Geophysical Research Abstracts
Vol. 15, EGU2013-14259, 2013
EGU General Assembly 2013

Estimation of Surface Runoff in the Jucar River Basin from Rainfall Data and SMOS Soil Moisture

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Surface runoff is the water that flows after soil is infiltrated to full capacity and excess water from rain, meltwater, or other sources flows over the land. When the soil is saturated and the depression storage filled, and rain continues to fall, the rainfall will immediately produce surface runoff.

The *Soil Conservation Service Curve Number* (SCS-CN) method is widely used for determining the approximate direct runoff volume for a given rainfall event in a particular area. The advantage of the method is its simplicity and widespread inclusion in existing computer models. It was originally developed by the US Department of Agriculture, Soil Conservation Service, and documented in detail in the *National Engineering Handbook, Sect. 4: Hydrology* (NEH-4) (USDA-SCS, 1985).

Although the SCS-CN method was originally developed in the United States and mainly for the evaluation of storm runoff in small agricultural watersheds, it soon evolved well beyond its original objective and was adopted for various land uses and became an integral part of more complex, long-term, simulation models. The basic assumption of the SCS-CN method is that, for a single storm, the ratio of actual soil retention after runoff begins to potential maximum retention is equal to the ratio of direct runoff to available rainfall. This relationship, after algebraic manipulation and inclusion of simplifying assumptions, results in the following equation given in USDA-SCS (1985):

$$\mathrm{Q} = \frac{(\mathrm{P} - 0,2\mathrm{S})^2}{(\mathrm{P} + 0,8\mathrm{S})}$$

where Q is the average runoff (mm), P the effective precipitation (mm) and S is potential maximum retention (mm) after the rainfall event.

The study has been applied to the Jucar River Basin area, East of Spain. A selection of recent significant rainfall events has been made corresponding to the periods around 22nd November, 2011 and 28-29 September and 10 October, 2012, from Jucar River Basin Authority rain gauge data. Potential maximum retention values for each point have been assumed as the first SMOS soil moisture values available at the closest DGG node immediately after saturation produced by the rain.

The results are shown as maps of precipitation and soil moisture obtained using a V4 integration method between a linear and nearest neighbour methods. Surface runoff maps are consequently obtained using the SCS-CN equation given earlier. These results have also been compared to COSMO-CLM model simulations for the same periods.

It is envisaged to obtain precipitation maps from MSG-SEVIRI data.