BioEarth Milestones: Dec 2, 2011

PROJECT INTEGRATION: years 1-5

1. Model Full Integration Timeline
    a. Years 1 and 2:
        i. Terrestrial:
            1. VIC-RHESSys integration/parameterization
            2. Routing and reservoirs online with VIC
        ii. Atmospheric:
            1. WRF/VIC parameterization over our western US domain
            2. WRF-CMAQ over our western US domain
    b. Year 3-5:
        i. Terrestrial:
            1. Inclusion of crops into RHESSys
            2. VIC-RHESSys-MEGAN (i.e., incorporation of newest version MEGAN (version 3.0) for biogenic emissions, as is currently being done for CLM)
        ii. Atmospheric: (WRF-CMAQ)/VIC
        iii. All WG I: (WRF-CMAQ)/(VIC-RHESSys-MEGAN)
    c. Years 2 through 5: Economic
        i. Development and full integration of a grid-based economic model (in Matlab) with simpler economics than the richer GAMS model being developed offline
2. Offline Model Simulations and Development (for addressing relevant questions that don't require the fully integrated BioEarth model, and for determining scaling relationships needed for scaling to larger domain, but may run sequentially with BioEarth components)
    a. Terrestrial:
        i. RHESSys focus study sites: Years 1-2
        ii. VIC-CropSyst improvements and focus study sites: Years 1-3
        iii. NEWS: Years 2-5
    b. Economic:
        i. GAMS modeling, rich economic analysis over basin: Year 1
3. Land Cover Consistency
    a. Use of NLDAS2 in WRF-VIC during years 1-2
    b. Use of Guenther land cover dataset in developing RHESSys, starting year 1
    c. Use of Guenther land cover dataset for all BioEarth terrestrial models starting year 3
4. Outreach Meetings
    a. 2 stakeholder each year during years 2-5 (agricultural, forestry, regional tribe representatives)
    b. Analysis of interactive communication: Years 2-5

WG Ia ATMOSPHERIC GROUP: years 1-2

1. January through July
    a. WRF-VIC historical runs
        i. VIC params (plan to use NLDAS2 soil and veg prior to integrating with MEGAN and RHESSys)

ii. Evaluation of simulations over historical period
iii. WRF-VIC offline simulations complete by end of July – be sure to give at least 4 hour output for CMAQ to make sure that WRF-VIC provides all the output needed CMAQ (may require adding more variables to WRF output by changing the Registry)

b. CMAQ setup
i. By early Jan – get domain/terrain info from Ruby
ii. Start getting emissions info (spatial) – Jan –Mar (Rodrigo will help Tsengel)
iii. ENSO variability analysis over historical period, Joe's student or Tsengel?
iv. Determine what chemical boundary conditions to use for CMAQ runs and get them

2. July through December
a. CMAQ runs using WRF-VIC output: time needed depends on number of years for simulation
b. Analysis on deposition results from CMAQ output
c. ENSO analysis on WRF-VIC simulations
d. papers out on ENSO and land/atm interactions as modulated by ENSO cycles
3. Post December: climate change experiments – e.g., CMIP5 data being prepared from CCSM4 – creating of WRF input files from this

WG Ib TERRESTRIAL GROUP: years 1-2

1. RHESSys focus study sites (i.e., improvements of RHESSys on N processes and evaluations over small watersheds)
a. (Dec) Site selection: Wet – McKenzie (Willamette); Dry – TBD (Deschutes)
b. (Jan) Data collection:
i. Climate Data – using a NetCDF reader.
ii. Physical data – DEM, land cover, vegetation type, biomass, soil type, N-loading…(data sets should be consistent with BioEarth)
iii. Evaluation data – water discharge, flux data, N export (if available)
iv. Remote sensing data – Modis, TM…
c. (Jan) Database construction
d. (Mar) wet site simulations and analysis
e. (Apr) dry site simulations and analysis
f. (Jul) submission of first paper. Research question: How do increases in temperature (and associated shifts from snow to rain) impact local/patch-scale N retention and export for a range of local settings, including: 1) elevation, 2) vegetation type and biomass, and 3) N-loading. This analysis focuses on local processes only and does not include the impact of hillslope-watershed redistribution.
g. (Sep) reporting scaling strategy based on focus site analysis for upscaling RHESSys: trade-off between resolution and processing time
2. VIC-RHESSys integration (i.e., RHESSys upscaling)
a. (Dec) Acquire VIC version (from VIC-WRF with space before time architecture)
b. (Jan) Develop grid cell masking file (based on watershed boundaries rather than latitude/longitude coordinates)

c. (Jan) Augment all data collection for #1 above over entire western US domain for VIC-RHESSys parameterization, initialization, calibration and evaluation
d. Calibration and offline simulations of VIC and RHESSys with new land-use/land-cover data sets (NLDAS2) and metdata (a:NLDAS2 force data and b:WRF-VIC simulated climate) over the Columbia River Basin for the period of 1979-2008;
e. Develop and implement scheme for coupling VIC and RHESSys

3. VIC-CropSyst development for focus study site, Yakima River Basin
    a. Improve soil physics in VIC for coupling with CropSyst
    b. Improved soil parameters and recalibration over Yakima
    c. Manuscript preparation: examination of relative impacts of climate change and irrigation efficiency on crop yield
4. Inclusion of routing and reservoirs into VIC with space-before-time architecture

WG Ic CYBERINFRASTRUCTURE: years 1-2

1. Support for BioEarth communications:
    a. Forum is already in place. **Goal is by Dec 2012 all users will be using the forum as a major means of project communication and generating memorandum/a documenting progress.**
    b. Support for tele-web-conferencing of the group. **Solve need for web-conferencing support by February 2012.**
2. Support for BioEarth codes:
    a. Code acquisition – Background: an earlier request for people to communicate/covey codes and data to Joe has resulted in zero codes offered for transfer. Next step is, by **February 2012, to solicit individual project members and negotiate a plan and schedule for code acquisition**. **Goal is for basic codes to be collected by December 2012.**
    b. Code storage -- we'll use subversion for storage of codes and scripts. **Conduct a *subversion* training by March 2012.?**
    c. work-flow -- we've identified Kepler as a promising tool to create script-like control codes. **Sequential workflow for WRF implemented as test by March 2012. Sequential workflow that integrates more than one model program by June 2012. Implementing Provenance features for the implemented workflows by December 2012.**

(All the CI milestones include associated documentation to ensure usability by the whole group)

WG II ECONOMICS: years 1-2

1. August 2011-March 2012
    a. Develop computable general equilibrium model of the regional economy
    b. First stage currently underway is the development of a partial equilibrium model that only focuses on the agriculture sector. The base model will be developed further along the following lines:

        i. Sub-regional disaggregation
        ii. Temporal disaggregation into monthly or weekly time steps
        iii. Production and cost function specification and parameterization
        iv. Stochasticity
    c. Move from partial to general equilibrium by developing a CGE-I/O model
2. April 2012-March 2013
    a. Develop framework for and implementation of sequential and iterative integration of CGE Economic model with other modeling components
    b. Develop theoretical framework for fully spatially disaggregated grid cell based economic model that can be fully integrated/coupled with other modeling components.
    c. Preliminary implementation of fully coupled model.

WG III COMMUNICATIONS & EXTENSION: years 1-2

1. By Spring 2012: continue interview analysis (ahead of schedule in proposal)
2. Fall/Winter 2012: First round of workshops