

Ozone perturbations and solar influences of the atmosphere: A GCM study

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Recent studies of reanalysis data have shown significant correlations between solar activity and the major observables of the atmosphere. Also, observations of the upper atmosphere have shown that sprites and solar proton events produce NOX gases in the middle and high mesosphere. The NOX causes an ozone depletion which in turn changes the atmosphere's radiative properties. This may be traceable in the same way as solar influences in the atmosphere. To reproduce these observations we use an advanced GCM with a well-resolved stratosphere. Two studies are presented: first a study of perturbed ozone fields and second a study of solar influenced changes.

A GCM model is run with a perturbed ozone field in order to estimate the dynamical impacts of disturbances in the ozone levels. A study is performed to see if there is a significant signal in the response of the lower atmosphere to these changes.

Another experiment treats the response of the atmosphere to an increased solar influence. Two experiments are made: the first with a typical solar constant of 1370 W/m^2 and the second with an increase of 1% to 1384 W/m^2 . The size of the increase is chosen so that an effect can be seen in a reasonably short run of 30 model years. The observables studied are mainly temperature and zonal winds. Results are evaluated using Monte Carlo techniques, based on a 30 year reference model run.