Geophysical Research Abstracts
Vol. 18, EGU2016-13468, 2016
EGU General Assembly 2016

"Atmospheric Measurements by Ultra-Light SpEctrometer" (AMULSE) dedicated to vertical profile measurements of greenhouse gases (CO_2, CH4) under stratospheric balloons: instrumental development and field application.

Rabih Maamary (1), Lilian Joly (1), Thomas Decarpenterie (1), Julien Cousin (1), Nicolas Dumelié (1), Bruno Grouiez (1), Grégory Albora (1), Nicolas Chauvin (1), Zineb Miftah-El-Khair (1), Dominique Legain (2), Diane Tzanos (2), Joel Barrié (2), Eric Moulin (2), Michel Ramonet (3), François-Marie Bréon (3), and Georges Durry (1)

(1) Université de Reims – Champagne Ardenne, Groupe de Spectrométrie Moléculaire et Atmosphérique, GSMA, UMR CNRS 7331, Reims, France , (2) Centre National de Recherches Météorologiques, Groupe d'étude de l'Atmosphère Météorologique, UMR 3589, Toulouse, France, (3) Université de Versailles, Laboratoire des Sciences du Climat et de l'Environnement, LSCE, UMR 8212, St-Quentin-En-Yvelines, France

Human activities disrupt natural biogeochemical cycles such as the carbon and contribute to an increase in the concentrations of the greenhouse gases (carbone dioxide and methane) in the atmosphere. The current atmospheric transport modeling (the vertical trade) still represents an important source of uncertainty in the determination of regional flows of greenhouse gases, which means that a good knowledge of the vertical distribution of CO_2 is necessary to (1) make the link between the ground measurements and spatial measurements that consider an integrated concentration over the entire column of the atmosphere, (2) validate and if possible improve CO_2 transport model to make the link between surface emissions and observed concentration.
The aim of this work is to develop a lightweight instrument (based on mid-infrared laser spectrometry principles) for in-situ measuring at high temporal/spatial resolution (5 Hz) the vertical profiles of the CO_2 and the CH4 using balloons (meteorological and BSO at high precision levels (< 1 ppm in 1 second integration time for the CO_2 sensor, and smaller than several tenths of ppb in 1 second integration time for the CH4 sensor). The instrument should be lighter than 2.5 kg in order to facilitate authorizations, costs and logistics flights. These laser spectrometers are built on recent instrumental developments. Several flights were successfully done in the region Champagne-Ardenne and in Canada recently.

Aknowledgments: The authors acknowledge financial supports from CNES, CNRS défi instrumental and the region Champagne-Ardenne.