

Issues in Middle Atmosphere Data Assimilation

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Brief Abstract:

The characteristics of the middle atmosphere present unique challenges for the assimilation of data from this region. Some of the issues in middle atmosphere assimilation include: (1) The variability of mesospheric flow is reflected in large forecast and observation error variances. The former render the assimilation system very sensitive to the details of specified correlations. (2) A second challenge is the separation of model and measurement biases. In the middle atmosphere, in-situ measurements are rare, so the flow is depicted primarily by satellite measurements, such as nadir temperature sounders. Bias correction is critical to the successful assimilation of such measurements. However, models are well known to have biases in this region (for example in global and zonal mean temperature). Therefore forecasts cannot be used to remove biases due to measurements or forward models. (3) The Brewer-Dobson circulation is a slowly evolving feature that plays an important role in the distribution of long-lived species. However, this circulation as depicted by assimilated winds, is far too fast. Consequently, many question the use of assimilated winds for transporting species for periods longer than several months. (4) Moisture in the tropical upper troposphere has a large dynamic range making it a challenge to assimilate. Nevertheless, it is important to correctly depict moisture in this region to retain the tropical tape recorder effect.