Workshop on Sustained Observations for Carbon Cycle Science and Decision Support
13 – 14 April 2016, NOAA Earth System Research Laboratory, Boulder, CO

Wednesday 13 April, Room GC402
Webinar: https://attendee.gotowebinar.com/register/7453486344374725889

8:30 Welcome and logistics
8:40 Charge to the Workshop (desired workshop outcomes, national and international context, including SOCCR-2) – Arlyn Andrews
8:55 Sustained observations of carbon and the bootlegging of big science – Ralph Keeling
9:15 The role of sustained observations in the US Carbon Cycle Science Plan – Anna Michalak
9:35 US GEO and the National Plan for Civil Earth Observations – Tim Stryker (remote)
9:55 The US Greenhouse Gas Inventory – Leif Hockstad (remote)

10:15 Break

10:35 The Global Carbon Project -- Rob Jackson
10:55 The NASA Decadal Survey and the role of satellite observations in a sustained carbon observing system – Dave Schimel

11:15 Breakout 1 – Developing a Strategy: Review of current capabilities and assessment of gaps

12:15 Lunch, Room GB124

1:00 Lessons from the NASA Carbon Monitoring System – George Hurtt
1:20 Forest carbon accounting and biologic carbon sequestration – Grant Domke
1:40 Sustained observation of the ocean including ocean acidification – Rik Wanninkhof, Adrienne Sutton

2:00 Breakout 2 – Developing a strategy: Using observations to understand the global carbon cycle

3:00 Break

3:20 Multi-species constraints on the global carbon cycle – Pieter Tans
3:40 Ocean time-series measurements – Matt Church, Steve Emerson
4:00 Measuring vulnerable reservoirs: Tropics – Doug Morton
4:20 Measuring vulnerable reservoirs: Arctic – Steve Wofsy, Ted Schuur, Lori Bruhwiler
4:40 Estimating GHG emissions at urban scales – Riley Duren, Anna Karion
5:00 Plenary discussion

5:30 Adjourn

6:45 Workshop Dinner at the historic Chautauqua Dining Hall
**Thursday 14 April, Room GC402**
Webinar:  [https://attendee.gotowebinar.com/register/7453486344374725889](https://attendee.gotowebinar.com/register/7453486344374725889)

**Case Studies: Research to Decision Support – Emissions**
8:30 Estimating global CO2 emissions using data assimilation – Kevin Gurney
8:50 Estimating US oil and gas emissions – Bob Harriss, Gaby Petron
9:10 Emissions monitoring in California: a model for research to decision support – Marc Fischer, California Air Resources Board, Riley Duren
9:30 Top-down and bottom-up estimates of North American methane emissions – Daniel Jacob
9:50 Plenary discussion

10:00 Break

**Case Studies: Research Concept to Sustained Observations**
10:20 NEON and the evolution of Ameriflux – Ankur Desai with contributions from Keenan/Biraud/Sturtevant/Schimel/Wofsy
10:35 Landsat -- Continuity of observations – Jeff Masek
10:50 Evolution of ocean observing systems – Ken Johnson/ Angel White
11:05 Use of in situ measurements via data-constrained models to evaluate OCO-2 retrievals – Chris O’Dell

11:20 Breakout 3 – Developing a Strategy: From short-term research projects to sustained observations/applications/big science

12:20 Lunch, Room GB124

1:00 Integrating models and observations: Ocean – Joellen Russell, Nikki Lovenduski
1:20 Integrating models and observations: Land – Forrest Hoffman, Yude Pan
1:40 Integrating models and observations: Atmosphere – Andy Jacobson, Randy Kawa

2:00 Breakout 4 – Developing a Strategy: Observing system design informed by models and intensive field experiments (Room GC402, Room GB124, Room 3D512)

3:00 Break

3:20 Lateral flows – transport of carbon in aquatic systems – Rob Striegl, Sarah Stackpool
3:35 The case for a national soil carbon network – Stephen Ogle
3:50 Toward predictive carbon cycle science – Scott Denning

4:10 Breakout 5 – Near-term opportunities, take home messages, and action Items (cross-disciplinary)

5:00 Plenary discussion – Summarizing workshop discussions
5:30 Adjourn
Breakouts:

Land/Group A: Room GC402
Webinar:  https://attendee.gotowebinar.com/register/7453486344374725889
(same as main meeting)

Ocean/Group B: Room GB124
https://global.gotomeeting.com/join/996915077

Atmosphere/Group C: Room 3D512
https://global.gotomeeting.com/join/158830277

1) Review of current capabilities and assessment of gaps
   - Consider agency summaries and written write-ups to be distributed before the workshop.
   - Consider the extent to which existing capabilities reflect current research foci.
   - Consider new and emerging technologies.
   - What auxiliary measurements support C-Cycle science (e.g. sea surface temperature, meteorological data)?

2) Utilizing observations to understand the global carbon cycle
   - What outcomes would you like to see from this workshop?
   - What have we learned from sustained observations?
   - Mapping current and potential measurement capabilities to science questions and goals from the 2011 Science Plan (i.e. how would a new sustained measurement capability advance understanding).
   - Are there research products that are already or are nearly mature enough to develop into “public services”?

3) From short-term research projects to sustained observations/applications/big science (cross-disciplinary)
   - Other examples where a sustained observing system has emerged from a collection of short-term research projects
   - Potential to develop new sustained observing capabilities and applications from current research projects
   - Potential for sustained satellite missions
   - Opportunities for public/private partnerships
   - Community efforts and federated networks
   - Building a case for coordinated support across agencies
4) Observing System Design with Models and Intensive Field Experiments
   - What new measurement strategies should be considered?
   - What networks exist for other purposes with infrastructure that could be leveraged?
   - What modeling tools are well-suited to this task?
   - Caveats and pitfalls (e.g. faulty assumptions, imperfect or inadequate models)
   - What mechanisms exist for agencies to support these activities?
   - What can we learn from intensive field experiments?

5) Near term opportunities, Take home messages, Action Items
   - Low-hanging opportunities for review/synthesis research (e.g., leveraging sustained carbon cycle observations for science and policy applications)
   - What messages should be highlighted in the written report?
   - What outcomes would you like to see from this workshop?
   - Mechanisms to engage broader community and those who were unable to attend in person.