



G3E – Geostationary Emission Explorer for Europe: mission concept

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Anthropogenic activities release various gaseous and particulate substances into the Earth's atmosphere affecting air quality and climate. The greenhouse gases carbon dioxide (CO_2) and methane (CH_4) are particularly important drivers of man-made climate change while ozone (O_3), carbon monoxide (CO) and aerosols are major players in tropospheric photochemistry controlling air quality. Once released to the atmosphere the fate of man-made pollutants and climate forcers is controlled by natural removal processes.

We present the mission concept of the Geostationary Emission Explorer for Europe (G3E). G3E primarily aims at accurately measuring CO_2 and CH_4 column-average concentrations across Europe with spatial and temporal resolution of a few kilometers and a few hours, respectively. Such spatiotemporally dense imaging of the greenhouse gas concentration fields above Europe is expected to boost our ability to disentangle anthropogenic emissions from natural source and sink processes and to impose unprecedented observational constraints on surface flux quantification. In support of the retrieval and interpretation of greenhouse gas concentrations, G3E's grating spectrometers cover a wide spectral range from the near infrared into the shortwave infrared. This facilitates estimates of column-average CO and aerosol abundances providing extra information on air-quality from a geostationary view. A flexible pointing design further allows for selecting focus regions beyond the European continent in order to address the surface flux budgets of other regions of interest such as tropical Africa. We demonstrate G3E's capabilities in terms of prospective instrument design, observation concept, and retrieval performance.