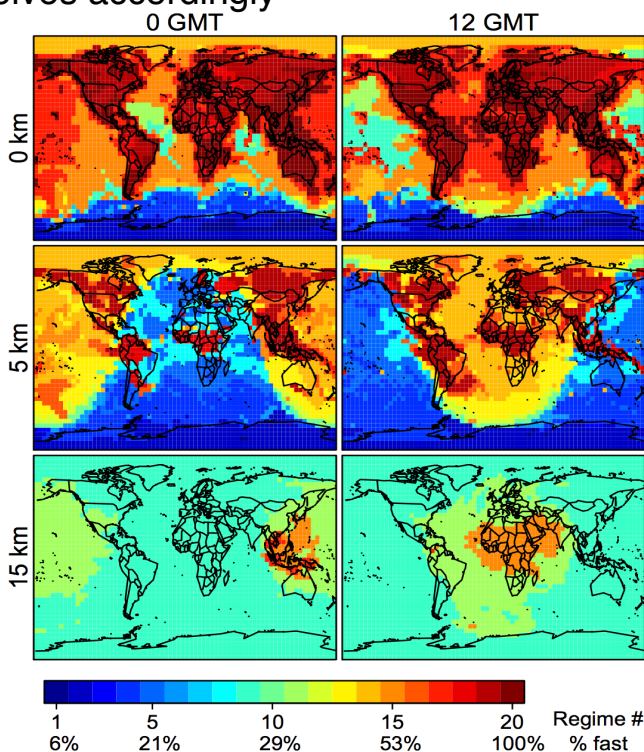


Speeding up atmospheric chemistry in Earth System Models

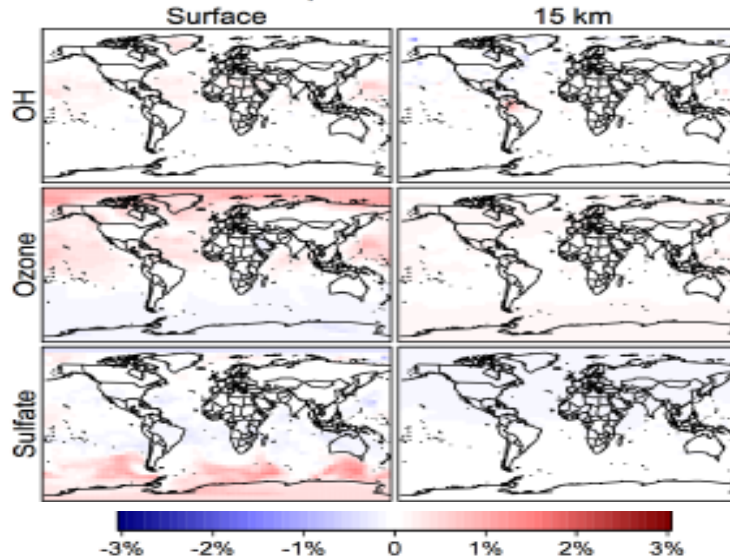
A high-accuracy adaptive method to solve a major ESM bottleneck

The method determines locally and on the fly what chemical complexity is needed and solves accordingly



40% speed-up is achieved with less than 2% error after 2 years of GEOS-Chem simulation

Relative error in the adaptive mechanism reduction method



The method (1) is highly accurate, (2) makes chemical sense, (3) retains full diagnostics, (4) is resolution-agnostic, and (5) is robust against mechanism changes.

Next step: implement it in the GEOS-Chem module used by GEOS including for composition forecasts (GEOS-CF)



Shen, L., D.J. Jacob, M. Santillana, X. Wang, and W. Chen, An adaptive method for speeding up the numerical integration of chemical mechanisms in atmospheric chemistry models: application to GEOS-Chem version 12.0.0, Geosci. Model Dev., 13, 2475-2486, 2020.

