1. Background of this study

As a part of a 3-years project “integrated carbon observation and analysis system for early detection of carbon cycle change in global and Asia-Pacific region” supported by the Ministry of the Environment Japan, we are now trying to estimate the carbon flux over Asian region using top-down and bottom-up analysis. WRF/Chem-VPRM is applied for the estimation of regional-scale transport and flux exchange between atmosphere and land surface.

2. Model Configuration

Base model: WRF-ARW version 3.5 with GHG and VPRM (chem_opt=17)
Meteorological data: Mesoscale Reanalysis from Japan Meteorological Agency (5km)
Terrain data: 50-m mesh elevation data of the Geospatial Information Authority of Japan
Model domain: 250 x 250 grids (3km) for the eastside of Japan, 35 layers
Calculation period: 2007 January to March (output interval: 30 min.)
Initial and lateral boundary for GHG: taken from our global chemical transport model (CO2 from ACTM, CH4 and CO from CHASER)

Emission:
- REAS 2.1 (0.25 degree, anthropogenic)
- Takahashi (1996) (4 x 5 degree, ocean)
- FINN (biomass burning)
- online VPRM (biogenic)

3. Results at AsiaFlux sites

Generally the model well reproduces the met. field and CO2 concentration at FHK (Fuji Hokuroku). Tagged tracers (lower right) shows most of eventual increases were caused by the anthropogenic emissions within the domain. Sometimes (e.g. March 5) the impact of continental airmass can be seen. It seems the model tends to underestimate uptake by vegetation, and more detailed comparison between model GEE+respiration and observed NEE.

4. Results at WDCGG sites

WRF/Chem-VPRM generally captured temporal variation of CO2 concentration at remote sites. High-CO2 airmass was transported from central Tokyo area to northward on 3 March.

EVI and LSWI: estimated from surface reflectance from 8-day, 500-m mesh MODIS data

LSWI with different landuse types

EVI with different time period