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Abstract

The recent IPCC Assessment Report 4 pointed out clearly that Carbon dioxide, CO2, and Methane, CH4, are by far the two most significant long lived greenhouse gases (GHG), being released to the troposphere by anthropogenic activity. The increase in atmospheric loading of these radiatively active gases is the dominant process driving global climate change. The key scientific issue is now to understand the current regional consequences of global climate change and to predict accurately the future changes. This is required for policymakers in respect of mitigation, adaptation and the management of ecosystem services in a changing climate. Surprisingly and in spite of their importance, our knowledge about their variable natural sources and sinks, which are determined by the underlying biogeochemical cycles and feedbacks, is inadequate. This results in large uncertainty in our prediction of global climate change and the impact on changing ecosystem services in addition to that recognized in IPCC AR4.CO2 monitoring and trading is often based on bottom-up calculations or even estimates with no independent top down verification. Due to the lack of global measurement data the top down verification is limited. SCIAMACHY, the first CO2 and CH4 mapping Instrument on ENVISAT shows that satellites are able to add valuable missing global information. So far GHG measurement satellites need to collect data over a long period to produce global regional fluxes products. This period is currently a year or even longer. Since consequently global, timely, higher spatial resolution is required the CarbonSat constellation idea comes up. CarbonSat origins from the resolution and swath width trade off during CarbonSat mission definition studies. A constellation of five CarbonSat satellites will be able to provide global, daily CO2 and CH4 measurement with high spatial resolution of only 2 × 2 km. To enable more reliable services associated with reduced uncertainty, e.g. to 0.3 ppm CO2 per month in 1000 km² and even more timely products, the constellation will provide unique global daily measurement capability and therefore significantly increased number of cloud free measurements.

The CarbonSat Constellation is proposed to be implemented through an internationally coordinated constellation. Each participating country contributes a full system consisting of a CarbonSat satellite and a ground station, which will be able to provide data for national applications. For the constellation operation, a central coordination centre will be set up to handle data calibration and international data distribution. For each partner this approach provides

independence and financial feasibility. This international forum provides worldwide transparency of CO2 and CH4 emissions which is critical in supporting Kyoto protocol and upcoming international agreement in man-made Greenhouse emission reduction. The paper will present the CarbonSat Constellation build up through a multilateral collaboration comprising satellite design and proposed products / services to verify GHG sources and sinks.