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CH4 IPDA LIDAR DATA SIMULATOR AND PROCESSOR (L1b and L2) FOR MERLIN MISSION: PROTOTYPES DEVELOPMENT

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Accurate knowledge of atmospheric greenhouse gas CO_2 and CH4 concentrations and fluxes is a key element of current climate change research. Methane (CH4) is the third most important greenhouse gas (GHG) in the atmosphere after water vapour (H_2O) and carbon dioxide (CO_2), and the second anthropogenic GHG after CO_2. MERLIN (The Methane Remote Sensing Lidar Mission) is a new Franco-German (CNES and DLR) space borne Lidar mission initiated late 2009, now in Phase B, for global monitoring of atmospheric methane (CH4. The two national agencies CNES and DLR, the French Space Agency and German Space Administration, respectively, set up jointly to bodies: a Group Project and a Science Advisory Group, to drive the mission development until achievement. The MERLIN mission is based on a small satellite. The launch is foreseen in 2019 for 3 years operation. The space segment consists of the new platform product line named MYRIADE Evolutions developed under CNES control, and an advanced IPDA (Integrated Path Differential Absorption) Lidar instrument under DLR responsibility to be developed by ASTRIUM Germany. The 1st science objective is to provide a significant improvement on retrieval of CH4 fluxes at synoptic scales, which in turn calls for 1% accuracy on CH4 column averaged air dry-mixing ratio (XCH4) at a 50 km horizontal resolution. A second objective is to contribute to a better understanding of atmospheric chemistry at global scale. A first prototype, called PROLID, has been developed to process the raw lidar signal that will be delivered by the MERLIN lidar instrument. This last will allow the extraction of the XCH4 concentration and corresponding weighting function. These two parameters will allow to determine the map of the radiative transfers due to CH4 concentration. Here, we will present the breakdown of the level 2 performance (on XCH4) into major contributors. To complete these objectives, and due to the lack of real datasets before the launch of the MERLIN mission, we develop a MERLIN data simulator, called LIDSIM, allowing us to make some tests on the MERLIN data processor, and characterize the expected performances of this last before the launch. The Lidar Signals Simulator module is composed of 3 sub modules: the Geometry, the Scene Generation and the Instrument.