# PhD Plan Eva Nowatzki February 2019

Currently, I started working on the DFG founded project 'Reducing the uncertainty on regional and local climate induced by land-atmosphere feedbacks'. According to the project description my main tasks are:

| | |
|---|---|
| WP4 | Implementation of a new phenology parameterization. Configuration and execution of regional climate simulations. Validation, sensitivity study and assessment of the effect of seasonal and inter-annual varying phenology. Analysis of the impact of climate variability on phenophases. |
| WP6 | Preparation / pre-processing of future land surface scenarios. Execution of regional climate simulation. Sensitivity study and assessment of uncertainty. |
| WP7 | Statistical evaluation of model bias and extremes of model output from WP1 to WP4 and WP6. Analysis of impact of land use/cover change on a number of extreme climate indices. Estimation of ranges due to land use/cover change in which the change of major climate parameters might develop. |

To reach those tasks some preliminary work has to be done, which can be separated in short-term, intermediate, and long-term steps.

Short-Term Steps:

At first a reference simulation has to be prepared and done. This reference simulation uses the default settings for the phenology that is either calculated by a minimum and maximum value of leaf area index (LAI) sinusoidal fitted or with monthly averaged values of the LAI. In general, the setting is adjusted to the CORDEX domain simulations to ensure a good comparability. For this purpose, the newest COSMO-CLM version 5.0_12 has to be prepared and started. To enable all simulations computing time at the DKRZ has to be requested as soon as possible (Application in April for time starting in July).

In addition, the main goal is to improve the resolution of phenology in the model. Therefore different methods as for example the JSBACH (Raddatz et al 2007), the Community Land Model (Oleson et al 2010) and the NOAH (Niu et al 2011) possibilities have to be compared. The purpose is to find the best fitting method for the COSMO-CLM and later on for the ICON-LAM.

Intermediate Steps:

After the method of choice is found, it has to be integrated into the model. This has to be done by adaptation of the source code. When the adapted code is ready to run and works without errors, another simulation has to be started. The results of the new simulation need to be compared and validated to the reference simulation as well as to observational data. Sensitivity studies are also planned.

Long-Term Steps:

To get an overview of the future climate, the former prepared model is going to run for different future scenarios. Now the impact of changing phenology on climate and vice versa should be seen in the different scenarios with various impacts. The uncertainty of each simulation should be calculated and sensitivity studies are again planned. Extreme events are another point of interest here.

Literature:


- Raddatz, T. J.; Reick, C. H.; Knorr, W.; Kattge, J.; Roeckner, E.; Schnur, R. et al. (2007): Will the tropical land biosphere dominate the climate–carbon cycle feedback during the twenty-first century? In: *Climate Dynamics* 29 (6), S. 565–574. DOI: 10.1007/s00382-007-0247-8.
- Oleson, Keith W.; Lawrence, David M.; Gordon, B.; Flanner, Mark G.; Kluzek, Erik; Peter, J. et al. (2010): Technical description of version 4.0 of the Community Land Model (CLM).
- Niu, Guo-Yue; Yang, Zong-Liang; Mitchell, Kenneth E.; Chen, Fei; Ek, Michael B.; Barlage, Michael et al. (2011): The community Noah land surface model with multiparameterization options (Noah-MP): 1. Model description and evaluation with local-scale measurements. In: *J. Geophys. Res.* 116 (D12), S. 1381. DOI: 10.1029/2010JD015139.