Geophysical Research Abstracts
Vol. 13, EGU2011-8970, 2011
EGU General Assembly 2011

Contribution to the study of tropical biomass burnings: Observation of carbon monoxide emitted by fires in Africa with IASI

Thibaud Thonat, Cyril Crevoisier, Noëlle A. Scott, Alain Chédin, Raymond Armante, and Laurent Crépeau
Laboratoire de Météorologie Dynamique, France (thibaud.thonat@lmd.polytechnique.fr)

Biomass burning is an important source of trace gases and aerosols to the atmosphere. In particular, CO emissions are a key component of the global carbon budget. This is especially true in Africa where some of the strongest emissions occur. However, there are still large discrepancies between CO emission inventories (Stroppiana et al., 2010), stressing the need of diverse approaches to this issue. The Infrared Atmospheric Sounding Interferometer (IASI) onboard the Metop-A satellite launched in October 2006 enables to observe CO twice a day, at 09:30 LT (day) and 21:30 LT (night): using such observations, monthly mean tropospheric CO mixing ratios are retrieved over the South of Africa, in clear sky conditions. The retrieval of CO is based on the difference between observed and simulated brightness temperatures (BT) using the 4A radiative transfer model (Scott and Chédin, 1981). In the 4.6 μm band highly sensitive to CO, three couples of channels have been selected. For each of them, the two channels have the same sensitivities to atmospheric and surface parameters, except for CO. Thus the difference between the BT of these channels is mainly due to CO, and minimizes the sensitivities to other variables. Following Chédin et al. (2005) who revealed the existence of a daily tropospheric excess of CO_2 (DTE) quantitatively related to fire emissions in the tropics, we focus our analysis on the day minus night differences of CO, and show that diurnal variations of CO are in good agreement with the presence of fires, which are characterized by a diurnal cycle of their activity. We show comparisons of retrieved CO for each month with fire products such as Fire Radiative Power (FRP), Burned Areas (BA) and burning emissions from inventories (GFEDv2,3). For several areas classified by their types of vegetation, IASI CO is in good agreement with these products in terms of seasonal variations, with a maximum in September and a length of the fire season of 5 months (May to October). Nonetheless, for some areas of South West Africa, the excess of CO is longer than the fire season given by the other products, with, sometimes, a maximum delayed by about 2-3 months, that we are investigating. We assess the impact of surface characteristics and other atmospheric variables on the retrieved CO, and also highlight the influence of aerosol fire plumes on IASI channels. Quantifying these effects on our retrievals allows improving our understanding of the biomass burning issue.