Geophysical Research Abstracts
Vol. 15, EGU2013-2817, 2013
EGU General Assembly 2013
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Quantifying the source/receptor link for the IAGOS-MOZAIC observation database

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Since 1994, the IAGOS-MOZAIC (In-service Aircraft for a Global Observing System and Measurements of OZone, water vapor, nitrogen oxides and carbon monoxide by Airbus In-service airCraft, http://www.iagos.org) project has produced in-situ measurements of chemical species through 35000 commercial aircraft flights. The IAGOS-MOZAIC database provides documentation of ozone, carbone monoxide and nitrogen oxides, mostly in the upper troposphere and lower stratosphere of the northern hemisphere, but without a priori specific sampling strategy.

In order to help analyzing these observations and understanding the processes driving their evolution, we improved the methodology used by Stohl et al. (2003), a lagrangian modelling tool that links the observed pollutants to their sources. Based on the FLEXPART plume dispersion model, this tool simulates contributions of anthropogenic and biomass burning emissions from the ECCAD platform (http://www.pole-ether.fr/eccad), or of specific inventories (i.e. designed for observation campaigns), to the measured carbon monoxide mixing ratio along each IAGOS-MOZAIC flight. These contributions are simulated for the last 20 days before the observation, separating individual contributions from the different source regions, and include a state-of-the-art estimation of background concentrations taking into account the origin of air masses (i.e. stratospheric intrusions, boundary layer).

The main goal is to supply add-value products to the IAGOS-MOZAIC database showing pollutants geographical origin and emission type, as well as an estimation of the carbon monoxide mixing ratio along the flights when the observations are not available. Using these informations, it will be possible to link trends in the atmospheric composition to changes in the transport pathways and to the evolution of emissions. We will also show that this tool can be used for validation and intercomparison of emission inventories, as lagrangian models are able to bring the global scale emissions down to a smaller scale, where they can be directly compared to the in-situ observations from the IAGOS-MOZAIC database.