**Methods**

*[…]*

*Implementation of a LSP parameter extraction*

The extraction of LSP parameters is the basis of most research in remote sensing of LSP and as such warrants a closer look in this thesis. To understand the mechanisms of LSP parameter extractions, an attempt was made at implementing the Midpoint and Max-increase extraction methods, rather than using available tools.

For both methods, a mask was first applied to exclude water pixels. Then, pixels which show an inter-annual LAI variability below a threshold of 0.5 were filtered out.

The implementation of the Midpoint method was rather straight-forward by calculating LAIMP=(LAImin + LAImax)/2 for each year and pixel, and defining the point in time where the LAI-curve first goes above LAIMP as the SOS. A special case had to be implemented for the southern hemisphere, where the growing season is shifted by half a year.

The implementation of the Max-increase method was more challenging in its conception since the theoretical definition is based on continuous data rather than the discrete data points that are being processed in practice. The approach used is based on the very simplistic assumption that the maximum increase must occur between the two adjacent data points which have the highest positive difference in LAI between them (fig X). The LAIMI was then defined as (LAIi+LAIi+1)/2. A more precise definition does not make sense with the given temporal resolution of the data.

When comparing the self-made implementation with more refined algorithms as used by Garonna et al. (2014), the results for the Midpoint method were comparable, the Max-inflection method however produced very different results. This is due to the more realistic extraction method, which uses a spline fit to the data points and extracts the point of maximum inflection from the spline rather than the bimonthly data points. The algorithm also uses a more thorough filtering method for pixels where an extraction is not possible.

For these reasons, as well as for making the results more comparable to other similar studies with NDVI3g datasets (Garonna et al. 2014, more?), it was decided to use the more advanced algorithm for further analysis.

**Results**

[...]

***Influence of Climatic Controls on LSP***

*Dominating Climatic Control during SOS and EOS*

*Dominating controls at Start of Season*

Dominating controls during SOS in the northern hemisphere are mainly temperature for higher latitudes and radiation for lower latitudes. The SOS in the subtropics are dominated by moisture and the tropics by radiation. The southern hemisphere is also mainly dominated by moisture in the subtropics and radiation in the south of Africa, south of Australia and some parts of southern America. Only small parts of the southwest America and south-eastern Australia are affected by temperature controls.

Analysing the time-series of dominating controls during the SOS shows that the areas unaffected by dominating controls, apart from desert and high mountainous areas, are in Siberia and wide parts of Canada where the dominating control is temperature over all 30 years. A lot of change can be observed in Europe and central Asia where the dominant control varies between temperature and moisture control. The southern hemisphere mainly shows small variations in the extent of moisture-controlled and radiation-controlled areas.

*Dominating Controls at End of Season*

The End of Season in the northern Hemisphere is dominated by the radiation control factor for many parts such as central and eastern Europe, east and south Asia and the east of north America. Central Asia, the Middle East and the north of Africa are dominated by the moisture control during EOS, as is the western part of the USA. The temperature control only dominates very high latitudes. The southern hemisphere is also mostly radiation controlled during EOS with the exception of Australia and southern Africa, which are mainly moisture controlled.

The time-series over the last 30 years showed annual changes between all 3 controls for most of the higher northern latitudes. The rest of the world only shows small variations around the border regions of dominating controls, mainly between moisture and radiation controlled areas.