[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-CG Complex & General

[A-CG35]Global Carbon Cycle Observation and Analysis

convener:Kazuhito Ichii(Chiba University), Prabir Patra(Research Institute for Global Change, JAMSTEC), Toshinobu Machida(国立環境研究所, 共同), David Crisp(Jet Propulsion Laboratory)
Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
The Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) is a landmark agreement in the 21st Conference of the Parties (COP21) in December 2016, which aims at reduction of greenhouse gases (GHGs) emission for keeping the global warming below 2 degC. The national commitments and progresses should be carefully monitored and verified by international bodies.

In recent years, the number of observational platforms for monitoring atmospheric GHGs and air pollution species is increasing. National or regional emission inventories have also been prepared at greater resolution in space and time using different methodologies. However, due to uncertainties in modeling and sparse observation network, high uncertainty persists in global and regional sources/sinks estimations, particularly for CO2.

Developing integrated observation and analysis systems for GHGs are the most urgent tasks. Atmospheric transport models, inverse models, and process-based bottom-up models should be tested and improved. The "top-down" (with inverse models) and "bottom-up" (with surface flux/emission network data and ground-based models) estimations have to be reconciled for gaining confidence in verifying the national commitments.

The purpose of the session is to discuss state-of-the-art techniques for estimations of surface budget of GHGs and air pollutants. Ideally, these results would allow us to detect changes at an early stage under the changing climate and human activity, and to disseminate scientific knowledge for mitigation policies in a timely manner. Improved estimates of emissions from land use change, forest fires, and other anthropogenic sources (urban developments and thermal power station etc.) should be addressed. We also welcome discussions for designs and plans for future studies targeting city and country scale emission estimations using sophisticated modeling tools.

[ACG35-P03]Carbon balance shifts controlled by land use change and ENSO in Southeast Asia

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Human activity and climate variability induce large variations in net carbon flux in the pantropics, shifting the direction of flux either to the land or to the atmosphere. In Southeast Asia, land use change (LUC) emissions account for a major fraction globally and climatic conditions are directly influenced by El Niño Southern Oscillation (ENSO). However, the variability of net carbon flux in Southeast Asia is not fully understood, and there has been no detailed studies addressing effects of the LUC and climate on flux variability. In this study, we used multiple terrestrial biosphere models and atmospheric carbon dioxide (CO_2

) inversions to investigate the decadal variability of net carbon flux in Southeast Asia over the past 30 years, with an aim to identify underlying factors controlling the decadal variability of net carbon flux. We show that terrestrial biosphere models, which consider LUC, yield an interannual and decadal variability of net carbon flux that are consistent with the result of atmospheric CO_2 inversions, indicating trends towards a net source from the 1980s to the 1990s, and towards a net sink from the 1990s to the 2000s. We found that increased LUC emissions during the 1990s was the major attribution for the trend found in the period 1980s–1990s, and the absence of strong El Niño events during the 2000s was the cause for the trend towards a net sink in the period 1990s–2000s. Our findings suggest that increases in temperature, associated with El Niño events, induce a strong carbon release in Southeast Asia, giving rise to large anomalous emissions in 1982/1983, 1987/1988, and 1997/1998. A further analysis suggests anomalous carbon emissions by recurring strong El Niño events after 2009, which in turn implies that net carbon flux in the 2010s may shift again towards a net source if LUC emissions are not suppressed.