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to Assess the Value of High Input Resolution in Atmospheric Transport Models

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The question of whether the increased cost of implementing higher input resolutions in atmospheric transport models is difficult to address, and any answer is typically qualified with an "it depends." Attempts to study the effects of high resolution are frequently performed with a small set of case studies, making it difficult to generalise the findings to other cases that may vary in a number of attributes.

Our group has developed a methodology to run hundreds to thousands of paired ATM (FLEXPART) simulations in which only the resolution is varied, evaluating metrics such as plume arrival time and concentration, and then looking for "signatures" over many simulations that may reveal significant differences due to resolution alone. We suggest that if there are general improvements due to higher resolution, they must exhibit such signatures, and once they are detected they are further scrutinised. The methods have been used to explore paired FLEXPART simulations driven by 0.5 vs 1.0 degree ECMWF and GFS meteorological inputs every 36 hours over periods of eight to twelve months.

Promotional text

This work describes a framework that facilitates rigorous comparison of model parameters to determine whether differences affect simulations in significant ways.

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