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From space weather towards space climate time scales

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The relationship between interplanetary high-speed streams and terrestrial substorm activity was examined during solar cycles 22 and 24 (from 1993 to 2010). High-speed streams are known to strongly modulate substorm occurrence rate, peak amplitude and ionospheric dissipation. In this study, the loading-unloading signatures are examined in the auroral region and in the magnetotail lobes. Magnetotail lobes response to the external forcing by storing magnetic energy during the substorms growth phase and releasing it afterwards during substorm expansion and recovery phases. The response of the magnetotail and auroral region to the long-lasting smooth forcing of high-speed streams will be examined in detail and the year-by-year variation in the driving conditions will be presented. High-speed streams were identified from the solar wind bulk speed measurements and database of over 9000 substorms was created from ground-based magnetic field measurements by using a search engine identification method. The magnetotail substorm signatures were examined by using Themis, Geotail and Cluster observations.