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Phenology experiments in a regional climate model

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European summer climate, especially extreme events such as heat waves and droughts, is strongly impacted by processes acting at the interface between the land surface and the atmosphere (e.g. Seneviratne et al. 2010). In particular phenological processes associated with vegetation may play an important role, since plants' transpiration is the largest contributor to evapotranspiration in many regions. However, the influence of vegetation phenology on climate is largely unknown and the relative importance of phenology versus other processes like SM dynamics has yet to be quantified.

We perform several experiments with a regional climate model to study the role of vegetation-atmosphere feedbacks for European summer climate. The applied regional climate model is the newly developed coupled biosphere-atmosphere model COSMO-CLM^2 (Davin et al. 2011). This model allows for a comprehensive representation of vegetation-climate interactions at the regional scale thanks to the inclusion of plant physiological processes and it also entails a detailed soil hydrological module.

In the control run phenology is described by a seasonal cycle of monthly leaf area index based on MODIS data (Lawrence and Chase, 2007). The set of experiments includes 4 experiments: (1) an experiment investigating the impact of using a daily seasonal cycle, (2) an experiment simulating very late spring and low vegetation activity, (3) an experiment simulating very early spring and high vegetation activity, and (4) an experiment investigating inter-annual varying phenology based on daily data. A global reanalysis of vegetation phenology (Stöckli et al. 2011) is used to prescribe realistic or extreme phenological conditions.

Based on these model experiments and earlier performed soil moisture experiments we investigate soil moisture- versus phenology-climate interactions. In particular, we study the impacts of phenology on climate, especially heat waves and droughts.

References:

Davin, E.L, R. Stöckli, E.B. Jaeger, S. Levis, and S.I. Seneviratne (2011), COSMO-CLM2: a new version of the COSMO-CLM model coupled to the Community Land Model. *Climate Dynamics*, 37, 1889–1907, doi: 10.1007/s00382-011-1019-z.

Lawrence, P. J., and T. N. Chase (2007), Representing a new MODIS consistent land surface in the Community Land Model (CLM 3.0), *J. Geophys. Res.*, 112, G01023, doi:10.1029/2006JG000168.

Seneviratne, S.I., T. Corti, E.L. Davin, M. Hirschi, E.B. Jaeger, I. Lehner, B. Orlowsky, and A.J. Teuling (2010), Investigating soil moisture-climate interactions in a changing climate: A review. *Earth-Science Reviews, 99*, 3–4, 125–161, doi:10.1016/ j.earscirev.2010.02.004.

Stöckli, R., T. Rutishauser, I. Baker, M. A. Liniger, and A. S. Denning, (2011), A Global Reanalysis of Vegetation Phenology, *J. Geophys. Res.*, 116, G03020, doi:10.1029/ 2010JG001545.