

Observations of Greenhouse Gases Over the Central Himalayas

Manish Naja¹, Hitoshi Mukai², Toshinobu Machida², Y. Tohjima², Narendra Ojha¹, T. Sarangi¹, and Rajesh Kumar¹

¹*Aryabhatta Research Institute of Observational Sciences
Manora Peak, Nainital - 263 129, India; manish@aries.res.in*

²*Center for Global Environmental Research, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki 305-8506 Japan; lnmukaih@nies.go.jp ; tmachida@nies.go.jp*

The recent report of the Intergovernmental Panel on Climate Change found that most of the observed warming over the past half-century is very likely to be caused by human activities. It is now well understood that global warming is real and it is not withstanding with cooling effect due to other trace species. Observations show that most of the greenhouse gases are increasing at significant rates, particularly in Asian region. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land-use change, while those of methane and nitrous oxide are primarily due to agriculture. Geographical distributions of some of the greenhouse gases, particularly CO₂, and quantification of their sources and sinks have large uncertainties. Knowledge and understanding of different physical processes, which are controlling their variations, are important for reliable predictions of these gases. Therefore, in order to recognize human impacts and assess their significance, we need to have measurements of greenhouse gases with greater geographical and temporal coverage.

Importantly, observations for greenhouse gases are severely lacking in Asia, particularly in south Asia. Further, precise measurements of greenhouse gases in many sites are also essential to estimate regional fluxes and support modeling activity. Realizing this, observations of greenhouse gases were initiated over a high altitude site (Nainital, 29.37N, 79.45E, 1959 m amsl) in the central Himalayan region. Weekly air sampling have been conducted since September 2006. Glass bottles are employed for sampling and air samples are collected after removing water vapor by a cold trap. These air samples are analyzed for various gases (CO₂, CH₄, CO, N₂O, SF₆ and H₂) at National Institute for Environmental Studies (NIES), Japan using a non-dispersive infrared analyzer (NDIR) and gas chromatograph (GC). Observation of CO suggests that this site has minimal influence of local pollutions and generally its levels are 100-200 ppbv. Occasionally, its mixing ratio observed to be about 500 ppbv. Levels of CH₄ are observed to be slightly higher (~1.95 ppmv). CO₂ mixing ratio varies from about 365 ppmv to 400 ppmv with low values in summer-monsoon and sometime extending until autumn, while maximum is in spring. Observations of N₂O and SF₆ show positive trends. More details discussions will be made during presentation.