Geophysical Research Abstracts
Vol. 19, EGU2017-19479, 2017
EGU General Assembly 2017

Tomographic iterative reconstruction of a passive scalar in a 3D turbulent flow

Ignacio Pisso (1), Arve Kylling (1), Massimo Cassiani (1), Anne Solveig Dinger (1,2), Kerstin Stebel (1), Norbert Schmidbauer (1), and Andreas Stohl (1)

(1) Norwegian Institute for Air Research, Kjeller, Norway, (2) Institut fuer Umweltphysik, Heidelberg

Turbulence in stable planetary boundary layers often encountered in high latitudes influences the exchange fluxes of heat, momentum, water vapor and greenhouse gases between the Earth's surface and the atmosphere. In climate and meteorological models, such effects of turbulence need to be parameterized, ultimately based on experimental data. A novel experimental approach is being developed within the COMTESSA project in order to study turbulence statistics at high resolution. Using controlled tracer releases, high-resolution camera images and estimates of the background radiation, different tomographic algorithms can be applied in order to obtain time series of 3D representations of the scalar dispersion. In this preliminary work, using synthetic data, we investigate different reconstruction algorithms with emphasis on algebraic methods. We study the dependence of the reconstruction quality on the discretization resolution and the geometry of the experimental device in both 2 and 3-D cases. We assess the computational aspects of the iterative algorithms focusing of the phenomenon of semi-convergence applying a variety of stopping rules. We discuss different strategies for error reduction and regularization of the ill-posed problem.