Why An Ecological Observatory System for Colombia?

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- Why are we here?
- Observatory systems
- Conceptual framework for integration



Why are we here?



Bundesministerium für Bildung und Forschung





Convocatoria Intercambio de Investigadores con Europa 2015 Wissenschaftlich-Technologische Zusammenarbeit (WTZ) mit Kolumbien, 2015



EOS, An Ecological Observatory System for Colombia



- Identify resources, for detecting, characterizing and monitoring hotspots of ecosystem change in Colombia.
- Outline a research strategy for implementing an Ecological Observatory System (EOS) that integrates ground-based observations of ecosystem properties with satellite-derived products.
- Develop an EOS prototype for a small region in Colombia.
- Identify funding opportunities for the establishment, operation, and maintenance of the Colombian EOS.

Objectives:

- Start a discussion forum to explore the possibility of an EOS
- Learn about current related activities in Colombia
- Learn about related activities in other countries



What is an observatory system?





What is an observatory system?







What is an observatory system?



Long-Term Ecological Research Network



- 26 sites in diverse ecosystems
- Goals: understanding, synthesis, information, legacies, education, outreach
- Core research: primary production, population studies, movement of inorganic and organic matter, disturbances.



National Ecological Observatory Network NEON



- 20 terrestrial and 20 aquatic sites in 20 domains
- Data collection across multiple scales
- Designed as a continental-scale observatory platform



Integrated Carbon Observation System ICOS







What is an Observatory System for?

- Quantify what we have (biodiversity, carbon, water, ...)
- Detect trajectories of change
- Understand natural processes and their interactions with social systems
- Policy planning and evaluation
- Enable scientific research

. . .



Should Colombia have an EOS?



- Colombia is in the middle of a historical political and socio-economic transition
- Ecosystems are also going through unprecedented rates of transformation
- There are already a large number of efforts and programs to build on top of them

- Biodiversity and ecosystem services?
- Essential biodiversity variables EBVs?
- Biogeochemical stocks and fluxes?
- Land cover and use?
- Human activities?



A conceptual framework for an EOS

State variables

- Set of variables used to describe the state of an ecosystem
- In most cases, it is not possible to observe them directly

Observational variables

- Set of variables that can be measured from a system
- The number of observational variables are not necessarily the same as state variables





Consider the $n \times 1$ vector \boldsymbol{x} of state variables defined for discrete times t and spatial grid-cell s. We are interested in finding

 $p(\boldsymbol{x}_{t,s}|\boldsymbol{y}_{t,s}),$

where \boldsymbol{y} is a $m \times 1$ vector of observed variables for some times t at spatial points s.



Example MODIS NPP and GPP



EOS

Example MODIS NPP and GPP



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- State variables $x_{t,s}$: GPP, NPP
- Observations vector $y_{t,s}$: FPAR, Rnet, Tmin, VPD, LAI
- Model: $y_{t,s} \rightarrow x_{t,s}$



$$\boldsymbol{x}_{t,s} = f(\boldsymbol{y}_{t,s})$$

- Need to define a set of state variables \boldsymbol{x} first
- Then, design a strategy to collect information \boldsymbol{y} and models f()
- If interested in forecasting, define a probability model $p(\boldsymbol{x}|\boldsymbol{y}, \boldsymbol{e})$



- Science-based network design
- Community and stakeholder engagement
- Governance structure
- Financing and sustainability



- EOS is a discussion forum about the conceptual design of an observatory system for Colombia
- The set of state variable and observations need for the observatory will be a subject of debate
- Topics about science questions, network structure, financing, governance, still have to be discussed.



Thanks, questions?



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