

Abstract

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What do we really know about the solar indices-climate interaction?

The Sun is the source of the energy that causes the motion of the atmosphere and thereby controls weather and climate. The solar influence and its variability modulate the cosmic rays, which in turn may affect the cloud cover and thus leads to a temperature change. A correlative studies of four components (monthly and yearly averages) that may be closely associated with the climate have been studied, which are the geomagnetic activity, aa, the sunspot number, Rz and the dynamic pressure, nv^2 , throughout a period of 39 years (468 months from 1970 to 2008), and total solar irradiance, TSI, through a period of 24 years (288 months from 1979-2003). The annual-means GST showed that it had two warming phases and one cooling period. The global temperature variability showed a strong warming trend over the past 40 yrs. The increase in GST for the recent years (from 1970 to 2008) was faster and smoother than in the first warming region. Observations of the Earth's near-surface temperature showed a global-mean temperature increase of approximately 1.1°C since 1877, occurred from 1887 to 1940 and from 1970 to the 1998. The temperature change over the past 39 years (1970-2008) is unlikely to be entirely due to internal climate variability. The correlation analysis between the variation of global temperature and both aa geomagnetic and solar activity are $+0.5 \pm 0.05$, for any lag lead, indicating a significant role in such variation. The GT-solar variability correlations indicated that 45-50% of the 0.72°C increases in global temperature in the recent years (1970-2008) are due to solar forcing. A 1 nPa increase in dynamic pressure is equivalent to the increase of about 16 nT in aa (average antipodal index) values observed over the last 100 years. The results support the hypothesis of El-Borie and Al-Thoyaib (2006) that geomagnetic activity can partially predict global mean temperatures. We think that the solar and anthropogenic greenhouse forcing are roughly equal contributors to the rise in global temperature during the recent years.