



## **Combined balloon, aircraft, surface and remote sensing greenhouse gas measurements at Traînou supersite, France**

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Atmospheric profiles of greenhouse gases (GHG) are of special interest for studies modeling the current and future climate of the Earth and for studies determining atmospheric GHG budgets. Several techniques are currently available: beside tall tower measurements or aircraft flights, upward-looking ground-based Fourier-transform infrared spectrometers (FTIR) can be used, for example within the Total Column Carbon Observing Network (TCCON) or Collaborative Carbon Column Observing Network (COCCON). Furthermore, the promising AirCore technique allows column air sampling up to 30 km using a sampling tube attached to a stratospheric balloon. One challenge is to compare the results of these different techniques on the same site.

Traînou is located approximately 100 km south of Paris/France. The Traînou site benefits from a tall tower setup for in-situ GHG measurements at 5, 50, 100 and 180 m height, and is equipped with a ground-based FTIR (TCCON-Orléans) for total column measurements. Since October 2016, lightweight AirCores specifically designed for weather balloons at LMD are operated by LSCE at Trainou. In addition, in May 2018, a multi-instruments campaign (MAGIC/COMET) was conducted to demonstrate the feasibility of combining surface, airborne, balloon-based and remote sensing total column measurements of GHG at several locations in France, including Trainou. During the campaign, aircraft flights were done to measure GHGs between 100 and 6000 m above the tall tower and AirCores were launched to sample and derive GHG vertical profiles. In addition, a compact FTIR instrument (EM27/SUN) measuring total column was also deployed at the estimated landing sites of the launched AirCores.

The proposed contribution will describe the AirCore measurement technique used by LSCE and LMD. It will also present the data acquired during the MAGIC/COMET measurement campaign and discuss the similarities and differences between surface, aircraft, AirCore and remote-sensing measurements at the Traînou supersite. AIRCORE profiles will be integrated over the vertical and compared to partial and total column measurements from FTIR instruments. The sensitivity to the scenarios used to extrapolate the measurements in the upper atmosphere (>30km) will be investigated.