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Research progress on this grant came in three principal areas. These are the understanding of the satellite mapping of constituents; observational analysis of the stratospheric general circulation; and the relationship between sea surface temperature variations, equatorial waves, and the QBO.

The first area is the improvement of our understanding of how the information content of mapped satellite observations relate to actual atmospheric behavior. Murray Salby published a series of papers on this topic during the 1980's that formally derived the temporal and spatial time scales that can be resolved by satellite sampling and subsequent mapping. We have taken a more concrete approach to this subject by flying a mathematical "satellite" through model results that were generated by the SGCCM group at NASA GSFC. The first results from this appeared in Rood et al. (1991). A more detailed explanation of these results appears in Geller et al. (1992).

A second area of research is a continuation of analysis of the stratospheric general circulation using the multi-year temperature data set from NOAA/NMC extending from the Earth's surface to about 55 km. The paper by Geller et al. (1991) presents and interprets the results from calculations of monthly mean residual circulations for a period of eight years. The results of this paper pertain to interpretation of which areas of the stratosphere are under radiative control and which are under dynamic control as well as how transport processes control the interannual variability of ozone.

The third area of research is the connection between the stratospheric quasi-biennial oscillation (QBO) and sea surface temperatures. A QBO is known to exist in both the ocean and the tropical atmosphere. Drs. M. H. Zhang and M. A. Geller have examined a mechanism by which sea surface temperature variations can affect the equatorial waves that force the stratospheric QBO. They have also modeled how sea surface temperature induced variations in the equatorial wave flux might affect the stratospheric QBO. At least two papers are being prepared for publication in this area.

References

Geller, M. A., E. R. Nash, M. F. Wu, and J. E. Rosenfield, 1991: Residual Circulations Calculated from Satellite Data: Their Relations to Observed Temperature and Ozone Distributions. Accepted for publication in J. Atmos. Sci.

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