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Ground based FTIR system for high-accuracy measurements of atmospheric CO_2 and CH_4 columns

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Our knowledge of the global carbon cycle has several uncertainties that make it difficult to correctly model sources and sinks of important atmospheric greenhouse gases like CO_2 and CH_4. One such uncertainty is the role of plants in the global CH_4 cycle. Recent studies suggest that living plants could actually be net producers of CH_4. These results are backed by first CH_4 measurements from SCIAMACHY on Envisat. These show enhanced CH_4 especially over the tropical rain forests when compared with modeled global CH_4 distributions.

However, the retrieval of CH_4 from SCIAMACHY and other future satellite instruments is difficult and has to make several assumptions, for example about the vertical CO_2 distribution. These assumptions and the resulting retrievals need to be validated. However, groundbased measurements of the column atmospheric CH_4 and CO_2 distribution that the satellite sees are very sparse - especially with the required high accuracy and especially in tropical regions. Ground-based FTIR instruments can provide the necessary accuracy but need to be able to also observe the total column of oxygen in order to relate the CH_4 and CO_2 column measurements to the total air mass.

The Max-Planck-Institute for Biogeochemistry in Jena, Germany, is currently preparing such an FTIR instrument for employment in the tropics. The exact location will be determined by summer 2007. The instrument will be able to observe the temporal variation of CH_4 and CO_2 and these results will be interpreted with the help of global source and sink models and possibly tall tower measurements at the site. Like a satellite instrument it will observe the total column of these trace gases and possibly provide some altitude information. It will therefore provide an ideal reference and validation site for future SCIAMACHY and OCO measurements of CO_2 and CH_4 in the very active tropical region.