Title of the presentation
CoMet: An airborne mission to simultaneously measure CO2 and CH4 using lidar, passive remote sensing and in-situ techniques

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Abstract
In order to improve our current knowledge on the budgets of the two most important anthropogenic greenhouse gases, CO2 and CH4, a co-ordinated measurement campaign in the Central European region will be carried out with the German research aircraft HALO and two smaller Cessna aircraft being its main experimental platforms. The goal of CoMet is to combine a suite of the best currently available airborne active (lidar) and passive remote sensors (spectrometer) with in-situ instruments to provide regional-scale data about greenhouse gases (GHGs) which are urgently required for their accurate modelling.
For CoMet, an intensive measurement period of 4 weeks is planned at the beginning of the growing season in May/June 2018 in Central Europe. During this period, optimized HALO research flights will comprise extended latitudinal transects to capture the GHG gradients, flights over known regions of strong emissions as well as comparison overflights over the ground-based remote sensing sites of the Total Carbon Column Observing Network (TCCON). While HALO will provide a larger scale picture, the two Cessna aircraft will concentrate on a region of prime interest: the Upper Silesian Coal Basin (USCB) in Poland. In this area which, due to hard coal mining activities, is known to be one of the European hot spots of anthropogenic methane emissions, a variety of additional ground-based instruments will support the CoMet mission: an array of several ground-bases FTIR instruments will be deployed here. Several wind lidars will accurately measure the local wind conditions to help inferring fluxes by means of e.g. mass balance approaches. In addition, in-situ measurements from mobile vans and small drones will be available through an in-kind contribution of the MEMO2 network to provide near-surface information of GHGs and to quantify CH4 and CO2 emissions from individual coal mining shafts. GOSAT and Sentinel-5P products will be used and compared with the respective ground-based and airborne instruments.
In order to assess regional scale fluxes from model results, a model infrastructure (regional inverse modelling, chemistry-climate modelling with regional refinement) will be employed in order to use the data streams of the individual instruments for modelling the greenhouse gas fluxes. With many vertical profile and column measurements across Europe the data provide an ideal testbed also for evaluation of transport models used within the TRANSCOM community.
The CoMet mission is also part of the validation activities for existing passive remote sounding GHG satellites, OCO-2, GOSAT, and Sentinel 5-P and preparation of the first active CH4 satellite mission MERLIN. In addition it will investigate methodologies for the synergistic combination for greenhouse gas measurements using lidar and passive remote sensing.
This contribution will present preliminary findings from the CoMet mission and the exploitation of the observations.

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