**CEOS WGCV Land Product Validation Subgroup**

**2nd Bi-annual Land Surface Phenology Product Validation Meeting**

**Milwaukee Sept 14, 2012**

**Introduction and overview of the LPV sub-group – Joanne Nightingale**

**Introduction to LSP validation meeting – Jadu Dash (LSP focus area co-chair)**

* + Background and re-cap of last meeting in Dublin, June 2010.
  + Overview of LSP definition as agreed upon via discussion after Dublin meeting – located at U of Arizona website
  + LSP in context of LPV land product validation stages
  + Overview of meeting, review of available data, panel led discussion to address how we combine site/satellite, define pilot projects

**Review of Remote Sensing data products – Jadu Dash**

* + Review of curve and metrics
  + Review of products, NACP (N. America), MOD12Q2 (Global), USGS (N. America), VGT4Africa (JRC, Coverage?), VIP (Global), PHAVEOS (Phenology and vegetation EO service) (Global)

**Review of Camera networks – Michael Toomey (Harvard University)**

* + RS for phenology summaries – Myneni 1997, White 2009
  + Relating when veg starts to change chemistry, water, physiology
  + Phenocam (N. America) – ref panels for site comparisons, estimating relationships between phenology and ecosystem functions by calculating % greenness (~17000 photos per year), one-size-fits-all camera solution.
  + Phenological Eyes Network (PEN), Japan - since 1999, 28 sites globally (9 countries mainly in Japan), radiometers, cameras and sun photometers, trying to assess the best index for estimating phenology/GPP
  + PhenoAlp (French/Italian), co-located instrumentation
  + Lund (Scandinavia, Greenland and Sahel), mainly boreal and arctic forestry
  + Hubbard Brook (New Hampshire)
  + Summary – numerous resources (6 local to regional networks, globally) with a rich suite of environmental measurements

**Ground Measurements and Citizen Science – Jake Weltzin (NPN)**

* + Terminology of ground-based for organism collection and near-surface networks
  + Nationally-distributed observation sites USA NPN. Program is called Nature’s Notebook, 5000 observer sites registered
  + Breaking leaf buds, increasing leaf size, leaves, deciduous trees etc, mean number of days of observations
  + New tool available by end of calendar year
  + NEON – planned for 30 years, 60 sites within 20 ecoregions, flux towers, phenocams and other ecophysiological measurements – integrated within the next ~5years
  + Project budburst, US
  + Natures calendar, UK
  + ClimateWatch Australia – 2000 observers, native and non native species, most aren’t deciduous, still implementing QA and won’t be available for a while, measurements are not co-located with other measurements
  + NZ has a plant phenology network that is relatively new
  + Canada - Alberta Plantwatch, 26 years of data
  + Swedish citizen science, not publically available – will be made available through European database
  + Ireland – International Phenological gardens via Berlin, other smaller networks, data isn’t available due to lack of QC
  + Turkey – Phenology Network of Turkey - just getting started
  + Pan European Phenology (PEP) database – set up in 2004, some observations from 19th century, data are available if registered, selection country or species, data comes in text file form – contact for large data downloads, 2 peaks spring and smaller autumn, native plants mainly from eastern European countries
  + International Society of Biometeorology phenological monitoring, global dataset of standardized anomalies (lat, long, alt, month and species), 2001 – 2010, to derive a lsp product from ground observations, identify “traits” for similar species to develop products
  + Chinese phenology network

**Core Sites and Pilot Projects – Jeff Morisette (DOI/previous LSP co-chair)**

* + New since 2010
    - Results from NACP indicate that better phenology is required (Richardson, GCB 2012 Vol18, 566-584)
    - Stockli, JGR Vol 116 2011 – Global Reanalysis of veg phenology
    - Use NPN and webcams
    - National Climate Assessment and NASA looking for proposal contributions re phenology
      * Advances in active sensors for LSP
      * No dedicated person (or funding) to move effort forward
      * Proposals won’t be funded for validation sake – RS validation will be done via coupled land atmosphere models
  + Site selection in terms of Type A and B sites
    - Type A: Ground observations and multiple resolution scaling analysis
    - Type B: Pheno cams with network observations
  + Seasonality issues, globally representative based on international collaboration to evaluate a range of biomes, and people using products at sites that we are trying to “validate”
  + Overlay site with Bill Hargrove’s phenoclusters – similar phenological signals based on MODIS NDVI – data-driven clustering algorithm, then find network data in each phenocluster
  + Validation issues related to spatial resolution of LSPs (scaling field measurements)
  + Aseasonality issues

**Panel Discussion**

* + Towers at aseasonal sites, crops with 2 seasons and anthropogenic influences, monsoonal low season, variable seasonality
  + LC products developed for needs of climate modeling community
  + What is needed? Timing? Locations? Comparisons on C-models saw input of phenology being problematic (Richardson paper) prognostic models out of sync by ~2months, better datasets are needed for model refinement and calibration
  + GCM land surface intercomparison paper (Pitman 2011) disparity in representation of phenology makes it difficult to compare GCM outputs
  + **Mark Schwartz**
    - Two 600x600m sites, 900 trees in WLEF (Liang 2011) data to be available via NPN in the future
    - Observation techniques and how the measurements are taken, there are various techniques and standards
  + **Mark Friedl**
    - Not measuring an ecological variable, comparing timing indices of ground to satellite, different indices = different answers, validating RS products and comparing with in situ, remote sensing ecochamber = using in situ to validate RS products but we use RS to tell us about ground measurements – which way to look at this problem, focus on natural veg, but a large proportion of the planet is agriculture and need to use crop calendars etc – how to do this….
    - Start with SOS, EOS and length to start small
  + **John Kimball**
    - Tower sites into a climate space, rank sites hierarchically, rank on phenotypically similar behavior, shape analysis techniques
    - Best practices to analyze for regions, then develop a set of core sites and define needs for underrepresented areas, spatial upscaling and full representation, microwave, optical, tower, overstorey and understory behavior and carbon exchange – detailed at a few sites across the globe and build more sites for augmentation
    - Rigorous analysis of uncertainty, i.e gap-filling, gaps and use of smoothing and curve definition techniques, methods for forward model simulations
    - Mountains of observations - exploit semi-automated dynamic data mining and mapping, quantitative information i.e phenocams
  + **Geoff Henebry**
    - Beyond SOS, EOS because of problems with aseasonality
    - Keep in mind we are looking at timing rather than the “shape” of the time series
    - Look at status changes rather than events to use ground data
    - Other visible and NIR indices that may be useful, thermal infrared, microwave rather than just NDVI and EVI because we are looking at processes and systems – will get different answers, but that is ok because we are looking at different aspects of the system, use more information to understand more about the system
    - Communicate WHAT we are measuring…..definitions….more clearly articulating what each dataset is providing
    - Leverage human managed systems
    - Assess uncertainties, esp temporal uncertainties due to compositing
    - Reconciling scales of observations
  + **Jake Weltzin**
    - Use of Hargrove phenoclusters, framework to build on
    - This will help NPN coordinate observations
  + **Jesslyn Brown**
    - Provide access to ground observations, but issues to do with species abundance is important
    - Provide species information around towers, and package them more cohesively
  + **Allison Donnelly**
    - Distribution - average day of budburst and add in variability of species starts (when we see different seasonality of same tree species next to one another)

Overall:

* + Ground observation community needs to understand RS community, spectral mixing, global products are too coarse, local-regional required
  + Averages of ground observations and they are seen in the RS data
  + How much biomass is actually on the ground before it’s actually visible in the RS signal – spatial arrangement of greenness, grass and understory impacting satellite information, might be a good idea to fully understand agriculture signal before moving into heterogeneous systems
  + National greenwave product from dominant species, spring indices
  + Proposals from US/Europe/Asia-Pacific

**Tasks:**

**Geoff Henebry**:

* + NASA National Climate Assessment – North America, Agriculture, existing data – pathfinding, Geoff to follow up with colleague who has experience in this particular aspect to lead this initiative, 10-page proposal due in 3 weeks.
  + Geoff to inform LSP group about the status of this proposal and if any help from the community is required.

**Jadu Dash:**

* + Jadu to provide Jaime Nickeson with updates for LPV webpage links, phaveos, vgt4africa etc.

**Joanne Nightingale:**

* + Joanne to organize a side follow-up meeting for key LSP people at the Fall AGU meeting in December, San Francisco, that will focus on iteration of a final set of LSP evaluation sites (within phenoclusters, with phenocams and ground-based observations, based on Type A and B sites)

**Jadu Dash and Matt Jones**:

* Contact Bob Cook (ORNL) and invite him to the AGU side meeting. Discuss ORNL hosting LSP data bundles and site subsets as well as hosting field, camera, satellite for the LSP validation community