Update on WRF-GHG model development

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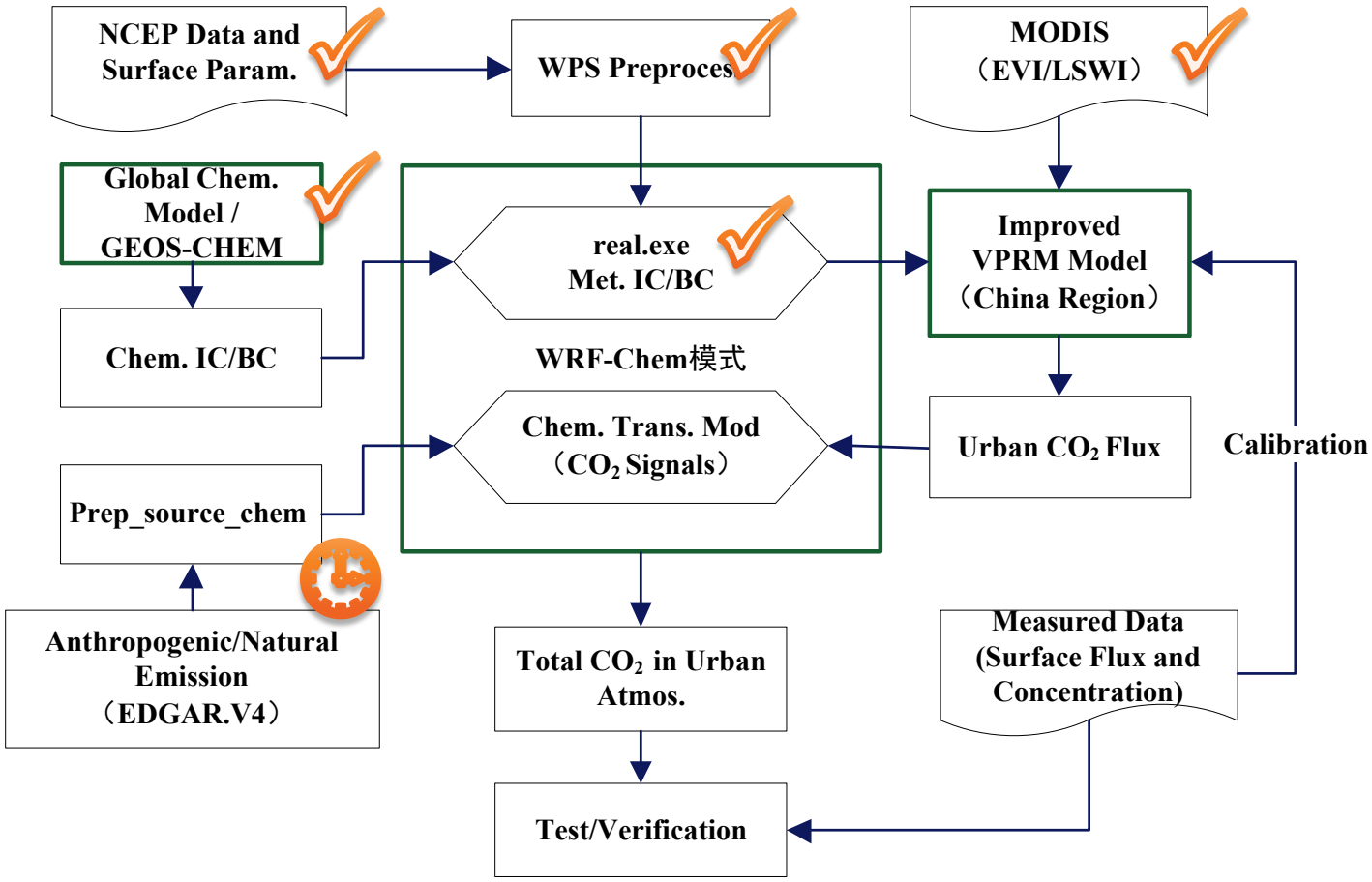
Outline

- System and Data Required/Preparing
- WRF-GHG Framework
- VPRM Model and it's preprocessor
- GEOS-CHEM current status
- Summary
- On-going work and difficulty

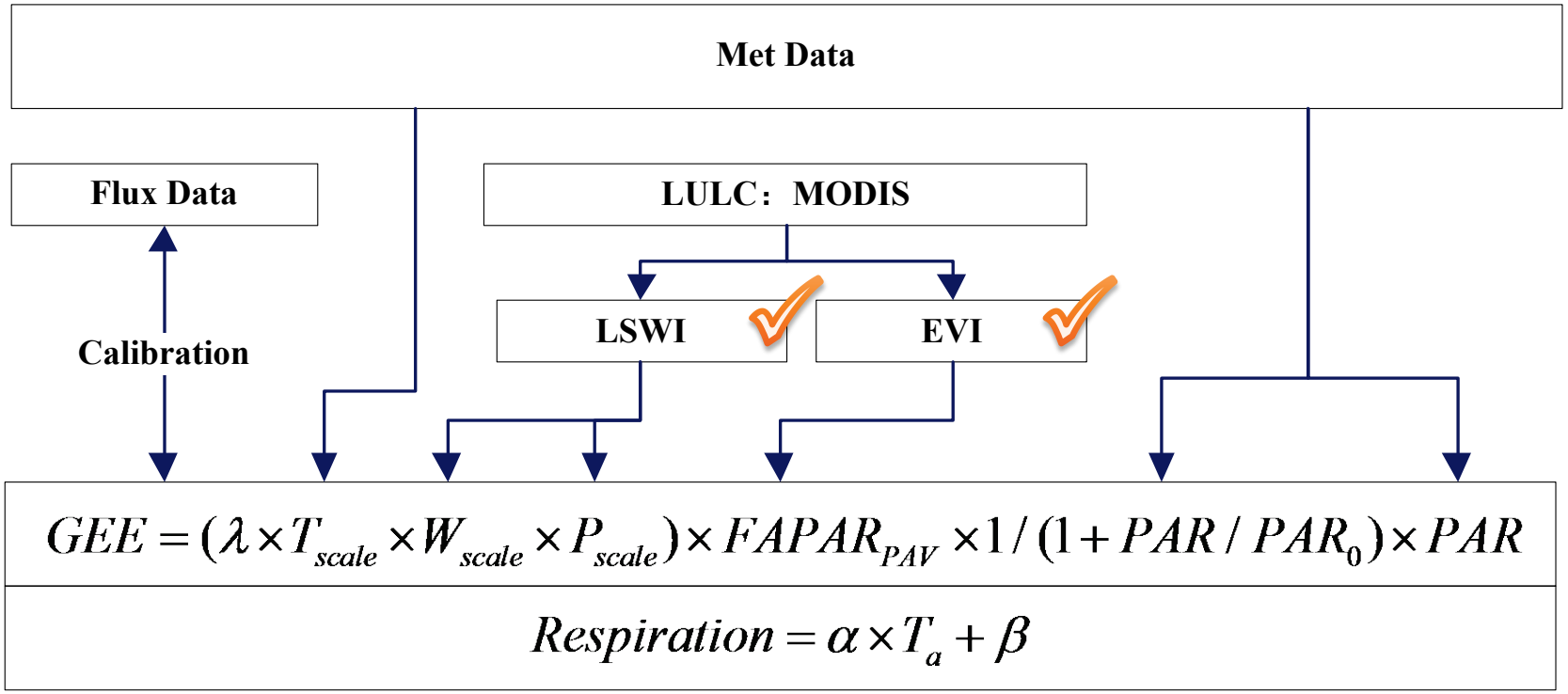
System and Data Required/Prepared

- Hardware: Intel I5-760, 4 core, 16Gmem.
- OS: Centos-6.2-x64
- Software:
  - MPICH2, Intel Fortran Comp. 11.1, NetCDF 4, HDF4/5.
  - R Language (including some R Libraries)
  - NASA MODIS Processing Tool: MRT and LDOPE
  - NCL, IDL and GAMAP.
- Data:
  - GEOS-CHEM Met./Trace Gas/Veg. etc. (Harvard)
  - MODIS data (NASA), Emissions(Edgar4.2)

WRF-GHG


NCEP Data and Surface Param.
WPS Preproces
MODIS (EVI/LSWI)
Global Chem. Model / GEOS-CHEM
real.exe Met. IC/BC
Improved VPRM Model (China Region)
Chem. IC/BC
WRF-Chem模式
Chem. Trans. Mod (CO_2 Signals)
Urban CO_2 Flux
Calibration
Prep_source_chem
Anthropogenic/Natural Emission (EDGAR.V4)
Total CO_2 in Urban Atmos.
Measured Data (Surface Flux and Concentration)
Test/Verification

VPRM Model

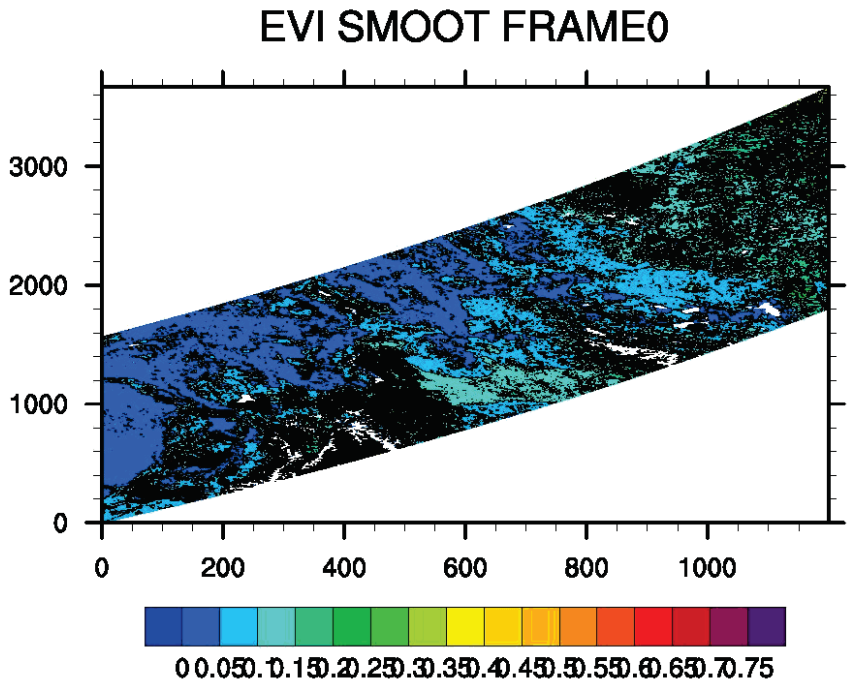

Met Data
Flux Data
LULC：MODIS
LSWI
EVI
Calibration
$GEE = (\lambda \times T_{scale} \times W_{scale} \times P_{scale}) \times FAPAR_{PAV} \times 1/(1 + PAR/PAR_0) \times PAR$
$Respiration = \alpha \times T_a + \beta$

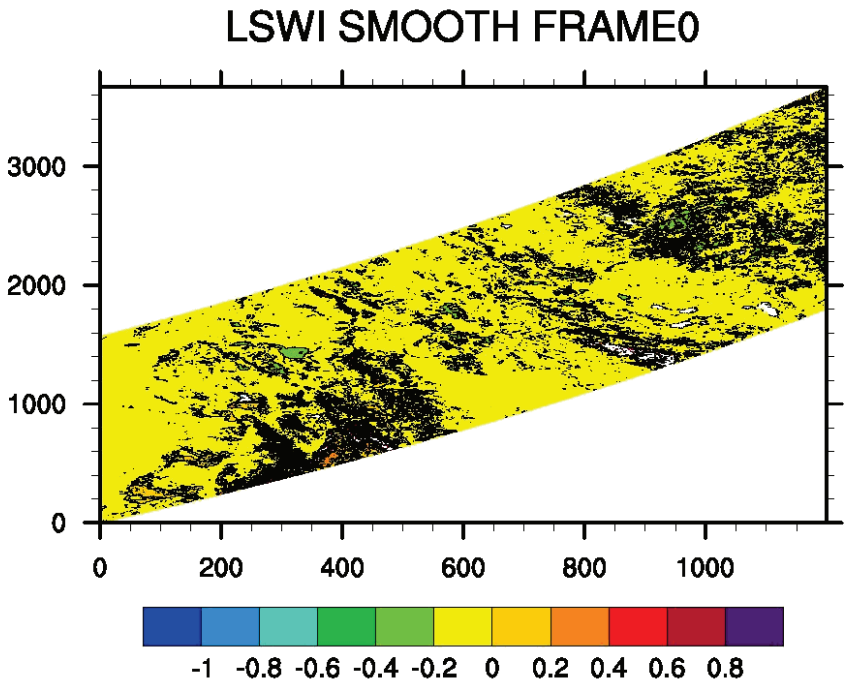
VPRM Preprocessor

- Almost all of the major modules of vprm-preprocessor has been debugged.
- The EVI/LSWI indices between 2010145 to 2010177, combined with synmap, has finished (in 1km by 1km resolution, need to be regridded in wrf further).
- The work stuck at the last step, which will merged the all slices in one netcdf file including "vegetation fraction".
- So, the above means the vegetation fraction is still not get now.
- The one month output for EVI/LSWI showed as below:

Some results from the preprocessor

- 34 tiles will covered the whole research region.
- One frame represent evi/lswi results extracted from a 8days modis data.



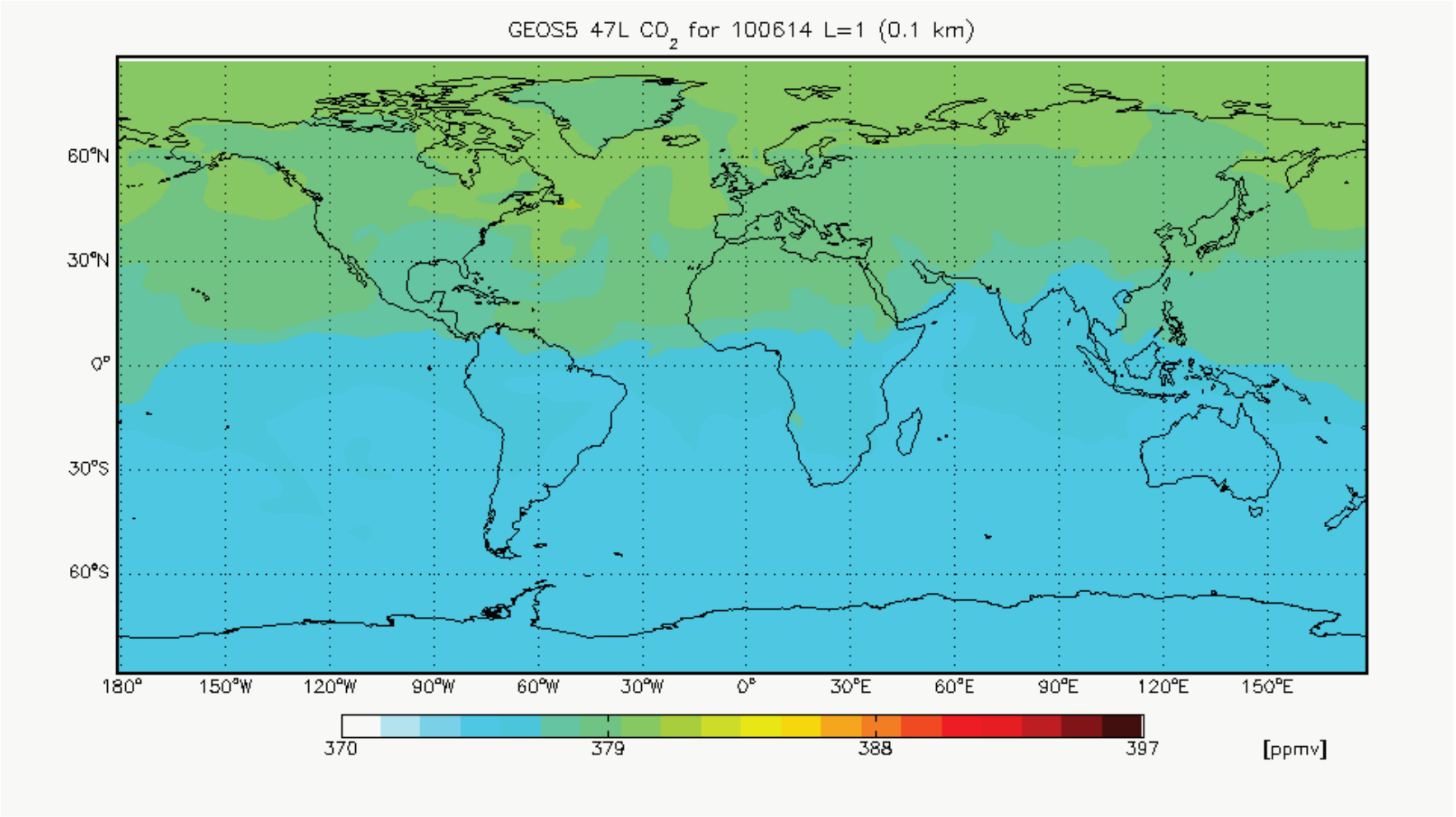


GEOS-CHEM CO_2 Simulation

#	Name	Description	g/mole
1	CO2	Total CO2	44
If you wish, you may add tracers for additional CO2 sources:			
2	CO2ff	CO2 from fossil fuel emissions	44
3	CO2oc	CO2 from ocean emissions	44
4	CO2bal	CO2 from balanced biosphere	44
5	CO2bb	CO2 from biomass burning emissions	44
6	CO2bf	CO2 from biofuel emissions	44
7	CO2nte	CO2 from net terrestrial exchange	44
8	CO2se	CO2 from ship emissions	44
9	CO2av	CO2 from aircraft emissions	44
10	CO2ch	CO2 from chemical source	44
11	CO2corr	CO2 chemical source surface correction	44
For a full tagged CO2 simulation, you can add the following tracers. NOTE: These extra tracers are only valid for a 2 x 2.5 simulation.			
12	CO2bg	CO2 background (including only fossil fuel CO2)	44
13-52	CO2xx	CO2 tracers produced in various geographic regions	44
53	CO2se	CO2 from shipping	44
54	CO2av	CO2 from aviation	44

http://acmg.seas.harvard.edu

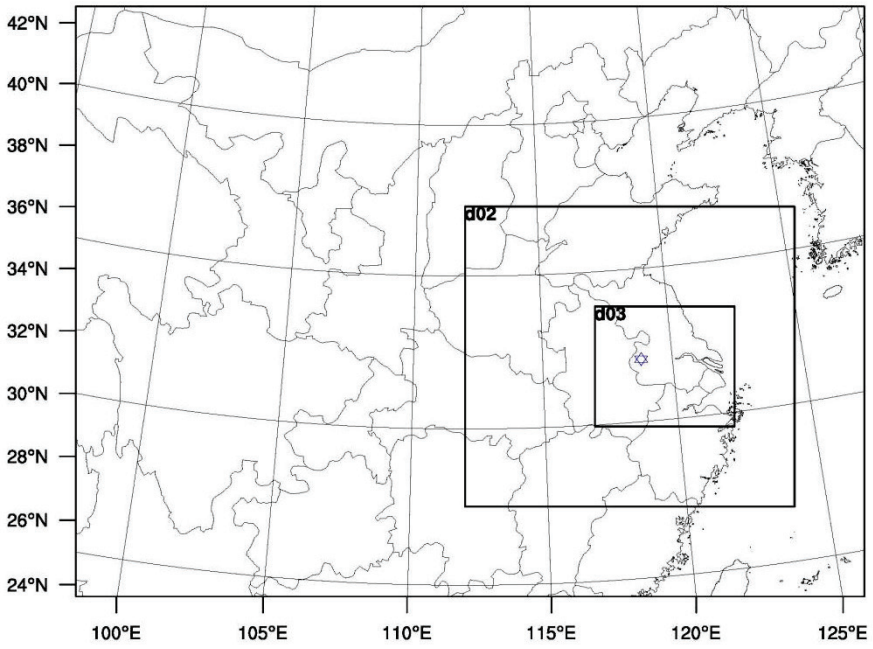
15 days result from geos-chem

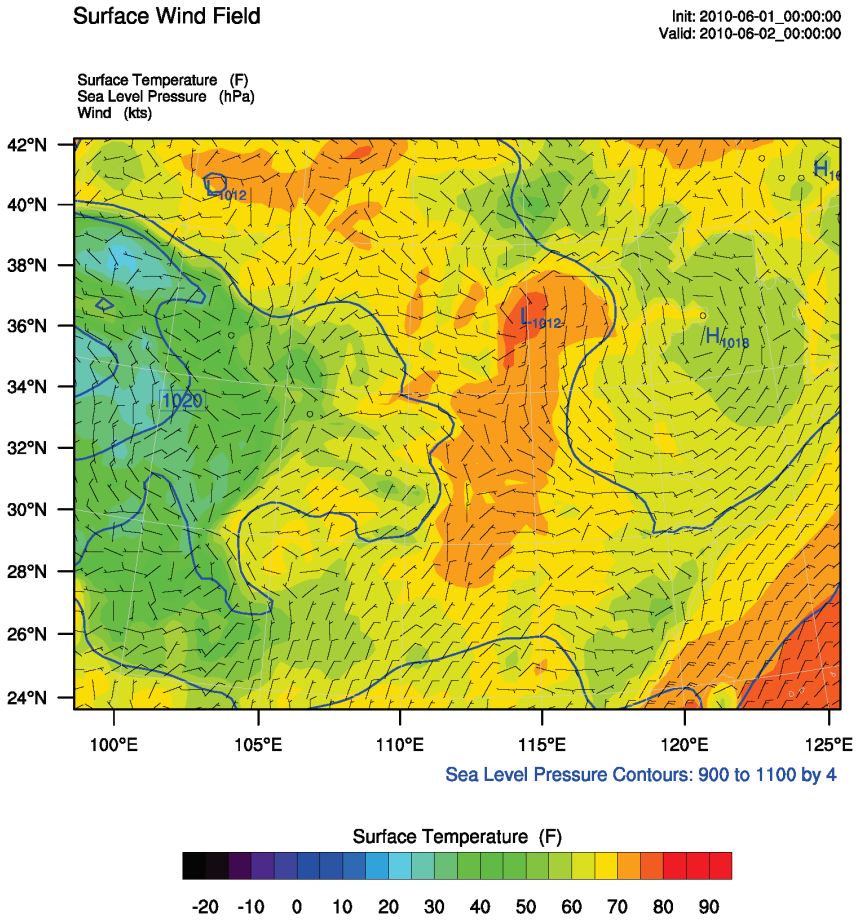


WRF-Chem

- We use 3 nested domains: 36-12-4 (km)
- The model runs fine.
- The results from geos-chem will be merged in wrfinput/wrfbdy.
- All the configure and simulation period keep identity with that of Jianping's.

WRF Test


WPS Domain 2010145
d02
d03
42°N
40°N
38°N
36°N
34°N
32°N
30°N
28°N
26°N
24°N
100°E
105°E
110°E
115°E
120°E
125°E


Surface Wind Field
Init: 2010-06-01_00:00:00
Valid: 2010-06-02_00:00:00
Surface Temperature (F)
Sea Level Pressure (hPa)
Wind (kts)
1012
1012
1020
42°N
40°N
38°N
36°N
34°N
32°N
30°N
28°N
26°N
24°N
100°E
105°E
110°E
115°E
120°E
125°E
Sea Level Pressure Contours: 900 to 1100 by 4
Surface Temperature (F)
-20 -10 0 10 20 30 40 50 60 70 80 90

Summary

- The current computing platform is satisfied just for testing and slight runs.
- All the test data has been prepared.
- The preprocessing work for VPRM is almost done.
- The CO_2 IC/BC Global chemistry done.
- WRF-Chem runs fine.

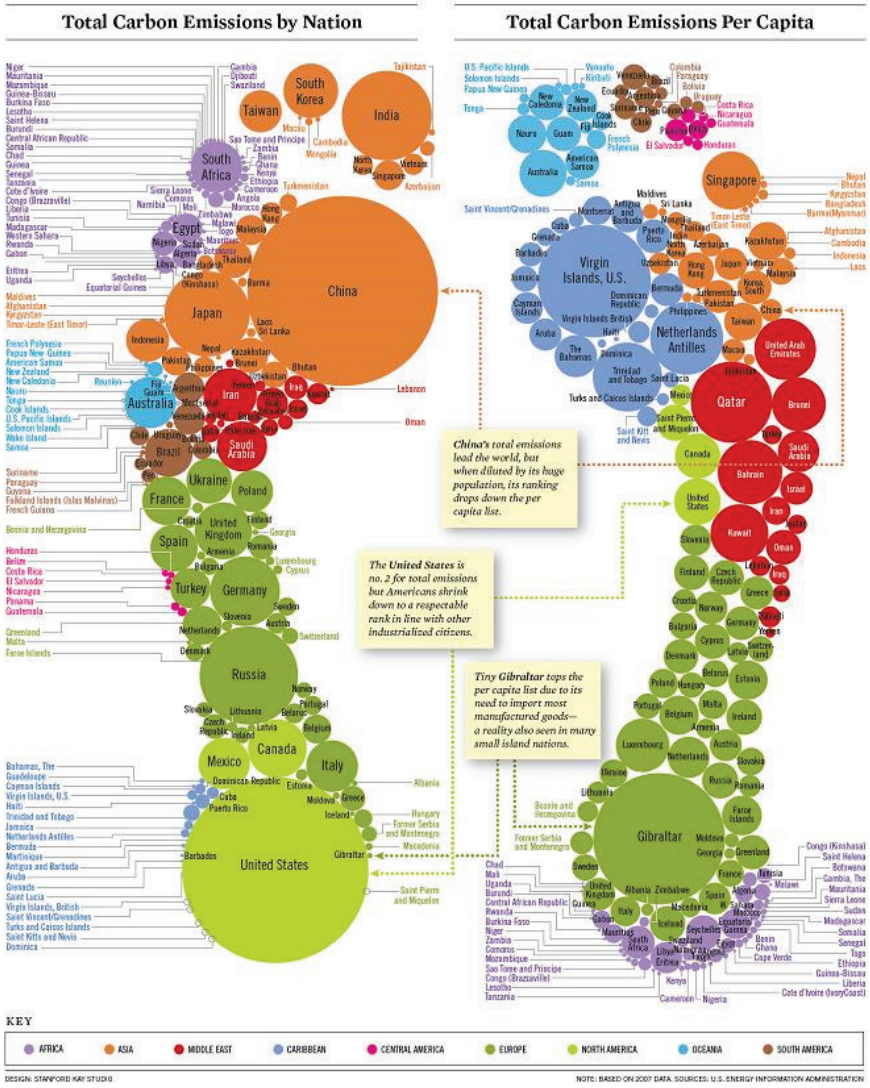
On-going work and difficulty

- Anthropogenic/natural emissions need to be tested.
- The parameters of VPRM model will be calibrated with the measured surface flux.
- To merge all the emissions and test.
- To check the model robust for long-term runs.

Tracking Carbon Emissions

A footprint comparison of total carbon dioxide emissions by nation and per capita shows there's plenty of room for smaller countries to reduce their carbon footprints.

By Stanford Kay



Thanks.