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TCCON Nicosia: First ground-based FTIR greenhouse gas measurements in the Eastern Mediterranean and Middle East region

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The Eastern Mediterranean and Middle East (EMME) region, with its population of more than 400 million people, is identified as one of the primary climate change “hot spots” worldwide, experiencing adverse impacts ranging from extreme weather events to poor air quality. Projections show that these phenomena are expected to further exacerbate in the coming decades. At the crossroads of Europe, Africa, and Asia, the island of Cyprus, in the middle of the EMME, receives long-range pollution from various anthropogenic and natural sources. To assess the variability and amounts of greenhouse gases (GHG) contributing to radiative forcing in the area, we have set up, in 2019, a new Total Carbon Column Observing Network (TCCON) site, the TCCON Nicosia, at The Cyprus Institute. Herewith, we present the first results; columnar amounts of the main GHGs in the region, namely carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and carbon monoxide (CO). The TCCON Nicosia site was validated against the World Meteorological Organization (WMO) reference scale in June 2020 with the first AirCore campaign in Cyprus. The WMO scale ensures common accuracy among observations from different platforms, i.e. in-situ, ground- and space-based remote sensing. The existing data set of 1.5 years of GHG data, together with the results of the AirCore comparison, are presented. Interestingly, two of the AirCore flights revealed elevated GHG levels in the upper troposphere, transferred by the Asian Summer Monsoon Anticyclone (ASMA). The latter provides evidence that long-range transported pollution originating in southeast Asia can reach the Eastern Mediterranean.