

Lagrangian transport and inverse emission modeling of non-CO₂ greenhouse gases in Europe

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3:00 p.m. – Refreshments & Socializing

3:30 p.m. – Seminar

Foothills Lab 2, Room 1022

Abstract

Lagrangian models, which track the movement of fluid parcels in their moving frame of reference, have gained in popularity and sophistication over the past few decades. More recently, Lagrangian models have demonstrated their great potential in the context of inverse emission estimation as the Lagrangian framework provides a simple means to establish the relationship between receptor (measurement) locations and upstream sources. In this presentation I will show several examples of inverse modeling of greenhouse gases and ozone depleting substances focusing on halogenated hydrocarbons and methane. Measurements have been obtained from the high Alpine research station Jungfraujoch, from aircraft, and from diverse sites in the Swiss Plateau and elsewhere in Europe. The main transport modeling tool is the Lagrangian Particle Dispersion Model (LPDM) FLEXPART which we run either on meteorological fields of the global IFS model of ECWMF or, in an adapted and augmented version, on high-resolution fields from the regional weather forecast model COSMO.

I will first present the basic concepts of LPDMs, their application in forward and backward mode, and our inverse modeling approaches. I will then show a number of results including estimates of European emissions of halocarbons and the sometimes large discrepancies from bottom-up inventories, and estimates of regional methane sources deduced from aircraft observations and a new measurement network in Switzerland.