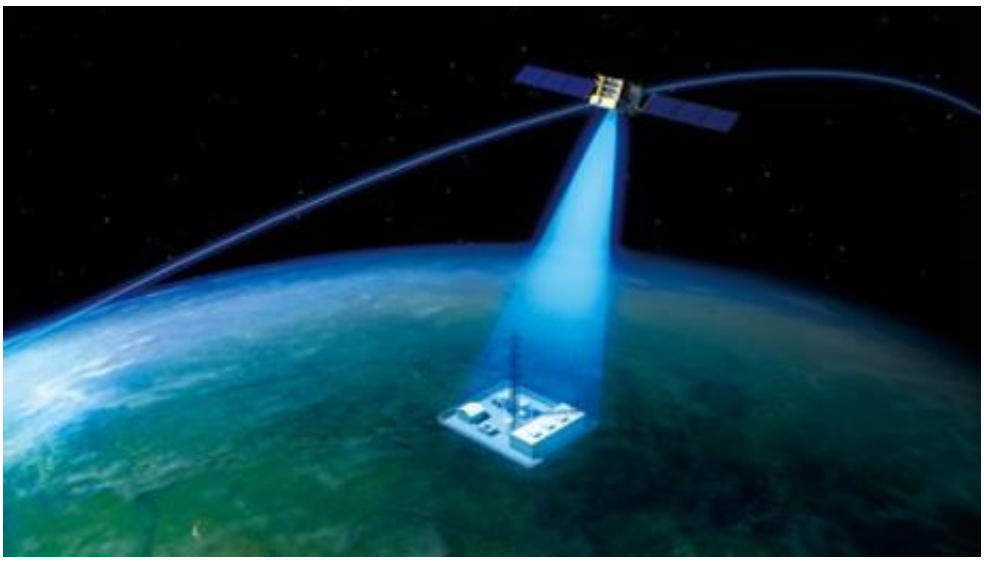
A cloud-screening scheme for for the Chinese Carbon Dioxide Observation Satellite (TanSat)

December 28 2016



TanSat. Credit: TanSat

Carbon dioxide (CO2) is a major greenhouse gas, and a source of atmospheric warming due to the rapid increase in its atmospheric concentrations. China has launched its first mini-satellite dedicated to carbon dioxide detection and monitoring at 15:22 UTC on December 22, 2016. The Chinese Carbon Dioxide Observation Satellite (TANSAT) was designed to focus on the global observation of CO2. For retrieving carbon dioxide from TANSAT observations, cloud detection is an essential preprocessing step.

The TANSAT project is one of the National High-tech Research and Development Programs funded by the Ministry of Science and Technology of the People's Republic of China and the Chinese Academy of Sciences. During the pre-launch study of TANSAT, a cloud-screening scheme for the Cloud and Aerosol Polarization Imager (CAPI) was proposed by a team at Peking University. They noticed that previous cloud-screening algorithms were basically designed to provide comprehensive utilization for sensors that contain multiple channels over a wide spectral range. However, for TANSAT/CAPI, the channels available for cloud screening cover only five spectral bands, which is why such sensors need a more effective method to regroup results from a few threshold tests.

Their work relies upon the radiance data from the Visible and Infrared Radiometer (VIRR) onboard the Chinese FengYun-3A Polar-orbiting Meteorological Satellite (FY-3A), which uses four wavebands, similar to CAPI, and can serve as a proxy for its measurements. The cloud-screening scheme for TANSAT/CAPI, based on previous cloud-screening algorithms, defines a method to regroup individual threshold tests on a pixel-by-pixel basis according to the derived clear confidence level (CCL).

The scheme has been applied to a number of the FY3A/VIRR scenes over four target areas (desert, snow, ocean, forest) in China for all seasons. Comparisons against the cloud-screening product from MODIS suggest that the proposed scheme inherits the advantages of schemes described in previous publications and shows improved cloud-screening results. This scheme is proven to be more efficient for sensors with few channels or frequencies available for cloud screening.

More information: Xi Wang et al, A cloud detection scheme for the Chinese Carbon Dioxide Observation Satellite (TANSAT), *Advances in Atmospheric Sciences* (2016). DOI: 10.1007/s00376-016-6033-y

Provided by Chinese Academy of Sciences