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Research Summary

Upper Atmosphere Theory and Data Analysis Program

A) Stratosphere Chemistry in a 2-D Model with Residual Circulation.

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C) The objective of this research has been to examine the effects of chemical perturbations on the stratosphere using models which can incorporate fully interactive radiative, chemical and dynamical responses, in the context of a zonally averaged model.

D) Model runs for the unperturbed, chlorine-perturbed and simultaneously chlorine-and CO_2-perturbed cases were completed using the JPL-87 chemical kinetics data. The base case has been analyzed and submitted for publication. A paper analyzing the perturbed cases is in preparation. The perturbed cases show substantial sensitivity of the predicted column ozone depletion to the perturbations affecting lower stratospheric temperature, but less so far dynamical perturbations. The column ozone distribution changed substantially when the kinetics data was changed. This implies a greater-than-expected uncertainty in predicted latitude distributions of ozone depletion, due to uncertainty about the accuracy and completeness of the chemical kinetics data set.

Work under this task has been terminated.

E) "On the sensitivity of a Residual Circulation model to differences in input temperature data," P. D. Guthrie, C. H. Jackman, T. L. Kucsera and J. E. Rosenfield, J. Geophys. Res., in press, 1989.

"The sensitivity of total ozone and ozone perturbation scenarios in a two-dimensional model due to dynamical inputs," C. H. Jackman, A. R. Douglass, P. D. Guthrie, and R. S. Stolarski, J. Geophys. Res., 94, 9873-9887, 1989.

"On the latitude dependence of ozone depletion predictions," P. D. Guthrie, T. L. Kucsera and C. H. Jackman, "Proceedings of the Quadrennial Ozone Symposium, Gottingen," in press, 1989.

"A prognostic 2-D model with coupled chemistry, radiation and transport I: the base case," P. D. Guthrie, T. L. Kucsera, C. H. Jackman and J. E. Rosenfield, submitted to J. Geophys. Res., 1989.