

Stratospheric Dynamics and Chemistry

2b-7) Predict Ozone from Specified Ozone Production and Loss

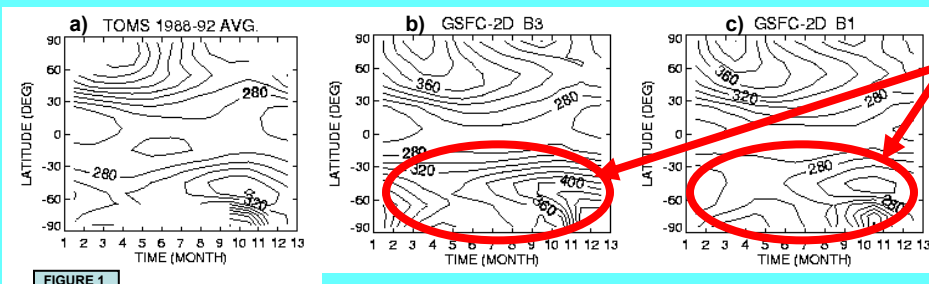
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Summary: Constrained model simulations are suggested as a way to highlight large-scale stratospheric dynamics or chemistry differences among GCMs. One such constrained experiment is: *All GCMs use the ozone production and loss from a well-established global model.* This model experiment was the “B3 Constrained Run” from the Model and Measurements II (1999) intercomparison completed several years ago. Analysis would be focused on total column ozone, however, it could include profile ozone as well. This model experiment complements that suggested by Douglass et al. “Ozone Seasonal Cycles” in poster 2a-1 at this meeting.

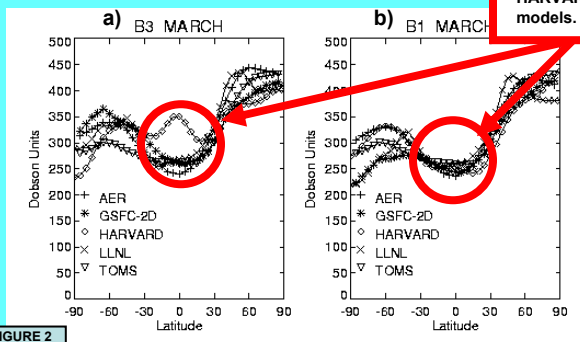
Plots taken from Models and Measurements II (1999), M&MII: Total Ozone Mapping Spectrometer (TOMS) measurements are shown in Figure 1a, which is one of the primary standards for comparing model simulations of total ozone. The AER model provided the ozone P and L for this model experiment of M&M II. A comparison of a simulation for the GSFC-2D model using the AER ozone P and L (B3 simulation) is shown in Figure 1b. The GSFC-2D model with its own computed (self-consistent) ozone P and L (B1 simulation) is shown in Figure 1c. These comparisons illustrate very significant differences between the two GSFC-2D simulations. Some very large differences in ozone chemistry and model dynamics between the AER and GSFC-2D models are revealed in the Southern Hemisphere middle and high latitudes.



Large differences between B3 and B1 simulations of GSFC-2D showed big differences between AER and GSFC-2D So. Hem. chemistry & dynamics.

Figure 1. Ozone column (in Dobson Units) for a) TOMS; b) GSFC-2D with AER ozone P and L (B3 simulation); and c) GSFC-2D with self-consistent P and L (B1 simulation). Contour intervals are 20 DU from 200 through 460 DU.

Plots taken from Models and Measurements II (1999), M&MII: A comparison of total column ozone from the AER, GSFC-2D, HARVARD, LLNL, and TOMS for the month of March are shown in Figure 2. The B3 simulations (using AER ozone P and L) for the models show large differences in the tropics for the HARVARD model (Figure 2a). The B1 simulation (self-consistent ozone chemistry) does not show significant differences in the tropics among the models (Figure 2b). These comparisons illustrated that the HARVARD model had a very different model dynamics than other models in the tropical region. A self-consistent chemistry computation can derive a similar total ozone, but the balance of the dynamical and chemical processes is clearly different.



Variations between B3 and B1 simulations pointed to significant differences in tropical dynamics between HARVARD & other models.

Figure 2. Ozone column (in Dobson Units) for AER, GSFC-2D, HARVARD, LLNL, and TOMS for a) model simulations B3 using AER ozone P and L and b) model simulations B1 using self-consistent ozone chemistry.

