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Monitoring of atmospheric Greenhouse Gases using a four-dimensional variational (4D-Var) data assimilation System in the GEMS Project

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In the spring of 2005 the European Commission awarded funding to the GEMS (Global and regional Earth-system Monitoring using Satellite and in-situ data) project within their sixth Framework programme. The GEMS project is a collaborative effort between the European Centre for Medium-Range Weather Forecasts (ECMWF) and many European research institutes and aims at creating a new European operational system for global monitoring of atmospheric chemistry and dynamics, and an operational system to produce improved medium-range and short-range air-chemistry forecasts through much improved exploitation of satellite data.

The greenhouse gas subproject aims at building a monitoring system based on the operational four-dimensional variational (4D-Var) data assimilation system to monitor the atmospheric concentrations of CO_2 and CH_4 using satellite observations from AIRS, Sciamachy, and IASI. These four-dimensional fields will then be used by the partner institutes to obtain better estimates of surface flux inventories. Much progress has been made over the last 2 years both in the area of CO_2 modelling and in the area of assimilating data from AIRS and Sciamachy to constrain the modelled atmospheric concentrations.

We will present an overview of the current status of the CO_2 modelling, including validation studies, and of the data assimilation of AIRS radiances. Several months of AIRS data for the summer and fall of 2003 have been processed, which provides a first indication of the quality and added value of the satellite data. Preliminary flux inversions using this dataset will also be presented.