42nd Session of the WCRP Joint Scientific Committee  
28th June – 2nd July

WCRP Grand Challenge on Carbon Feedbacks in the Climate System

1. Highlights for the JSC

- **Contribution to CMIP6**
  - GC-carbon has played a major in contributing to C4MIP and ZECMIP, as well as to DCPP simulations including the carbon cycle.
  - GC-carbon pushed CMIP6 beyond its “boundaries” with emission driven large ensemble simulations (historical and SSPs) as well as emission driven decadal predictability simulations.

- **Contribution to GCP**
  - Strong interaction between GC-Carbon and Global Carbon Project (GCP)
  - Global Carbon Budget 2020, Friedlingstein et al., ESSD 2020.
  - Shaping future directions of global carbon budget assessment (metrics for mitigation, carbon sinks efficiency).

- **Contribution to IPCC AR6**
  - Climate-carbon cycle feedbacks
  - TCRE and compatible emissions
  - Carbon cycle response on high and low warming worlds
  - Predictability of carbon sinks and atmospheric CO₂
  - Two carbon cycle figures in the SPM (current version)

- **Several relevant publications, including:**
  - Friedlingstein et al., ESSD, 2020, https://doi.org/10.5194/essd-11-1783-2019
  - Liddicoat et al, JCLim 2021, https://doi.org/10.1175/JCLI-D-19-0991.1
  - Schlund et al, JGR, https://doi.org/10.1029/2019JG005619
2. Future of the Grand Challenge

Near term:
- TCRE assessment, including ongoing study on emergent constraints on TCRE and a broader community assessment
- Development of robust carbon annual to decadal prediction of the global carbon cycle to support the annual Global Carbon Budgets
- New work on mitigation metrics, carbon sinks efficiency to feed in GCB.
- C4MIP workshop, Autumn 2021

3. Advice from or questions to the JSC
- Where is the home for Carbon in the new WCRP structure?
- How to keep the GC-Carbon momentum in the new structure?