The 36th International Symposium on Remote Sensing of Environment,
11 – 15 May 2015, Berlin, Germany, ISRSE36-290

OBSERVING METHANE FROM SPACE. THE FRENCH GERMAN LIDAR MISSION MERLIN

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THEME: Atmosphere, Weather and Climate.

KEY WORDS: LIDAR, IPDA, Methane, Climate Change, Satellite

ABSTRACT:
Methane is one of the strongest anthropogenic greenhouse gases. The radiative forcing caused by methane contributes significantly to the warming of the Earth atmosphere. To better understand the complex global methane cycle on a global basis, it is necessary to apply space-borne observing techniques in order to obtain global coverage at high precision. Currently, only spectrometers are in orbit or planned for the near future. These "passive" instruments barely cover key source regions at northern high-latitudes (boreal wetlands, melting permafrost regions) because of lack of sun light. Therefore, the "active" LIDAR technique (= light detection and ranging) was proposed for further greenhouse gas monitoring missions.
MERLIN (Methane Remote Sensing LIDAR Mission) is a joint French-German initiative on the development and operation of a satellite for the monitoring of atmospheric methane. MERLIN will be launched in the timeframe of 2019 with an operational lifetime in orbit of 3 years. The objective of MERLIN is to measure the spatial and temporal gradients of atmospheric methane columns with high precision and unprecedented accuracy at all latitudes and seasons. The main data product of MERLIN will be the column-weighted dry-air mixing ratio of methane, measured over the satellite sub-track which will be used as valuable input for global methane flux calculations. First scientific impact studies show a substantial reduction of the prior methane flux uncertainties in key observational regions when using synthetic MERLIN observations in the flux inversion experiments. MERLIN will be the first Integrated Path Differential Absorption (IPDA) LIDAR for trace gas monitoring from space. The key component for such a LIDAR system is a very compact, precise and durable high-power laser source with very low power consumption. The mission is currently in Phase B. This presentation will give an overview on the mission concept and the current mission status.

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