheet. CODIF data are mapped along magnetic field lines to assess the spatial distribution of O+ and H+ ions at the magnetospheric equatorial plane. We make a multi-correlation analysis between the O+ and H+ density and solar wind parameters to investigate their impact on the plasmasheet composition in various regions.
An emphasis is placed on the effect of solar wind pressure on the plasmasheet O+ content. Solar wind pressure is expected to affect the energy and momentum input into the ionosphere, which in turn should modulate the ionospheric ion outflow rate and thus the plasmasheet O+ density. On the other hand, when the solar wind pressure increases, the magnetosphere is compressed, resulting in an increase of the O+ and H+ densities independently of the ionospheric outflow rate variation. To infer the actual influence of the solar wind pressure on the plasmasheet O+ content we compare the O+ and H+ density variations associated with solar wind pressure changes with density variations due to magnetospheric compression alone.