BioEarth

Biosphere-relevant earth system model

Atmospheric Group Workgroup I.A Progress report

All-Hand Meeting
February 20, 2013
Pullman, WA

Team Members

Atmospheric Team		
WSU:		
	Jennifer Adam	Sarah Anderson*
	Serena Chung	Dave Evans*
	Brian Lamb	Mingliang Liu
	Tsengel Nergui	Joe Vaughan
NCAR:		
	Alex Guenther	Xiaoyang Jiang
PNNL:		
	Ruby Leung	Jinho Yoon

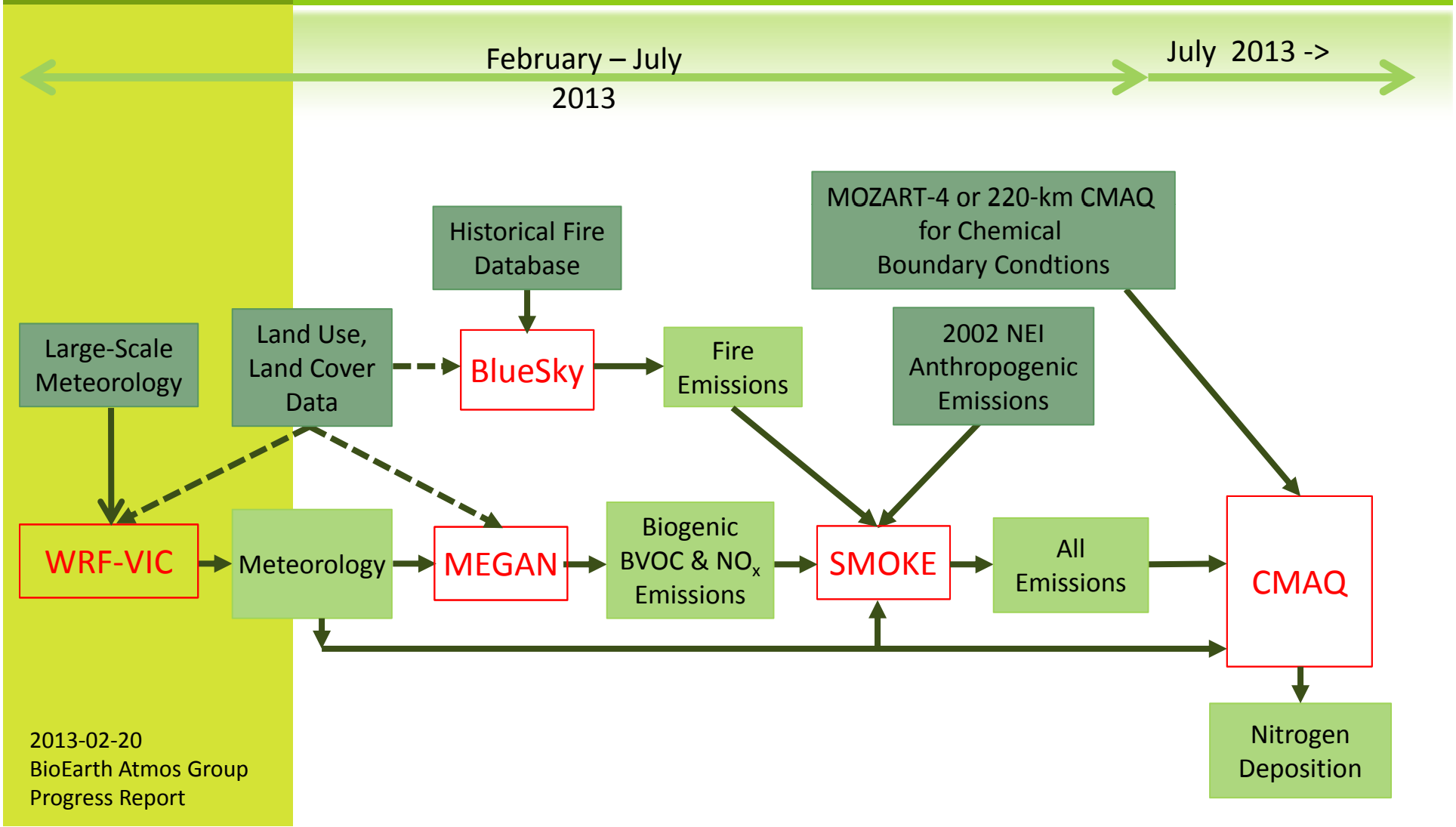
*"New" to Atmospheric Group

Quick Update

- Coupled WRF-VIC (using flux coupler)
  - Able to run for 1 month for western US using 12 km x 12 km cells
  - Initial testing indicates results are ok; more evaluation is underway
- MEGAN
  - Paper on MEGANv2.1 publised *in Geophys. Model Dev*.

    http://www.geosci-model-dev.net/5/1471/2012/gmd-5-1471-2012.html
- CMAQ Simulations
  - On hold
- Wavelet Analysis on N Wet Deposition Rates and Climate Variability
  - Results presented at AGU in December

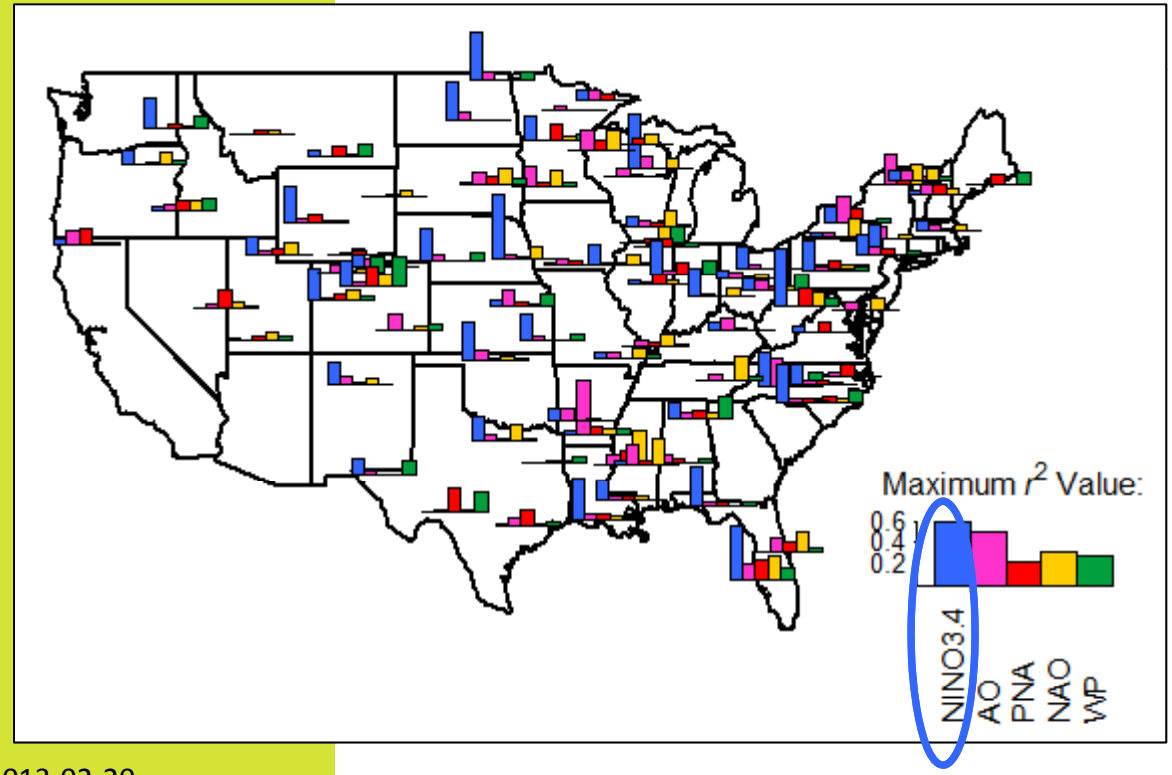
Sequential Simulations Timeline



2013-02-20
BioEarth Atmos Group
Progress Report

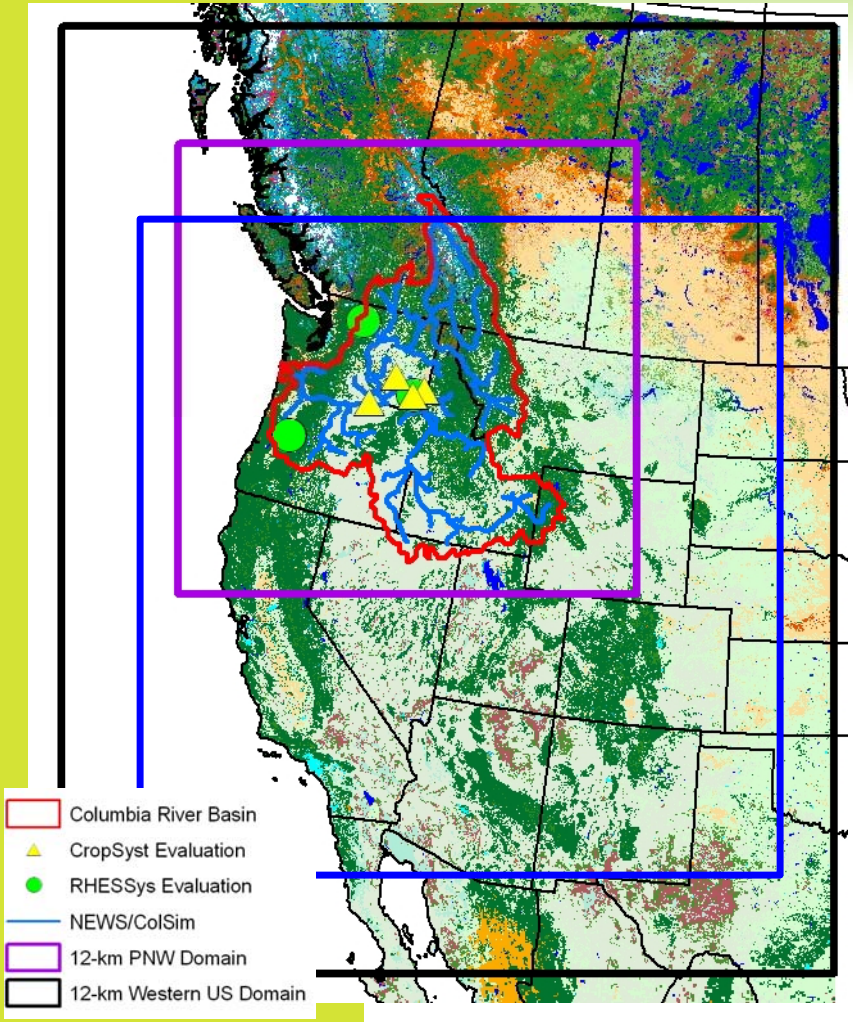
Climate Variability and N Wet Deposition Rates

r^2 between power spectrum of various climate indices and $NO_3^- + NH_4^+$ wet deposition at NAPD sites



- Currently refining the analysis by detrending NAPD data
- Plan to have manuscript written by August 2013

Model Evaluation: ENSO Effects on N Deposition



- Focus in effects of ENSO
  - Jan 1997- Dec 1999 and/or

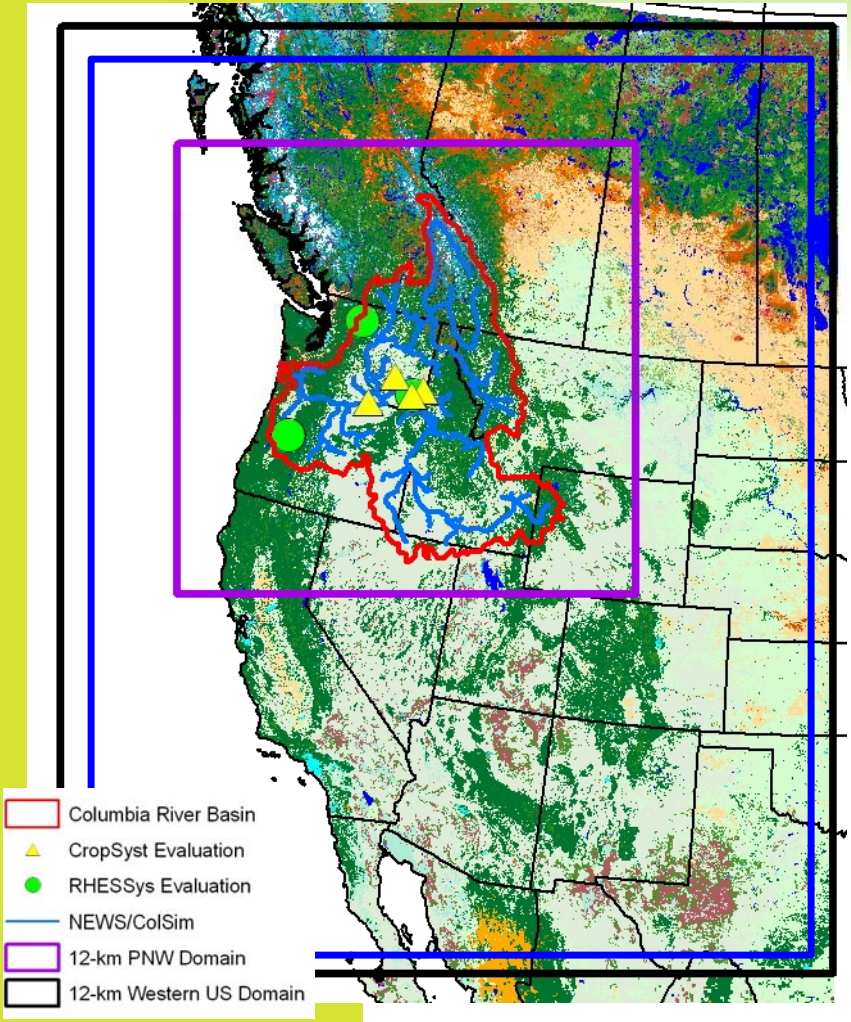
    Jan 1988 –Dec 1992
  - Constant anthropogenic emissions
    - EPA NEI 2002
  - Constant Chemical Boundary Conditions
    - MOZART-4 or 220-km CMAQ

WRF Domain, 233 x 285 (12-km)^2 cells

CMAQ Domain 1

WRF-CMAQ-VIC/CropSyst Domain

Modeling Source Attribtion: of N Deposition



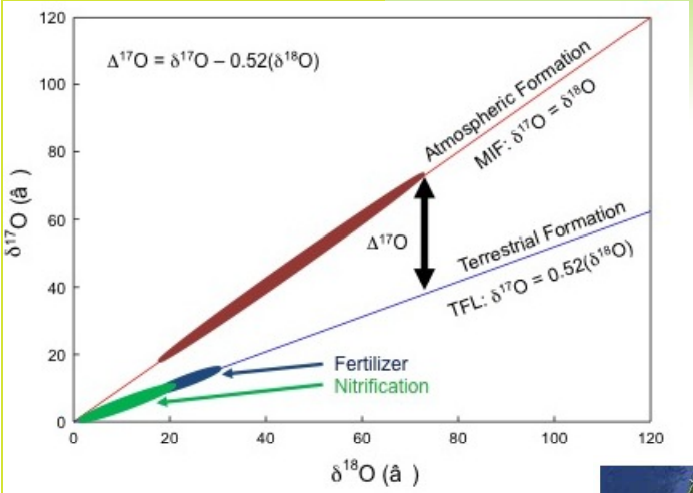
- CMAQ-Adjoint ("inverse" model)
- In combination with HYSPLIT and Synoptic weather analysis
- Several weekly simulations
  - Matching samples used for isotopic analysis

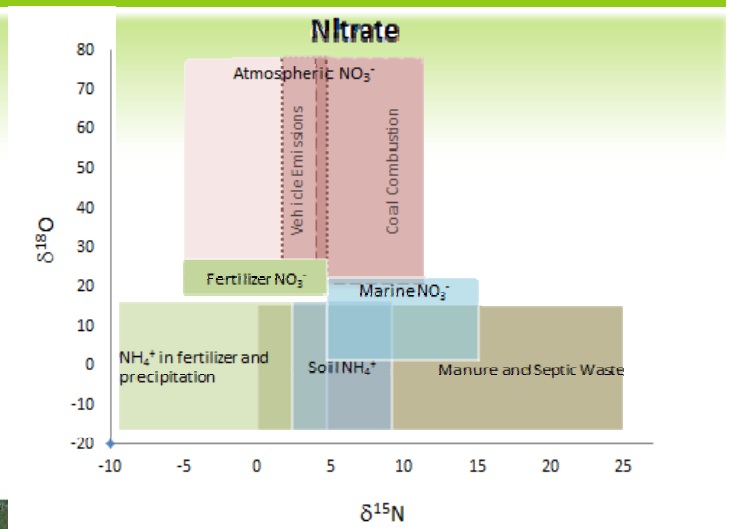
WRF Domain, 233 x 285 (12-km)^2 cells

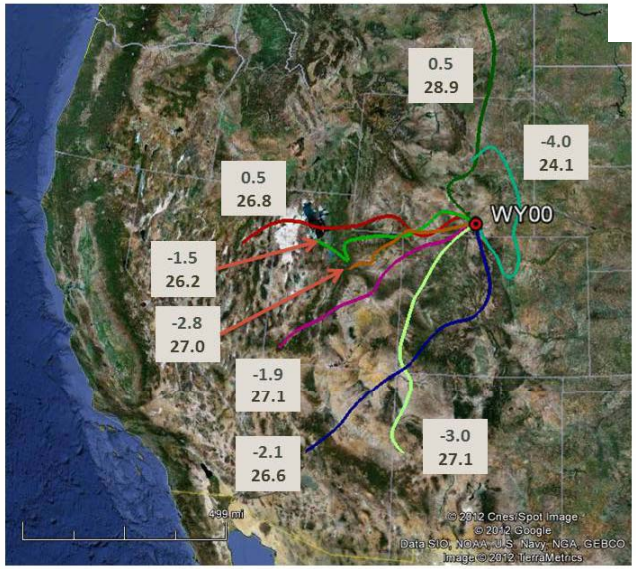
CMAQ Domain 2

WRF-CMAQ-VIC/CropSyst Domain

Source Attribution using Isotopic composition







8/15/2000
7/25/2000
7/4/2000
6/27/2000
8/24/1999
4/28/1998
8/19/1997

$\delta^{15}N$
$\Delta^{17}O$

adapted from Kendall et al. 2007 & Elliott et al. 2009

2013-02-20
BioEarth Atmos Group
Progress Report

MEGAN
Ongoing / Planned Activities

- Integrating MEGAN into Bioearth
  - Coupling with VIC-RHESSys-CropSyst
  - Coupling with CESM/CLM (boundary conditions) (done)
- Improve soil nitrogen emissions (NO, NH_3, N_2O)
- Add particles: pollen, fungal spores, bacteria, dust
- Use MEGAN in BioEarth to identify scientific questions that can be addressed with a PNW regional field study
  - Landcover change (e.g. poplar plantations)
  - Interactions of biogenic emissions and anthropogenic pollution