Paper ID: 78953
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IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observations to address Earth's Environment and Climate Challenges (7)

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NOVEL APPROACH FOR CO2 AND CH4 MAPPING USING MICRO-LIDAR AND SMALL SATELLITE CONSTELLATION

Abstract

The seriousness of global warming cannot be overstated, and more and more organizations are setting targets of achieving net-zero emissions. In order for our efforts to combat the climate crisis to be effective, we will require accurate and reliable figures on CO2 and CH4 emission levels. Existing methods of measuring these gases are not capable of providing the necessary data quality and quantity. Earth Observation is a strong tool that could provide the necessary environmental and socio-economic data to assess success of emissions reduction. However, current technology is not advanced enough to deliver the accuracy and resolution needed to make an action.

This paper presents a project architecture aiming to deploy a network of new data source for greenhouse gas (GHG) emissions monitoring with high temporal and spatial resolution and high accuracy. The goal is to increase the capacity of existing monitoring systems and create new emissions monitoring applications to address the climate crisis. The project is based on a small satellite constellation equipped with novel set of instruments: microLiDAR, SWIR spectrometer and camera. Compared to existing solutions, the proposed method will improve the temporal coverage while meeting the requirements of high accuracy and spatial resolution. Installation of LiDAR system on board of the satellite enables data correction due to winds disturbances and high aerosol concentrations. Moreover, retrieve of wind directions together with GHG concentration will make it possible to attribute emissions to individual facilities, as well as to obtain information on gas loads in specific areas or regions. Analytics will be used to turn the emissions data into actionable insights to help optimize operations and reduce emissions, in line with existing guidance, policies, and trends related to climate change and global warming.