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Data assimilation of stratospheric constituents: a review

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Abstract. The data assimilation of stratospheric constituents is reviewed. Several data assimilation methods are introduced, with particular consideration to their application to stratospheric constituent measurements. Differences from meteorological data assimilation are outlined. Historically, two approaches have been used to carry out constituent assimilation. One approach has carried constituent assimilation out as part of a Numerical Weather Prediction system; the other has carried it out in a standalone chemical model, often with a more sophisticated representation of chemical processes. Whereas the aim of the Numerical Weather Prediction approach has been to improve weather forecasts, the aims of the chemical model approach have included providing chemical forecasts and analyses of chemical constituents. A range of constituent assimilation systems developed in these two areas is presented and strengths and weaknesses discussed. The use of stratospheric constituent data assimilation to evaluate models, observations and analyses, and to provide analyses of constituents, monitor ozone, and make ozone forecasts is discussed. Finally, the current state of affairs is assessed, future directions are discussed, and potential key drivers identified.

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