Assessment and Modelling of CO₂ Fluxes over India

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A 'National Carbon Project', under the ISRO Geosphere Biosphere Program was initiated in 2007 with aim to estimate net carbon balance for India through completion of specific studies that include, (a) spatio-temporal observations and analysis of ground measured and remote sensing (RS) derived columnar atmospheric CO₂, (b) measurement of net CO₂ exchange (NCE) between vegetation and atmosphere using eddy covariance approach, (c) modeling of terrestrial landatmosphere fluxes using biospheric models, (d) estimation of ocean-atmosphere CO₂ fluxes using empirical models and (e) estimation of net CO₂ emissions from land use change. The project established NCE observations with eddy-covariance technique over agricultural and forest sites. Results from one season over wheat crop at Meerut were used to calibrate GPP and respiration sub-models and upscale fluxes with remote sensing inputs [1]. The ocean-atmosphere CO₂ fluxes for Bay of Bengal, Arabian Sea, Equatorial and Southern Indian Ocean were estimated using an empirical model that used RS-based wind speed. CASA model estimated NPP of 1.54 PgC for 2003 [2]. Analysis of AIRS mid-troposheric CO₂ data over India for seven years (2002-2008) indicated annual growth of CO₂ to be 2.05 ppm^{a-1} over Indian region, with lower estimates over Bay of Bengal and southern Indian Ocean. Comparison of CO₂ variability with modeled land-ocean fluxes indicated strong modulation of atmospheric fluxes by land and Arabian sea. The average net flux of carbon attributable to land use change, using IPCC 2006 methodology indicated a source of 5.65 Tg C yr⁻¹ during 1982–1992 which changed to a sink level of 1.09 Tg C yr⁻¹ during 1992–2002[3]. The other ongoing and proposed activities such as strengthening of observation network, analysis of multi-satellite column CO₂ (from AIRS, SCIAMACHY and GOSAT) and up-scaling of fluxes from eddy-covariance towers is likely to improve understanding of gross and net C balance over India.

Keywords: Atmospheric CO₂, India, Net Primary Production, Ocean CO₂ flux, Eddycovariance, Land cover-Land use Change, Net C emission.

References

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