

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 role in contributing to C4MIP and ZECMIP, as well as to DCPD 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>
 - Ilyina, T. et al., GRL, 2021, <https://doi.org/10.1029/2020GL090695>
 - Spring and Ilyina, GRL, 2020, <https://doi.org/10.1029/2019GL085311>
 - Liddicoat et al, JCLim 2021, <https://doi.org/10.1175/JCLI-D-19-0991.1>
 - Terhar et al., Nature, 2020, <https://doi.org/10.1038/s41586-020-2360-3>
 - Terhar et al., Sci Adv., 2021, <https://doi.org/10.1126/sciadv.abd5964>
 - Matthews et al. Nat. Geo, 2020, <https://doi.org/10.1038/s41561-020-00663-3>
 - Schlund et al, JGR, <https://doi.org/10.1029/2019JG005619>

- Kwiatkowski et al., Biogeosci., 2020, <https://doi.org/10.5194/bg-17-3439-2020>
- Séférian et al., Curr. Clim. Change Rep., 2020, <https://doi.org/10.1007/s40641-020-00160-0>

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?