Project Database of ICP Forests
PROJECT DESCRIPTION

PROJECT INFORMATION

Project title: leaf phenology and canopy status with remote sensing in relation to climate

Project ID: 77

Contact person: Mathieu Decuyper (mathieu.decuyper@wur.nl)

PROJECT DESCRIPTION

Rising atmospheric CO_2 levels in Northwestern Atlantic Europe and elsewhere are expected to lead to higher temperatures and more frequent summer droughts (Ciais et al., 2005), and this will profoundly affect forest ecosystems. Yet, how tree growth responds to these changes remains unclear. There are many studies linking reductions in wood formation (by using dendrochronological data) to drought events (Eilmann et al., 2011; Sterck et a|., 2008) and the same accounts for remote sensing studies (Vacchiano et al., 2012), However up to now there are very few studies combining this tow approaches. In this project, we will determine the direct effects of temperature and drought on wood formation and leaf phenology from 2000 to 2014. By combining different data sources we aim to study the effects on a local scale by understanding the tree growth and linking the data to remote sensing data. In the next step we will upscale from the local level to national scale by using climate models and remote sensing MODIS data. Special emphasises is put on the extreme events such as drought stress and late frost events. To validate the results obtained by remote sensing we will use ground based measurements such as crown condition, growth and yield data, leaf area index (LAI) and dendrochronological data. We expect that we are able to detect drought stress on a larger scale by remote sensing and that we can link this towards wood production. Other datasets (not mentioned in the project description): Digital Elevation Model (DEM) to make the climate models and stratify the country into high classes. The aim is to perform time series analysis by using the Mann—Kendal trend analysis and perform correlations between relevant climate parameters and the remote sensing derived indices and wood formation data by using the Mann-Kendal Rank Correlations. This study will first focus on Slovenia to develop the methodology and test the outcomes, but the idea is to further upscale on a European scale.

ICP Forests

LRTAP
Long-range Transboundary Air Pollution

References

Ciais, P., Reichstein, M., Viovy, N., Granier, a, Ogée, J., Allard, V., Aubinet, M., Buchmann, N., Bernhofer, C., Carrara, a, Chevalller, F., De Noblet, N., Friend, a D., Friedlingstein, P., Griinwald, T., Heinesch, B., Keronen, P., Knohl, a, Krinner, G., Loustau, D., Manca, G., Matteucci, G., Miglietta, F., Ourcival, J.M., Papale, D., Pilegaard, K., Rambal, S., Seufert, G., Soussana, J.F., Sanz, M.J., Schulze, E.D., Vesala, T., Valentini, R., 2005. Europe—wide reduction in primary productivity caused by the heat and drought in 2003. Nature 437, 529-533. doi:10.1038/nature03972

Eilmann, B., Zweifel, R., Buchmann, N., Graf Pannatier, E., Rigling, A., 2011. Drought alters timing, quantity, and quality of wood formation in Scots pine. J. Exp. Bot. 62, 2763-2771. doi:10.1093/jxb/erq443

Sterck, F.J., Zweifel, R., Sass-Klaassen, U., Chowdhury, Q., 2008. Persisting soil drought reduces leaf specific conductivity in Scots pine (Pinus sylvestris) and pubescent oak (Quercus pubescens). Tree Physiol. 28, 529-536. doi:10.1093/treephys/28.4.529

Vacchiano, G., Garbarino, M., Borgogno Mondino, E., Motta, R., 2012. Evidences of drought stress as a predisposing factor to Scots pine decline in Valle d'Aosta (Italy). Eur. J. For. Res. 13]., 989-1000. doiI10.1007/s10342—011—0570—9 l