

Identifying and Quantifying Sources of Halogenated Greenhouse Gases Using Lagrangian Dispersion Methods

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Halogenated greenhouse gases are continuously monitored at the atmospheric research station “O. Vittori” located on the top of Monte Cimone, Northern Apennines, Italy (44°11' N, 10°42' E) at the altitude of 2165 m a.s.l., in the frame of the European funded Project SOGE (System for Observation of halogenated Greenhouse gases in Europe, URL <http://www.nilu.no/soge>). SOGE is an integrated system based on a combination of observations and models. Such an integrated approach allows verifying emissions of halogenated greenhouse gases on a regional scale. Results obtained are useful to ascertain compliance with international protocols regulating production/emission of halogenated greenhouse gases. Beside Mt Cimone, the SOGE network includes the research stations Mace Head (IE), Ny-Ålesund (Spitsbergen, NO), Jungfrauoch (CH) and Monte Cimone (IT), two of which (Jungfrauoch and Monte Cimone) are mountain sites, whose location is crucial in assessing the role of specific potential source regions in Europe.

In this study, in order to identify halocarbons source regions, the following models have been used i) MM5 to reproduce meteorological fields; and ii) FLEXPART to simulate tracers dispersion. The method here proposed implies initially that concentrations at the receptor site, produced by a homogeneous arbitrary emission field, are simulated. The choice of enhancing factors, converting simulated concentrations into observed ones, could be assimilated to a multiple linear regression problem. Here, for the determination of the best group of regression coefficients, a stepwise regression procedure is proposed.

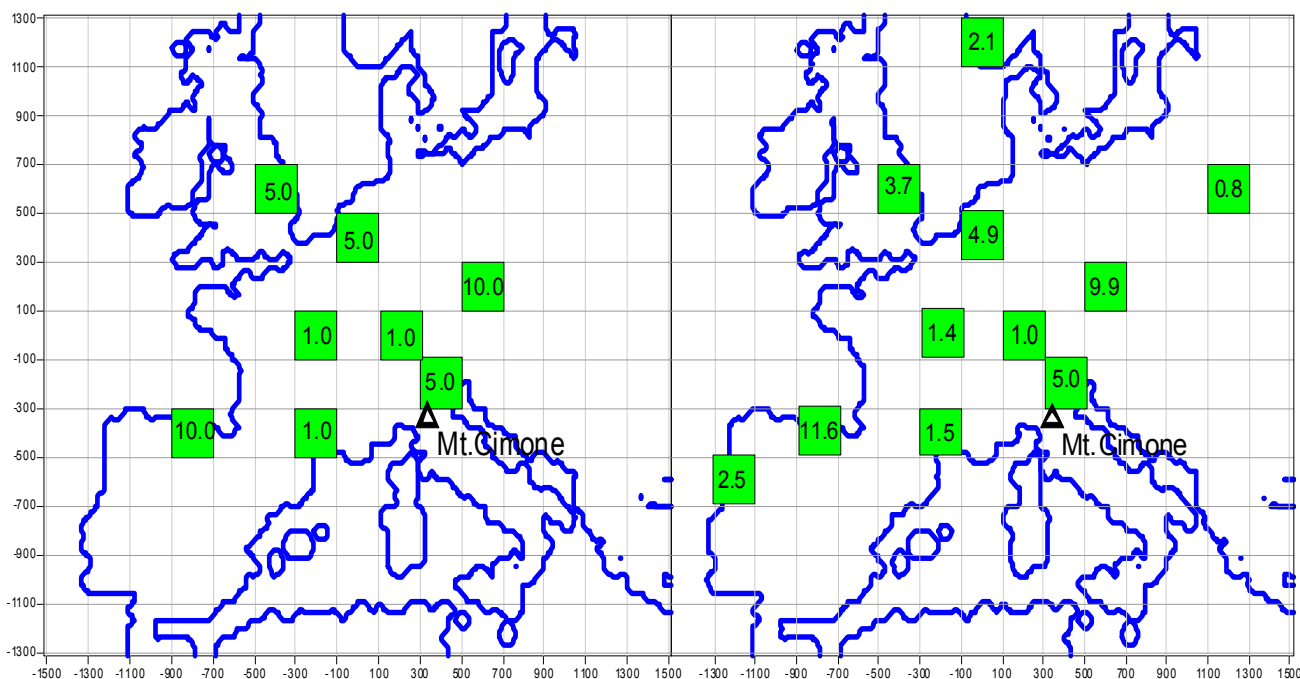


Figure 1. Left: Strength of sources used in the synthetic test field. Right: Sources' position and strength obtained by the model. Triangle represents the receptor's position (Mt Cimone station).