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As part of the UK Greenhouse gas Emissions Measurement Modelling Advancement programme (GEMMA), the National Centre for Earth Observation are establishing the Greenhouse gas Emissions Monitoring network to Inform Net-zero Initiatives for the UK (GEMINI-UK). The primary aim of the GEMINI-UK network, comprising ten Bruker EM27/SUN shortwave infrared spectrometers, is to help quantify regional net GHG emissions across the UK, complementing in-situ measurements collected by the existing tall tower network. Together, these data will eventually form the backbone of a pre-operational GHG emissions monitoring framework for the UK. The GEMINI-UK instruments observe column concentrations of carbon dioxide and methane in cloud-free conditions, which we will then use in the context of Bayesian inverse methods to constrain regional flux estimates of these gases. We have designed the measurement network to deliver the biggest uncertainty reductions in carbon dioxide flux estimates, working closely with host partners that include UK universities and schools and NERC facilities to promote the open access and transparency of the collected data. Continuous and autonomous operation of the EM27/SUNs at each site will be achieved by an automated weatherproof enclosure, based on a design developed by University of Edinburgh researchers, which enabled year-round measurements to be collected during the DARE-UK project in central London. In this presentation we describe the status and longer-term goals of GEMINI-UK, which is coming online throughout 2024, including an ongoing evaluation of one of the EM27/SUNs alongside a higher specification TCCON spectrometer, located at the Rutherford Appleton Laboratory in Harwell. We will also report data from the DARE-UK London deployment, which demonstrates the value in using all-weather enclosures for continuous long-term observations, and allows comparison with coincident measurements obtained by the NASA OCO-2 and OCO-3, and Copernicus Sentinel-5P TROPOMI instruments over the London metropolitan area.
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