EMS Annual Meeting Abstracts
Vol. 8, EMS2011-273-1, 2011
11th EMS / 10th ECAM
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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

The effect of climate change on agro climate zoning of wheat in Iran

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This study presented first results on a regional climate downscaling exercise which will be used for studying the effects of climate change on wheat phenology and yield in Iran. Local temperature variability which is the important factor for phenology is very well represented in the ERA-40 data set. Coherent large scale structures can be used as predictors to related large scale information from a global climate model to local climate in a statistical sense. The climatic stations with long term data (45 years) in Iran were selected. These stations covered the whole Iran. We used ERA-40 reanalyses at 806 grid points covering Iran and parts of the neighboring countries. Due to the complex orographic structure within Iran and the possible influence of two rather large water bodies (the Persian Gulf to the south and the Caspian Sea to the north) we performed a univariate linear regression between each ERA-40 grid point temperature as predictor and each single station as predictand. Then the estimated regression coefficient and the respective squared correlation coefficient are functions of the grid point coordinates and can be presented as maps. To estimate the sampling uncertainty of the regression results we used bootstrapping creating a sample size of 1000. The results show spatially coherent, high significant correlation between ERA40 calculated temperature data and Iran observed temperature data on a monthly and daily scales. Because the domination of local variability in summer, the summer pattern is much smaller in its spatial extend than the winter pattern. Based on these patterns a stochastic weather generator was developed for each station simulating the daily temperature conditioned on the ERA40 data. The cross validated verification shows a favorable agreement in time and probability density distribution of observations with the simulated station data.
To relate temperature variability to the phenology of wheat we now estimate wheat GDD (Growing Degree Days) based on the FAO model. Exploratory Data Analysis on GDD will be presented which can be used for crop models to predict wheat yield.