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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Phenological models to estimate the blossoming dates of tart cherries

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The objective of the project CLIMARK (Climate Change Impact Assessments for International Market Systems) is to provide a potential framework and strategy for conducting sub-sectorial, multiregional climate change assessments. In particular, the framework is intended for industries with international markets, long-term capital investment decisions, limited adaptation options, and sensitive to unusual or intense weather and climate events or conditions. An example industry from agriculture is utilized to help illustrate the proposed framework and potential approaches for implementing the framework. The selected industry, tart (sour) cherry production, is highly sensitive to climate extremes and threshold events, particularly to extended springtime warm periods followed by cold temperatures that cause buds to lose hardiness and become susceptible to frost damage (Winkler, 2010).

In the framework of this project we developed phenological models for the main tart cherry growing region in Germany, Rhineland-Palatinate. Here, the production is mainly focused on four counties, which represent 92 % of the tart cherries growing area. In 2007, 9,458 t of tart cherries were produced here on an area of 826 ha.

For the study temperature (T, Tx, Tn) and phenological (beginning, end of blossom and picking ripeness) station data from the German Weather Service in the period 1961-2009 were regionalized to a 0.2° grid, using second order universal kriging (Blümel et al. 2003). On the basis of these data, the growing regions in Rhineland-Palatinate were represented by 4 grid points, ranging from 193 to 257 m altitude. Hourly temperatures for the chilling and forcing models were generated according to the algorithm by Linsley-Noakes at al. (1995) from daily temperatures.

In order to optimize phenological chilling and forcing models for the beginning as well as the end of blossom and the beginning of picking ripeness, different approaches from the literature were selected. Growing degree days, growing degree hours and forcing units were calculated to describe the ontogenetic development. To model the winter rest of the tree (chilling period) different chilling hour models were used. Finally, the optimized models were compared according to its RMSE and the best models were selected. These models were tested with independent phenological observations of the Service Centre Rural Area, Rhineland-Palatinate in Ahrweiler. At the congress the models with the best performance will be presented.

References

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