Numerical sensitivities of the ECMWF semi-Lagrangian scheme in upper air forecasts

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Abstract

Interpolation and departure point calculation schemes are of fundamental importance for building an efficient and accurate semi-Lagrangian NWP model such as the ECMWF Integrated Forecast System (IFS). In this work we will assess the sensitivity of IFS forecasts in the upper tropospheric and stratospheric domain with respect to these algorithms. The focus on the upper atmosphere is motivated by identified forecast errors there as well as by the potential influence of the stratosphere on medium range and seasonal predictions. In particular, we shall examine the impact of IFS interpolation options on the existing extra-tropical tropopause cold bias and the impact that departure point algorithms may have in the accuracy of stratospheric forecasts and in the performance of a 4-dvar data assimilation system. Simple modifications and enhancements to the semi-Lagrangian transport scheme will be summarized and results will be shown demonstrating the scope for further improvements.