

Development of China's greenhouse gas monitoring satellite missions

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(Virtual Talk)

After the launch of the first Chinese greenhouse gas monitoring satellite mission (TanSat) in 2016, GF5-01 and GF5-02 have taken a new path to measure CO₂ and CH₄ based on a new spatial heterodyne spectroscopy (SHS) technology, which is compared with the assessment spectrum on board TanSat. In this presentation, some new results of XCO₂ and XCH₄ from GF5-01 and GF5-02 in the period 2018 to 2023 will be presented.

DQ-1 (DC-Atmosphere) satellite, on the other hand, uses an active detection lidar to measure CO₂. To improve nocturnal and polar measurements, DQ-1 and DQ-2 will be equipped with a greenhouse gas lidar called ACDL (Aerosol and Carbon dioxide Detection Lidar), and the coordinated measurement with a passive instrument will provide more accurate results in highly aerosol-polluted areas. DQ-1 was launched in April 2022 and ACDL has been operating continuously for almost two years. The global XCO₂ measurement from 82° N to 82° S over land and sea during day and night was carried out. The ACDL XCO₂ measurements are compared with the TCCON XCO₂ data, and the RMSE of less than 1 ppm has been confirmed.

To improve measurement coverage and repetition frequency, the TanSat-2 mission can be built in medium Earth orbit so that each satellite observes the Earth in an orbit more than 800 km wide with 2x2 km pixels. The NIR/SWIR hyperspectral measurement of the sunlight backscattered by the spectrometers on board TanSat-2 covers the bands 0.69 μm (O₂B), 0.76 μm (O₂A), 1.61 μm (CO₂) and 2.06 μm (CO₂). Instruments for monitoring air pollution (NO₂) and the optical properties of aerosols will be on board TanSat-2. TanSat-2 will measure atmospheric CO₂ and CH₄ at least twice a day over a wide area, which will be useful for studying the daily fluctuations of the greenhouse gas.

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