

University of Bremen, Institute of Environmental Physics (IUP)

Seminar on Physics and Chemistry of the Atmosphere

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Abstract

It Takes Two to Tango

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The Twin ANthropogenic Greenhouse Gas Observers (TANGO) mission is a pioneering Cubsat satellite mission comprising two satellites, TANGO-Carbon and TNAGO-Nitro. Secured by national funding Tango will be launched in the year 2026 and envisages a unique European contribution to monitoring globally and independently the emission of anthropogenic greenhouse gases over the period 2026-2030. To this end, breakthrough technology will be used to quantify emissions of the greenhouse gases methane (CH₄) and carbon dioxide (CO₂) at the level of individual industrial facilities and power plants. The mission will demonstrate a distributed monitoring system that will pave the way for future larger constellations of Cubsats allowing for enhanced coverage and temporal resolution. The TANGO mission consists of two agile satellite buses flying in formation, each carrying one spectrometer. The first satellite measures spectral radiances in the shortwave infrared part of the solar spectrum (1.6 μm) to detect moderate to strong emissions of CH₄ (≥ 3 kt/yr) and CO₂ (≥ 1 Mt/yr). The instrument has a field of view of 30 x 30 km² at spatial resolutions small enough to monitor individual large industrial facilities (≤300 x 300 m²), with accuracy to determine emissions based on a single observation. Using the same strategy, the second satellite yields collocated NO₂ observations from radiance measurements in the visible spectral range, supporting plume detection and exploiting the use of CO₂/NO₂ ratio. In essence, TANGO will provide surface fluxes of specific emission types based on the combination of CH₄, CO₂, and NO₂ observations at a high spatial resolution following a strictly open data policy. Mission operation will be open for input from the science community on target selection. In doing so, TANGO aims to uniquely complement the large, planned Copernicus monitoring missions like Sentinel-5 and the CO2M mission by providing unrivaled high-resolution monitoring of the major anthropogenic greenhouse gas emissions on a regular basis.