ACRP-Project AgroDroughtAustria

Methodological and technical aspects involved in the development of an operational soil drought monitoring and forecast system for Austria

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Introduction

Extreme climatic events are already moving beyond the patterns of natural variability and recent climatological extreme events in some European regions already suggest a shift in the return-period of heat-wave and drought events. Within the framework of the ACRP project *AgroDroughtAustria* a crop specific drought monitoring and forecasting system for agriculture in Austria is being developed and implemented in a Java-based software.

Methodology

The *AgroDroughtAustria* system combines a GIS model for monitoring yield and grassland drought in Austria (Schaumberger, 2011) and a crop water balance model (Hlavinka, 2011). Both models are adapted and calibrated to the purpose of monitoring and forecasting of crop specific drought and impact at a high temporal and spatial resolution and combined in a new software.

The software computes the soil moisture regime of Austrian forest and agricultural land according to the FAO Penman-Monteith method. The resulting soil water content values (SWC) are the basis for the subsequent drought index computations. Both processes can be run in analysis/monitoring and forecast mode (image 1).

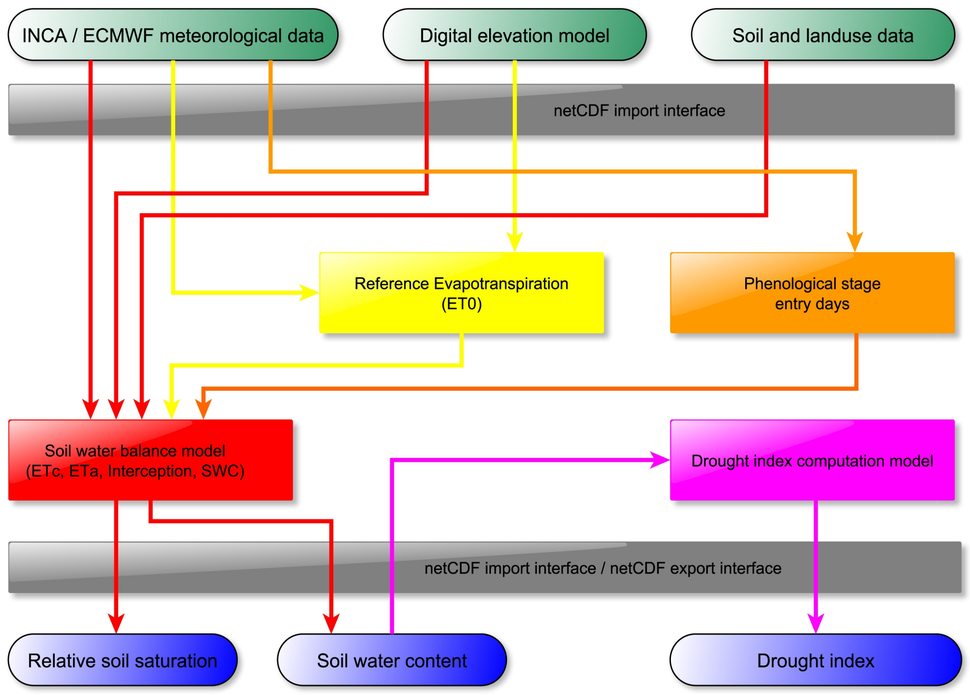

Image 1: I/O data, structure and data flow of the ADA model

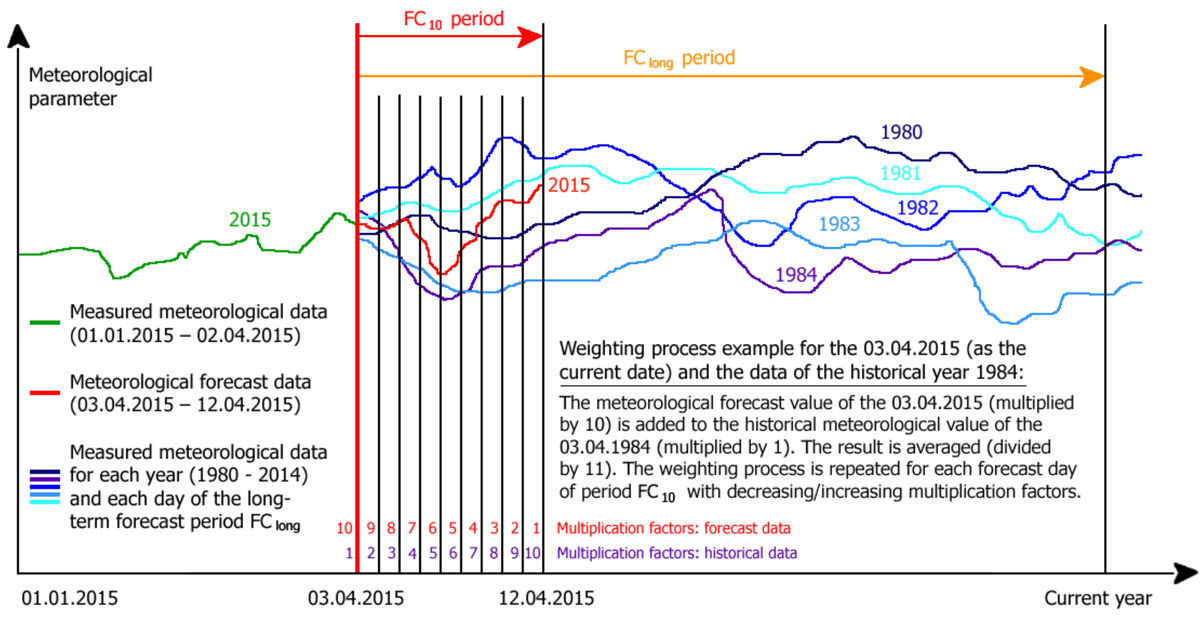

Image 2: Example of weighted meteorological data merging and averaging with a ten days forecast period FC_{10} and a long-term forecast period FC_{long} .

The SWC forecasting system combines a long-term probabilistic forecast approach with a short-term forecast (up to 10 days) using the global IFS model from the European Centre for Medium-Range Weather Forecasts (image 2).

Drought computations use a percentile-based approach. Computing the percentile value of the cell's SWC for an arbitrary day in relation to the group of SWC observations for the same day of all years taken into account reveal its percental deviation from the "normal" SWC state. Percentile values are classified using a user defined drought index class table.

Results

Various analysis output parameters are exported as netCDF files (image 3). The results are visualized on a web-based GIS viewer in high resolution maps. All parameters are calculated on a daily basis, with at least one weekly update. Optionally the 10 days forecast can be extended to larger forecast periods.

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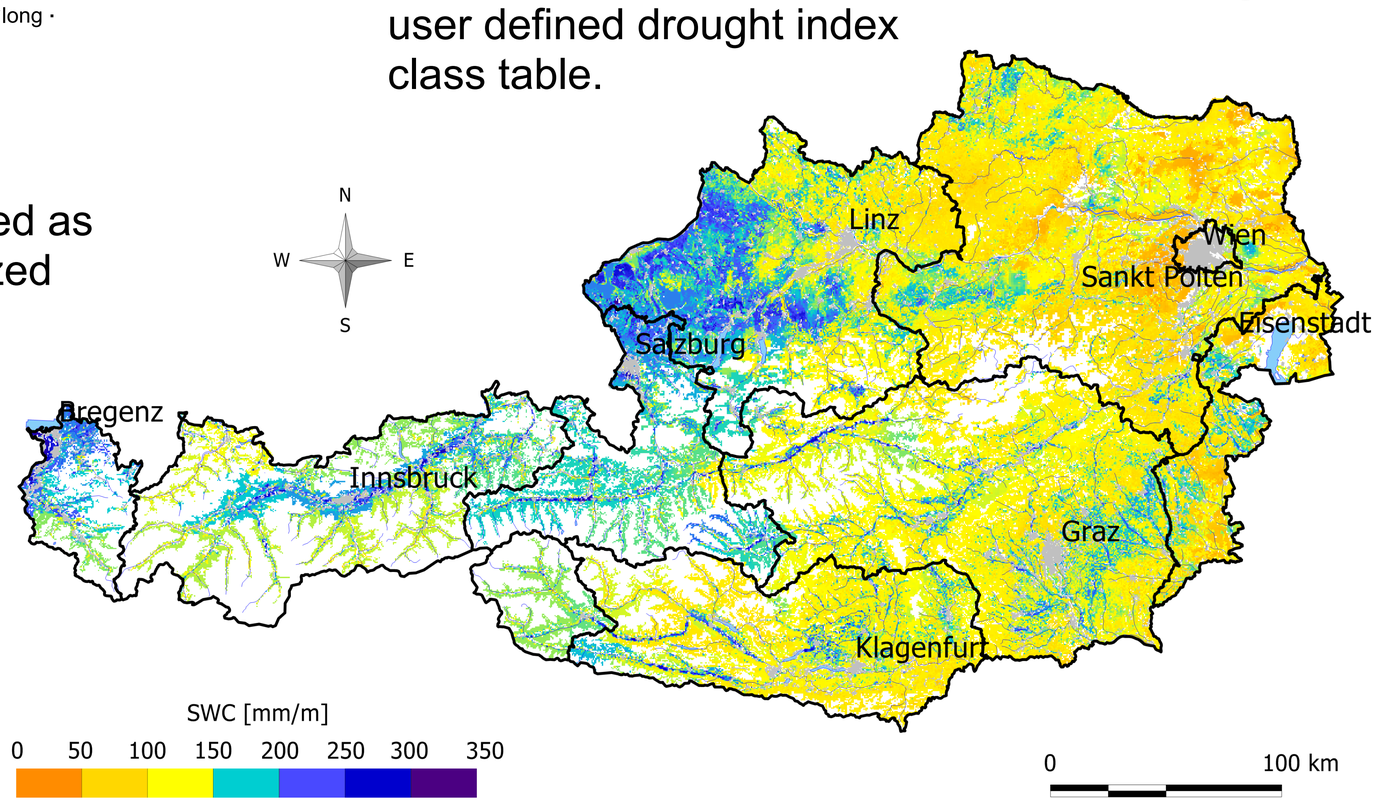

Image 3: Soil water content (SWC) output data sample of the 31.08.2012.

References

Schaumberger, A. (2011): Räumliche Modelle zur Vegetations- und Ertragsdynamik im Wirtschaftgrünland. Dissertation, Technische Universität Graz, Institut für Geoinformatik, 264 S.

Hlavinka, P.; Trnka, M.; Balek, J.; Semerádová, D.; Hayes, M.; Svoboda, M.; Eitzinger, J.; Mozný, M.; Fischer, M.; Hunt, E. and Zalud, Z. (2011): Development and evaluation of the SoilClim model for water balance and soil climate estimates. Agricultural Water Management (Impact Factor: 2.33). 05/2011; 98(8):1249-1261.