Seasonal-longitudinal variation of substorm occurrence frequency: Evidence for ionospheric control

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Abstract: Based on 2760 well-defined substorm onsets in the northern hemisphere and 1432 in the southern hemisphere observed by the FUV (Far Ultraviolet) Imager on board IMAGE (Imager for Magnetosphere-to-Aurora Global Exploration) spacecraft, a statistical study is performed for both hemispheres. The main emphasis is put on a possible dependence of the substorm occurrence frequency on season and longitude (S/L). It was found that around December solstice UT noon-time and around June solstice UT nighttimes are more favorable for substorms to occur. The occurrence frequency varies by a factor of 2. The sum of ionospheric Pedersen conductances of both hemispheres caused by solar illumination in the nightside auroral regions can account for the S/L dependence. Lower total conductivity seems to reduce the trigger level. We find that the IMF threshold for initiating a substorm is on average lower during favorable times, thus, substorms can occur more frequently.

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