1.129 Observing the changing Anthropocene from satellites and from aircraft: SCIAMACHY/GOME/GOME-2/S5-P and EMeRGe .

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Abstract:

Population grew from 4M at the Neolithic Revolution (10000 BC) to around 1 Billion at the beginning of the Industrial Revolution (1750-1800 AD). This growth then accelerated rapidly and population is now over 7.6 Billion with more than 50% living in megacities or urban agglomerations, known as Major Population Centres, MPC. The impact of pollution from anthropogenic activity of the MPC and related land use change now extends from the local to global scale. The world has entered a new geological epoch, the Anthropocene.

To assess accurately the evolving Anthropocene both space based an airborne measurement of atmospheric composition are a pre-requisite. The SCIAMACHY (SCanning Imaging Absorption spectrometer for Atmospheric CHartographY) project was proposed in 1988 to begin to meet the need. The SCIAMACHY project led to SCIAMACHY on ESA Envisat (2002 to 2012), the smaller GOME (Global Ozone Monitoring Experiment) 3 GOME-2 on the ESA/EUMESAT operational Metop A B and C(2006-2026), OMI on NASA AURA (2004-present). The new EU/ESA/EUMETSAT Atmospheric Copernicus programme comprises Sentinel 4 on MTG (2021-2036) Sentinel 5–P (2017- present)) and Sentinel 5 (2 satellites 2021 – 2037) on Metop Second Generation.

Aircraft measurements are needed to provide measurements at high spatial resolution of trace atmospheric constituents to test our understanding of how natural and anthropogenic emissions are modified and oxidised. The EMeRGe (Effect of MEgacities on the Transport and Transformation of Pollutants on the Regional to Global Scales) exploits the capabilities of the German HALO research aircraft and its sophisticated in situ and remote sensing payload. EMeRGe synergistically exploits the observations from HALO, FAAM and smaller aircraft, together with data from ground based and satellite instrumentation. This presentation will provide highlights from 23 year of spaced based remote sensing and first results from the unique EMeRGe campaigns in Europe in 2017 and Asia in 2018.