



Twentieth century atmospheric halocarbon trends: comparison of model results with atmospheric and firn air data sets

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A 2D model of tropospheric and stratospheric chemistry, constrained with available emission data, was used to simulate concentration trends of about twenty halocarbon species. Model results were validated by comparison with various atmospheric data sets : surface, total column, and balloon-based measurements. For most species, the modelled trends are consistent with the obtained trends within the uncertainty limits of atmospheric emission and concentration data. On-going work using satellite data will complete the validation of modelled vertical distributions.

The validated atmospheric halocarbon trends were used as input to a model of gas diffusion in interstitial air of polar firn. Note that firn, a porous medium, is the transition layer between near-surface snow and ice. The simulated vertical concentration profiles in the firn were compared with Arctic and Antarctic data obtained within the FIRETRACC and CRYOSTAT EC projects. Since firn is a large reservoir of air and constitutes a natural archive for the atmosphere, firn measurements provide information on atmospheric trends over longer periods than the atmospheric records.

A different approach was used for four species for which historical emission inventories are not available. The atmospheric trends were estimated by fitting firn-air data at different sites using the gas diffusion model. Historical emissions were then derived from the 2D atmospheric chemistry model constrained with atmospheric trends.

Using the above data sets and models, we discuss our understanding of halocarbon species budgets.