Mapping potential evapotranspiration using high resolution digital terrain models, geographical information systems and regression-based techniques: application in the Ebro valley (NE-Spain)

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Monthly and annual potential evapotranspiration (PET) was obtained in a continuous way with a resolution of 100 meters by means of the combined use of meteorological data, high resolution digital terrain models, Geographical Information Systems (GIS) and regression-based techniques. The analysis was done in the Ebro valley, a very complex topographic area, in which the climatology has diverse spatial patterns. The PET was calculated following the Hargreave's method, which only requires information on maximum and minimum temperature, a parameter widely recorded in the weather stations. The PET calculation was done using continuous temperature maps obtained at a resolution of 100 meters by means of GIS and regression-based interpolation. Also a local interpolation of the residuals obtained from the regression models was performed to improve the results. The interpolation was carried out from a dense spatial data base composed by 311 temperature stations. Interpolations were done by means of the 80% of the records (248 temperature stations). The quality of the PET maps was tested by means of the remaining 20% temperature stations, in which PET was calculated locally also using the Hargreave's method. The Willomott's D statistic was used to compare between the local PET estimations and those results obtained from the continuous models. The results indicate a high reliability. Also the PET maps were tested by means of independent PET calculations obtained in some agroclimatological stations by means of the reference PET method of Penmann-Montheith. The

PET maps obtained in this paper may be very useful for water resources, irrigation and environmental management.