Geophysical Research Abstracts,
Vol. 11, EGU2009-11903, 2009
EGU General Assembly 2009

Discrepancy in behavior of different solar proxies in cycle 23

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The Sun can influence the Earth climate through mechanisms that are not fully understood but which can be linked to solar variations of luminosity, magnetic field, UV radiation, solar flares and modulation of the cosmic ray intensity. Several proxies are used to characterize the Sun behavior and its influence on the geospheres. Solar activity over long time scales has usually been studied with the use of sunspot numbers (SN). The integrated radio flux from the solar disc (F10.7 index) follows the SN. Regular direct monitoring of solar irradiance has been made by satellites since 1978, resulting in time series of total solar irradiance (TSI) and variations of solar EUV irradiance (MgII index). The long-term components of all four solar proxies are expected to correlate linearly with each other. The situation was stable until the last solar maximum. Actually, cycle 23 had two maxima: one near middle of 2000 and another near end of 2001. According to SN, the magnitude of the first maximum was larger, whereas according to irradiance proxies, TSI and MgII, the second maximum was significantly higher. After this episode of enhanced irradiance (and until now) the mutual correspondence between published solar indices has been changed resulting in significant divergence. The present paper is aimed to the evaluation of discrepancy observed in different solar proxies. We examine the solar activity, namely the SN, F10.7, TSIs and MgII time series, in order to emphasis its unusual mutual behavior during the declining phase of cycle 23. Behavior of the solar indices is compared with the global ionospheric response using the F2 layer critical frequency from many observatories spread over the globe.