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ANALYZING THE IMPACTS OF CLIMATE CHANGE ON N2O EMISSIONS FROM SOIL USING SMALL SATELLITES

Abstract

The increasing atmospheric concentration of greenhouse gasses (GHG) is resulting in their heightened absorption by oceans, land, and forests. Although the ground and plants absorb only around 10

With the growing effects of climate change, it is projected that the atmospheric concentration of N2O will increase significantly. Rapidly fluctuating soil temperature and precipitation due to climate warming and weather change are causing the emission of CO2, CH4, N2O, and loss of Phosphorous, which affects plants' growth. The available finite data indicates such deteriorating soil health will impact agriculture in the coming decades by rising social issues such as food shortage, food storage, inflation, and recession and generating health issues like malnutrition, deprivation of the immune system, etc.

Monitoring GHG emissions from the soil will provide data that can aid in the early response and maintenance of soil health. This paper analyzes the requirements for the GHG emissions monitoring mission to investigate the use of this data to monitor soil health. The main focus of the project is to propose the rational mission concept to guarantee the constant and accurate monitoring of the atmospheric concentration of N2O.

Dedicated small satellite missions can deliver global emission mapping coverage, which will improve the understanding of soil GHG emissions and health dynamics. Furthermore, this will increase the diversity of the data available across different climates, landscapes, and crop types for enhanced response. However, depending on the particular used case and final data user the mission concepts and satellite compositions can differ.

As the result of the use cases definition and stakeholders' interviews on important parameters to be tracked, the paper proposes a rational small satellite monitoring mission profile. Particular attention is paid to the inversion algorithms and requirements to derive them. Furthermore, the paper exhibits how Earth Observation data of soil health can mitigate the intensity of mentioned social and economic crises.