

GC Carbon feedbacks in the climate system Report

1. Highlights for JSC

After its successful launch in November 2016, GC Carbon continued its work via a number of activities:

- A session “Carbon feedbacks in Earth’s climate system: using ocean and land variability to diagnose critical carbon cycle processes” was held at the AGU 2017 Fall Meeting in New Orleans. The session conveners were Ash Ballantyne (U Montana, USA), Tatiana Ilyina (MPI-Met Hamburg, Germany), Ana Bastos (LSCE, France), Benjamin Poulter (NASA-GSFC, USA). The session focused on novel drivers and new insights on inter-annual to decadal variability of terrestrial and ocean fluxes of carbon and nitrogen as well as turnover times of various carbon reservoirs to constrain future climate-carbon cycle feedbacks, both from observational and modelling perspectives. The session received wide attention and we are discussing currently to submit a session proposal for the 2018 AGU Fall Meeting
- A session “Ensemble Modeling Approaches in Physical and Biogeochemical Oceanography” was held at the 2018 Ocean Science Meeting in Portland. The session conveners were Keith B Rodgers (Princeton University), Thomas L Froelicher (ETH Swiss Federal Institute of Technology), Tatiana Ilyina (Max Planck Institute for Meteorology), Nicole S Lovenduski (University of Colorado). This session focused on studies that employ ensemble methods in a wide range of applications relevant to physical and biogeochemical oceanography and the role of the ocean in the climate system. Talks and posters particularly focused on the interplay between ocean physical and biogeochemical processes, processes in high-latitude environments, and studies of marine ecosystems under a changing climate.
- At the 4th International Conference on Earth System Modeling (4ICESM) held on 28 August – 1 September 2017 in Hamburg, Germany we held a session on Carbon feedbacks in the climate system (Convenors: Tatiana Ilyina und Pierre Friedlingstein) Keynote presentations were given by Anna Michalak (Stanford University, USA) and Pedro Monteiro (CSIR, Pretoria, South Africa). The session addressed the following questions: What are the drivers of land and ocean carbon sinks? What are the origins of variability of carbon sinks and is this variability predictable? How will the carbon cycle and feedbacks operate in a warming climate and how different were they in the past? What is the potential for amplification of climate change over the 21st century via climate-carbon cycle feedbacks? How do greenhouse gases fluxes from highly vulnerable carbon reservoirs respond to changing climate? These questions are profound to the GC-Carbon. Contributions to the session were from modeling, observational and process studies that address those questions in ways that link to Earth System Modelling.

2. Early success and/or planned activities in 2018/2019

- A workshop on carbon –climate feedbacks in Bern will take place during 25-27 April 2018. The goal of the workshop is to advance our understanding of feedbacks between the climate and the carbon cycle and extend the existing carbon-climate feedback workshop. The workshop therefore will bring together leading experts with background in physical climate and carbon cycle.
- A side meeting on Carbon Cycle Predictions and Predictability will take place during the Boulder prediction conference in September 2018. The community is building a critical mass around the topic of carbon predictions, it is critical to discuss plans, objectives, problems, and potentially think of some coordinated activity. The proposed side will bring together scientists working on near term predictions of the physical climate and carbon cycle. Methodologies, (first) results, encountered problems, good practices, next steps, etc. will be discussed and next steps will be planned.
- A session on "Improving the Understanding of the Carbon Cycle with Satellite Observations and Modeling" at the COSPAR Assembly 2018. The session will cover the topics including: (1) quantification of anthropogenic and natural carbon fluxes across different reservoirs, (2) process understanding of terrestrial and oceanic carbon cycle, and (3) feedbacks between the carbon cycle and the climate system. Preference will be given to studies that incorporate satellite observations and modeling. Session conveners are Junjie Liu and Nick Parazoo. Organizing Committee includes Tristan Quaife, University of Reading, United Kingdom Pierre Friedlingstein, University of Exeter, United Kingdom

3. Partners for GC implementation (within and outside WCRP community)

Future Earth programs: GCP, AIMES.

4. Overall GC timeline (include any milestones)

At GC Carbon kick-off workshop held in Hamburg in 2016, priorities and next steps have been identified. They outline our planned milestones for 2018 and beyond. These priorities are (1) extension of the current carbon cycle feedback framework and (2) near-term predictions of the carbon cycle.

5. Issues and challenges, for example:

- How do you work with CPs, other GCs and major WCRP groups
We are establishing cooperation with GC on near term predictions. The planned side meeting on Carbon Cycle Predictions and Predictability during the conference in Boulder will contribute to progress in both GCs.
- How you see your community evolving
We have identified near-term priorities and are still in the process of community building.
- How the current funding affects your community, your activities, your service
Uncertainty on funding for 2017 made us decide to postpone the feedback workshop to 2018, giving us more time and securing co-funding from AIMES and U-Bern. The workshop is organized with a smaller number of participants as initially planned.
