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Tropospheric NO_2 and HCHO columns derived from ground-based MAX-DOAS system in Guangzhou, China and comparison with satellite observations: First results within the EU FP7 project MarcoPolo

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A miniature MAX-DOAS system, Phaethon, has been developed at the Laboratory of Atmospheric Physics of the Aristotle University of Thessaloniki, Greece, for ground-based monitoring of column densities of atmospheric gases. Simultaneous measurements with two Phaethon systems at the city centre of Thessaloniki and at a rural location about 30 km away have shown that Phaethon provides NO_2 and HCHO tropospheric column measurements of acceptable accuracy under both low and high air-pollution levels. Currently three systems have been deployed in areas with different pollution patterns to support air quality and satellite validation studies. In the framework of the EU FP7 Monitoring and Assessment of Regional air quality in China using space Observations, Project Of Long-term sino-european co-Operation, MarcoPolo project, one of the Phaethon systems has been installed since April 2015 in the Guangzhou region in China. Tropospheric NO_2 and HCHO columns derived at Guangzhou during the first 10 months of operation are compared with corresponding retrievals from OMI/Aura and GOME-2/Metop-A and /Metop-B satellite sensors. The area is characterized by humid subtropical monsoon climate and cloud-free conditions are rather rare from early March to mid-October. Despite this limitation and the short period of operation of Phaethon in Guangzhou, the agreement between ground-based and satellite observations is generally good for both NO_2 and HCHO. It appears that GOME-2 sensors seem to underestimate the tropospheric NO_2, possibly due to their large pixel size, whereas the comparison with OMI data is better, especially when a small cloud fraction ($<$ 0.2) is used for cloud screening.