Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MIS22-P01 Room:Convention Hall Time:May 20 18:15-19:30

Influence of solar wind and total ozone on the temperatures of the troposphere and stratosphere

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The correlation between global atmosphere and solar magnetic activity is evident though the cause is not clear. In this presentation, we analyze the vertical structure of the global atmosphere to examine the cause on the basis of the previousobservations[1].

The OMNI2 solar wind data as well as the aa index data were used to detect the influence of the solar wind on the vertical temperature distribution. The period examined was 2000-2013, and the atmospheric temperature data was obtained from RSS/MSU.

In the analysis, the following factors were taken into account: 1)EPP-NOx effects on ozone at low latitudes may be comparable to the effects of solar UV radiation [Callis et al., 2000, 2001; Langematz et al., 2005; Rozanov et al., 2005]. 2) Change distribution of tropopause level and total ozone in the Sea of Okhotsk are correlated.

From analyses of OMNI2 and RSS/MSU we suggest that changes in stratospheric ozone due to the influence of the solar wind affects the climate of the troposphere.

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Keywords: solar wind, troposphere, stratosphere, geomagnetic activity index, temperature, ozone

Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MIS22-P02 Room:Convention Hall Time:May 20 18:15-19:30

Lightning simulation by Poisson equations and its implication for entropic theories

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Various studies have been reported as for simulations of lightning by Poisson equations, and its mechanisms are also well known [1]. However, a difficulty that programs require a lot of memories and long elapsed time complicates the usage of laptop PCs. This presentation introduces a practical simulation model by means of the Finite Difference Method (FDM), then, the origin of tree-shaped fractal structures of lightning is studied from the entropic viewpoint. According to the principle of Maximum Entropy Production (MEP) by Kleidon, open systems existing far from equilibrium are stabilized in the state of maximized entropy production, creating dissipative structures characterized by low entropy [2]. On the other hand, the constructal theory advocated by Bejan insists that area-to-point or area-to-volume flow optimizes itself in such a way that the global flow resistance is minimal. In other words, the flow systems that persist for a long time should provide easier access to the current flow [3],[4]. Both are optimization theories of the same kind. Since about 2010, there have been some controversies between these two about which is essential, however, fruitful results have not been produced [5],[6],[7]. We intend to help reconciliation between two theories, regarding tree networks such as lightning as dissipative structures with low entropy and inquiring its origin. We also refer to the differences between the MEP principle by Kleidon and the more classical principle of Minimum Entropy Production by Prigogine [8].

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Keywords: Principle of Maximum Entropy Production (MEP), Constructal theory, Tree network, Poisson equation, Finite Difference Method (FDM), Lightning