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The TanSat on-broad status, data product and future plans

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The first scientific experimental CO_2 satellite of China - Chinese carbon dioxide observation satellite (TanSat) launched in 22 Dec 2016. After on-broad test and calibration, the TanSat starts to record the backscattered sunlight spectrum from scientific earth observation and produced CO_2 concentration data. The radiometric and spectrum performance has been evaluated during TanSat on-broad test and calibration experiment. The key parameters of instrument have been proved to meet the design requirement from solar calibration.

The optimal estimation theory was involved in TanSat XCO_2 retrieval algorithm in a full physics way with simulation of the radiance transfer in atmosphere. Gas absorption, aerosol and cirrus scattering and surface reflectance associate with wavelength dispersion have been considered in inversion for better correction the interference errors to XCO_2. In order to simulate the radiance transfer precisely and efficiently, we develop a fast vector radiative transfer simulation method. Application of TanSat algorithm on GOSAT observation (ATANGO) is appropriate to evaluate the performance of algorithm. Validated with TCCON measurements, the ATANGO product achieves a 1.5 ppm precision. A Chinese carbon cycle data- assimilation system Tan-Tracker is developed based on the atmospheric chemical transport model GEOS-Chem. Tan-Tracker is a dual-pass data-assimilation system in which both CO_2 concentrations and CO_2 fluxes are simultaneously assimilated from atmospheric observations. A validation network has been established around China to support a series of CO_2 satellite of China, which include 3 IFS-125HR and 4 Optical Spectrum Analyzer etc.

Preliminary results of XCO_2 approached from TanSat measurement inter-compared with OCO-2 results in an overlap footprint measurement over north Australia. Validation study with TCCON indicate a better than 4 ppm both on April and July. we also introduce the recent progress on TanSat measurement, the first global CO_2 map of April and July in 2017, which is a milestone means TanSat start to provide CO_2 global measurement for future climate change research.