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Seasonal variation of the position of the magnetodisc in Saturn's magnetosphere

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Seasonal periodicities in a planetary magnetosphere are driven by the obliquity of the planet which implies the existence of a non-zero magnetospheric tilt between the planet's spin axis and the solar wind direction which varies approximately sinusoidally with time between solstices. Saturn's obliquity is 26.7° which implies well-marked seasons which are reflected in the structure of its magnetosphere. In particular, the location of Saturn's plasmasheet is supposed to be very sensitive to the magnetospheric tilt. Away from equinox when the tilt angle is zero, the solar wind blows from above and below the equatorial plane of Saturn. This asymmetric interaction should result in a seasonal hinging of the magnetodisc at large distances where it should become parallel to the direction of the solar wind. The properties of this region are therefore very interesting to study in details in order to estimate the seasonal impact of the solar wind on Saturn magnetosphere. In the present study we use published Cassini magnetic field observations obtained from early 2005 (northern winter solstice) until late 2013 (northern summer solstice) that includes the transition to equinox in order to identify the seasonal warping of the magnetodisc. We will first show statistically that the magnetodisc is above the rotational equator before the equinox and below after and that the magnetodisc coincides with the rotational equator around the 11th April of 2010. We will then discuss potential implications of this result on the overall structure and dynamics of Saturn's magnetosphere.