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Agricultural drought assessment system: A combination of agro-hydrological modeling, remote sensing and data assimilation

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This paper addresses the question whether data assimilation of remotely sensed leaf area index LAI and/or relative evaptranspiration ET ET-1 estimates can be used to forecast total wheat production as an indicator of agricultural drought. A series of low to moderate resolution MODIS satellite data of the Borkhar irrigation district, Isfahan (Iran), was for the year 2005 converted into LAI and ET ET-1 using a land surface energy algorithm. Using geographical information of soil types, land use, groundwater and irrigation on a raster basis with a grid size of 250 m, i.e. moderate resolution the agrohydrology SWAP model was then implemented on a distributed way. To correct the internal variables of the distributed model whenever remotely sensed data were available, a constant gain Kalman filter data assimilation algorithm was used for each data series.
The differences between the field data and the data determined by simulation or low to moderated RS data implied that these methods separately are not accurate estimators for calculating crop yield. The results of data assimilation at both the regional and field scale showed significant improvement in accuracy of simulation in case of using both the RS based data of LAI and ET ETp-1 in assimilation process. The results showed also that LAI data have a dominant influence in the assimilation process.
Forecasts for one month in advance using simulation with assimilation at regional scale was promising with respect to the statistical data of the district (bias = %). Long term predictions i.e. two month in advance, however resulted in a higher bias between the simulated and statistical data.