Geophysical Research Abstracts
Vol. 15, EGU2013-10492-1, 2013
EGU General Assembly 2013

COLT: seasonal prediction of crop irrigation needs

Giulia Villani (1), Andrea Spisni (2), Maria Cristina Mariani (3), William Pratizzoli (2), Valentina Pavan (2), Fausto Tomei (2), Lucio Botarelli (2), and Vittorio Marletto (2)

(1) University of Bologna, Dipartimento di Scienze e Tecnologie Agro-Alimentari, Bologna, Italy (gvillani@arpa.emr.it), (2) ARPA Emilia-Romagna, Servizio Idro-Meteo-Clima, Bologna, Italy, (3) Consultant

COLT is an operational chain to predict summer (June, July, August) crop irrigation needs in Emilia-Romagna (Northern Italy) at the regional and lower scales. Set up by ARPA-SIMC in 2010, it has been applied since with good results. COLT predicts summer irrigation needs in May, i.e. at the beginning of the irrigation season in Emilia-Romagna.

COLT is based on the production of yearly updated land use maps, observed daily weather data, a regional soil map and ensemble probabilistic seasonal weather forecasts obtained from the EUROSIP multi-model operational system and a geographical soil water balance model (CRITERIA).

The first step of the operational scheme is the supervised classification of crops through field surveys and a set of multitemporal satellite images acquired during the first months of the growing period. As the identification of all crop species during the satellite working windows is not feasible, they are grouped in six classes: summer field crops (including corn, sorghum, tomato, sugar beet, potato and others), winter crops (wheat, barley, oat, etc.), perennial grasses (alfa-alfa and meadows), rice, vineyards and orchards, on the whole regional plain, covering about 775000 ha.

The second step involves the statistical downscaling of the EUROSIP ensemble predictions over Emilia-Romagna and the use of a weather generator to synthetically produce a number (usually 50) replicated meteorological summer daily data series, consistent with the predicted and downscaled summer anomalies of temperature, rainfall and other related indices.

During the final step the CRITERIA model computes crop development and soil water balance on the crop classification map using observed meteorological daily data up to the end of May. Afterword forecasts are used up to the end of the summer irrigation season, i.e. August 31st. The statistical distribution projections of summer irrigation needs at the regional and reclamation consortia scale are then issued and disseminated from the ARPA-SIMC web site.

Since 2010 forecasts of the crops water irrigation requirements have been computed and compared with the simulated data at the end of the summer with good results. The COLT scheme is able to predict the very large interannual variability of the seasonal crop water needs: in 2010 the summer was rather wet and COLT predicted about 500 Mm3, while in 2011 the median forecast was 850 Mm3, a value considered as normal. The summer of 2012 was exceptionally dry, thus the median COLT forecast was 1077 Mm3, while the value computed with observed summer data reached 1340 Mm3 (+24%).

The COLT scheme was also tested in a study area located near Ravenna (570 ha), where actual crop irrigation volumes are measured. The median forecasted irrigation (0.50 Mm3) resulted 14% higher than the observed value for 2011 (0.44 Mm3), mainly due to errors in classification of non irrigated crops as irrigated, and possibly to the water table not being accounted for in the model.

COLT looks like a promising approach for assessing, planning and managing water resources in agriculture, and for mitigating the impacts of intense climate anomalies in the agricultural sector.