Towards a UFS-based Greenhouse Gas Inversion System

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GML's current greenhouse gas flux inversion modeling systems are limited in spatial and temporal resolution. This limitation has implications for the use of high frequency continental *in situ* observations in inversions because these observations are difficult to simulate at coarse information and therefore must be de-weighted, throwing out potentially useful information about fluxes. The NOAA Unified Forecast System (UFS) presents an opportunity to use significantly higher spatial and temporal resolution and an on-line modeling approach where the small-scale transport features are allowed to evolve in response to large scale forcing. In addition, prior flux estimates can potentially be estimated using the same driving meteorology as the transport. We describe progress using the UFS model to simulate CO_2, CH_4 and SF_6 with the eventual goal of using it for greenhouse gas data assimilation and flux inversion.

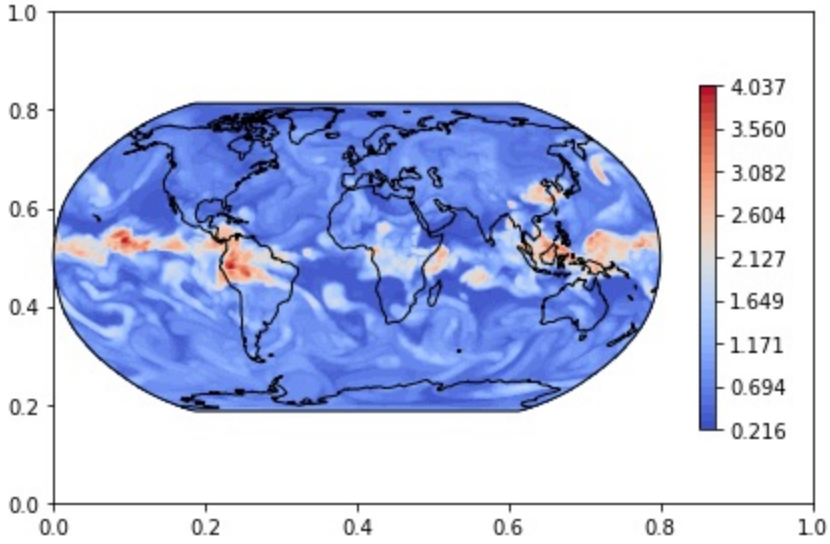

Figure 1. Moisture variables (e.g. water vapor, cloud droplets, ice, etc.) are currently not conserved by the model physics. This has implications for conservation of tracer gradients as shown here for an idealized CO_2 experiment with no emissions or removals and a globally constant mixing ratio of 400 ppm.