



Influence of interplanetary solar wind sector polarity on the ionosphere

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Knowledge of solar sector polarity effects on the ionosphere may provide some clues in understanding of the ionospheric day-to-day variability. A solar-terrestrial connection ranging from solar sector boundary (SB) crossings, geomagnetic disturbance and ionospheric perturbations has been demonstrated. The increases in interplanetary solar wind speed within three days are seen after SB crossings, while the decreases in solar wind dynamic pressure and magnetic field intensity immediately after SB crossings are confirmed by the superposed epoch analysis results. Furthermore, the interplanetary magnetic field (IMF) Bz component turns from northward to southward in March equinox and June solstice as the Earth passes from a solar sector of outward to inward directed magnetic fields, whereas the reverse situation occurs for the transition from toward to away sectors. The F2 region critical frequency (foF2) covering about four solar cycles and total electron content (TEC) during 1998–2011 are utilized to extract the related information, revealing that they are not modified significantly and vary within the range of 15% on average. The responses of the ionospheric TEC to SB crossings exhibit complex temporal and spatial variations and have strong dependencies on season, latitude, and solar cycle. This effect is more appreciable in equinoctial months than in solstitial months, which is mainly caused by larger southward Bz components in equinox. In September equinox, latitudinal profile of relative variations of foF2 at noon is featured by depressions at high latitudes and enhancements in low-equatorial latitudes during IMF away sectors. The negative phase of foF2 is delayed at solar minimum relative to it during other parts of solar cycle, which might be associated with the difference in longevity of major interplanetary solar wind drivers perturbing the Earth's environment in different phases of solar cycle.