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Space-borne profiling of CO_2 by Raman lidar

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As clearly reported in the IPCC fifth Assessment Report (http://www.ipcc.ch/report/ar5/wg1/) CO_2 emissions are already producing destructive effects to the plant ecosystem through the alteration of soil-atmosphere interaction mechanisms, which may determine a worsening of hydrogeological risk and an alteration of the role of vegetation on the carbon cycle. Although the space and ground network for CO_2 monitoring has regularly expanded over the past 50 years, it does not guarantee the necessary spatial and temporal resolution needed for quantitative analysis of sources and sinks, especially for what concerns profile measurements. Space sensors provide CO_2 measurements above forest canopies, which do not allow to properly estimate the Gross Primary Production (GPP). These observational gaps could be addressed with an active remote sensing system in space based on the vibrational Raman backscatter lidar technique. CO_2 profile measurements are possible, together with of simultaneous measurements water vapour and a variety of derived variables (aerosol backscatter profiles, PBL depth, cloud top and base heights, cloud optical depth). Combining rotational Raman backscatter signals, simultaneous measurements of temperature and aerosol extinction profiles are also possible. An assessment of the expected performance of the system has been performed based on the application of an analytical simulation models developed at University of Basilicata. Results will be illustrated at the Conference.