Grand Challenge on Carbon Feedbacks in the Climate System, Report (draft 1)

1. Highlights for JSC

- **Contribution to CMIP6**
  GC-carbon strong contributor to C4MIP and ZECMIP, as well as to DCPP simulations including the carbon cycle: coordination, design, simulations, analysis and publications.
- **Contribution to GCP**
  Strong interaction between GC-Carbon and Global Carbon Project. P. Friedlingstein leading the 2019 and 2020 Global Carbon Budgets.
- **Funding**
  EU H2020 Project 4C (coordinator P. Friedlingstein, 2019-2023), focus on improving understanding of current carbon cycle, develop policy-relevant decadal predictions of carbon cycle and long-term projections of mitigation effort.
  Project PalMod Phase II funded by the German Federal Ministry of Education and Research (BMBF, co-coordinator T. Ilyina, 2019-2022), focus on understanding slow feedbacks including the carbon-climate feedbacks in the Earth system during the last glacial cycle.
- **GC-Carbon meetings**
  - Side meeting "carbon cycle predictability", Barcelona, March 2019
  - Session on carbon cycle feedbacks at the AGU 2019
  - Session at the Ocean Sciences Meeting and Town hall meeting on carbon cycle predictability, February 2020, San Diego
- **GC-Carbon related Publications**
  - Arora et al., BGD, 2019, doi.org/10.5194/bg-2019-473
  - Friedlingstein et al., ESSD, 2019, doi.org/10.5194/essd-11-1783-2019
  - Jones et al., GMD, 2019, doi.org/10.5194/gmd-12-4375-2019
  - MacDougall., et al., BG, 2020, doi.org/10.5194/bg-2019-492

2. Primary science issues (looking ahead, 3 to 5 years)

- Provision of a GC-Carbon Assessment on TCRE (following the format of the WCRP ECS assessment), led by Chris Jones (UK MetOffice), Tatiana Ilyina (MPI, Hamburg) and Pierre Friedlingstein (U. Exeter). Timeline: next 18-24 months
- Development of robust carbon annual to decadal prediction of the global carbon cycle to support the annual Global Carbon Budgets
- Encourage GC-Carbon focused analysis of carbon cycle and climate response in CMIP6 ESMs

3. Issues and challenges, for example:

- Keeping the GC-Carbon momentum
- Lack of "long-term" (beyond current year) vision on WCRP funding and support
- Inadequacy of WCRP funding rules for supporting GC-activities