[SO-15] Relative Contribution of Space Weather and Human Effects to Global Warming

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We have estimated the relative contribution of space weather (aa index) and human (CO2) effects to global warming using Hadcrut3 temperature anomaly (Ta) data (Brohan et al. 2006) from 1868 to 2005. Here aa index indicates the geomagnetic activity taken at two anti-podal subauroral stations (Canberra Australia and hartland England). From the comparison between Ta and aa index, we found two interesting things : (1) the linear correlation coefficient between two parameters increases until 1990 and then decreases rapidly, and (2) the scattered plot between two parameters shows a bifurcation of the correlation tendency near 1990. The partial correlation analysis of Ta(aa, CO2) also shows that the space weather effect (aa index) is dominant until about 1990 and then the human effect becomes much more important. These results imply that the human effect become very important since 1990. For a further analysis, we simply assume that Ta = Ta(aa)+Ta(CO2) and made a linear regression between Ta and aa index from 1868 to 1990. A linear model is then made from the linear regression between energy consumption and Ta-Ta(aa) since 1990. This linear model makes it possible to project the temperature anomaly in 2030, about 1 degree higher than the present temperature.

[SO-16] Global MHD Simulation of the Geomagnetic Sudden Commencement on October 21, 1999

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Recently, Shinbori et al. [2004] examined the electric field variations associated with geomagnetic sudden commencements (SC) by using the data from the Akebono satellite in the inner magnetosphere (L < 5) and reported the following characteristics of the SC-associated electric field variations. (1) The electric field shows a bipolar change. (2) The initial excursion of the electric field tends to be directed westward. (3) The amplitude of the electric field does not depend on magnetic local time. By using a global three-dimensional MHD simulation model, we examine how and where such SC-associated electric field variations establish. In our study, we used the SC event occurred on October 21, 1999, caused by a sudden increase in the solar wind dynamic pressure from ~3 to ~13 nPa. The solar wind and interplanetary magnetic field conditions observed from the WIND satellite near GSE (x, y, z) ~ (21.9, -65.4, 2.0) Re are used as the simulation input parameters. The numerical simulation shows that inward flow is first excited near local noon and then flow vortices are generated near the flankside as the solar wind discontinuity is passing over the magnetosphere. Thus, the convection electric field directions significantly change with local time. The electric fields associated with flow vortices show a bipolar structure during the SC event. We discuss whether the SC-associated electric fields observed at Akebono are explained by the convection electric field obtained from our numerical model.