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Proposal for an international project aimed at quantifying the impact of land Earth system processes and feedbacks on seasonal climate forecasts (GLACE-ESM)

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Several works have been showing the importance of the land biosphere (i.e. vegetation/land cover including anthropogenic effects and land-use changes) in forcing interannual climate anomalies and in modulating the influence from soil moisture and/or snow. In this respect, a recent effort by Alessandri et al. (2017) has clearly demonstrated significant effects of the representation of realistic vegetation-cover anomalies in the prediction of temperature and precipitation at multiple time-scales using the EC-Earth/ECMWF system.
The aim of this initiative is to evaluate the impact of including Earth system processes over land (from the latest Earth System Model developments in the frame of CMIP6 and beyond) on the performance of seasonal forecasts by state-of-the-art dynamical prediction systems. This is well phased with the scientific emphases in the WCRP strategic plan 2019-2028 on the central role of systems approach to incorporate the effects and impacts of natural and human forcings/feedbacks and investigate into predictability. The lack of enough observations to constrain the model complexity has led to the development of often diverging representation of surface processes between different land surface models. Therefore, the use of multi-models is also fundamental because of the poorly constrained parameterizations over land.
Building from already established multi-model efforts (e.g. SNOWGLACE, LS3MIP, LS4P) a set of land-initialized (at least soil moisture and snow but soil temperature is also welcome) hindcasts (covering some portion of the satellite-era) will be taken as the reference to further quantify the impact of land Earth system processes on seasonal forecasts. Long memory biophysical states will be either persisted (from available satellite observations prior to beginning of the hindcast) or (optionally) initialized/dynamically simulated by the land models. These states or processes will include: Natural vegetation density (Leaf Area Index); interannual Land cover/Land use changes from historical reconstructions; as well as other optional fields from CMIP6 boundary forcing such as water flux from irrigation over crop areas, anthropogenic fertilization, fire perturbation, etc.
It is expected that a good representation of the groups previously involved in GLACE-2 will participate in this coordinated effort. Preliminary contact and indication of possible interest has already been expressed by several modelling groups.
In connection with the ongoing experiences in CMIP6, LS3MIP, LUMIP, GSWP-3, SNOWGLACE, LS4P and PROCEED, the details of experimental protocol will be implemented during first half of 2019. Simulations are expected to begin in the second half of 2019. See GLACE-ESM Concept Note for more details at following google doc link: https://tinyurl.com/GLACE-ESM