

Expansion of the atmospheric greenhouse gases observations with global satellite coverage in
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Greenhouse gas observation from space are under way with instruments like SCIAMACHY, AIRS, TES and others providing useful data on methane and carbon dioxide, complimentary to surface networks. In 2009 two dedicated missions - GOSAT in Japan and OCO in USA will join the effort targeting more precise observation of CO₂ column mean concentration by measuring high resolution atmospheric transmission spectra in near infrared range for the first time. Expected accuracy of the observations (in the range of 0.3-1% volume mixing ratio) is comparable to observed natural synoptic scale variability in the Northern hemisphere, thus allows one to retrieve useful information about the surface fluxes and atmospheric transport from the observed concentrations. Better quantification of the climate-carbon cycle feedbacks at regional and global scale can be expected with the availability of the new observations. However, many problems of the concentration retrieval and data analysis are being faced for the first time. Complexity of the data analysis process is contributed by interplay of the dynamics of the greenhouse gases, aerosols, clouds and meteorology, all affecting the retrieval procedures and flux inversion schemes. Earth system models developed for climate research incorporate all those important processes and can become unique tools well suited for solving the problems of concentration retrieval and further applications of the data.