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The pre-launch status of TanSat Mission: Instrument, Retrieval algorithm, Flux inversion and Validation

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After 5 years development, The Chinese carbon dioxide observation satellite (TanSat), the first scientific experimental CO_2 satellite of China, step into the pre-launch phase. The characters of pre-launch carbon dioxide spectrometer have been optimized during the laboratory test and calibration. Radiometric calibration shows a SNR of 440 (O_2A 0.76um band), 300 (CO_2 1.61um band) and 180 (CO_2 2.06um band) on average in the typical radiance condition. Instrument line shape was calibrated automatically in using a well design testing system with laser control and record. After a series of test and calibration in laboratory, the instrumental performances meet the design requirements. TanSat will be launched on August 2016. 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.