

Inverse Modeling: Investigation Using Cross Appalachian Tracer Experiment (CAPTEX) Data and Ensemble Dispersion Simulations

A HYSPLIT inverse system based on 4D-Var data assimilation and a Lagrangian dispersion transfer coefficient matrix (TCM) has been developed and successfully applied to several implementations. For instance, Chai et al. (2015) recovered cesium-137 release rates from the 2011 Fukushima nuclear accident using air concentration measurements around the globe finding consistent temporal variations with the Katata et al. (2015) estimates. However, it is difficult to quantitatively evaluate the source strength estimates without knowing the exact emission rates. The Cross Appalachian Tracer Experiment (CAPTEX), consisting of perfluoromethylcyclohexane (PMCH) observation data at 84 measurement sites collected from several controlled releases, provides a unique opportunity to evaluate the estimated emission sources. In this study, the HYSPLIT inverse system is tested using the CAPTEX data. In addition, ensemble HYSPLIT runs are used to provide uncertainty analyses for the source estimation. The capabilities of the HYSPLIT inverse system, such as recovering the source strength and temporal variations are evaluated. This investigation is also aimed at improving the HYSPLIT inverse system algorithm and providing insights for the source estimation results in similar applications. Chai, T., R. Draxler, and A. Stein, *Atmos. Environ.*, 106, 241-251, doi:10.1016/j.atmosenv.2015.01.070, 2015 Katata, G., et al., *Chem. Phys.*, 15, 1029-1070, doi:10.5194/acp-15-1029-2015, 2015.

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