Assessing the impact of climatic controls on global changes in land-surface phenology **Introduction**

**Land Surface Phenology**

-> Why important, timeseries etc.

**Climatic Controls in the LSP context**

- Growing Season Index (Jolly 2005)

- Based on Temperature, Vapour Pressure Defficit (VPD) and photoperiod

- Very simple linear relationships and thresholds

**Idea: Compare them!**

Spark: New Stöckli dataset:

* **Modelled** LAI based on GSI, Plant Functional Type (PFT) and elevation classes
* Prediction assimilated with 10 years of MODIS LAI and FPAR data
* 50 years of global LAI & FPAR data (1 deg resolution)
* 32 years of global LAI & FPAR data (0.5 deg resolution)

**How plausible is LAI-re?**

* Comparison to an established LAI product is needed
* LAI3g is the newest iteration of the AVHRR GIMMS timeseries
* LAI3g based on remotely sensed NDVI3g and MODIS LAI and FPAR FFNN

**Research Questions**

* How does the LAI-re compare to the LAI3g dataset? Do they differ/how? (any obvious over/under estimations?)
* How do climatic controls (temperature, VPD) impact different PFTs/biomes/regions over time?
* (How) do changes in LSP depend on changes in climatic controls?

**Methods**

**Data & Data preparation**

*Available data*

* LAI3g: 30 years (1982-2011) of global 1/12 degree LAI data
* LAI-re: 33 years (1980-2012) of global ½ degree LAI and climatic control data*Preparation:*
* Resize LAI3g to fit LAI-re resolution (1/2 degree, bilinear)
* resample temporal frequency of LAI-re (daily) to fit LAI3g (bimonthly)

**Plausability analysis of LAI-re**

* Correlation of LAI-re data to LAI3g data for Land surface points (yearly averages, monthly averages).
* Extract

**Analyze Changes in Climatic Controls**

**Compare Controls to LAI**

**Introduction**

*LAI3g:* based on GIMMS AVHRR NDVI3g (MODIS LAI used for training neural network)

*LAI-re:* MODIS dataset reanalysis by extending GSI Model (including Plant functional type (PFT) and elevation data; then: forward model FPAR, based on MODIS LAI on FPAR, )

-> both connected to MODIS LAI

-> any other LAI datasets to compare to? Something completely MODIS-independent?

**Methods**

*Resample*all datasets to 0.5 degree resolution? (LAI-re resolution, coarsest dataset) Check for scaling effects..

*Test sites*: For LAI-Comparison: Landcover type (IGBP, like Zhu,2013)?

***LAI Comparison:***

- HANTS for smoothing

- Land Cover (p42. Validation good practices, Garonna) to mask water/other non-vegetation lc

- Extract metrics: Max-inflection and/or Midpoint method for LSP

***Changes in Climatic Controls***

Look at controls independently by creating maps, look at trend in time series by defined regions (same as LAI-regions?)

(mainly amount-of-daylight; or maybe test just to make sure?)

How: yearly averages? Monthly? Don’t know yet.

***Comparison***

Correlate changes in LSP-metric (GSL probably (or all 3)) to measured LAI3g; - Extract by PFT/Land Cover? Biome/Region -> seems more appropriate for global trend study.

**Results**

Expected:

*LAI*: generally GSL lengthening, Depending on location of course

*LAI3g-LAIre:* wouldn’t expect too many differences considering they use the same training data. NDVI limitations (3g) might influence it more than climatic controls (re)

*GSI-LAI*: slight rise in temperature, VPD?! No clue what to expect.

Comparison: generally slight rise of GSL with temperature; no trend with radiation (hours daylight stay the same), maybe something with VPD

**Analysis**

**Discussion**