Hydrol. Earth Syst. Sci. Discuss., 4, S858–S860, 2007
www.hydrol-earth-syst-sci-discuss.net/4/S858/2007/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Parameter extrapolation to ungauged basins with a hydrological distributed model in a regional framework" *by* J. J. Vélez et al.

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Received and published: 30 August 2007

Is their a correlation between the level of physical accuracy of the mathematical methods of the tanks and the correction factors, e.g. you use the saturated hydraulic conductivity of the soil although in general the soil in the upper layers is unsaturated.

With regard to the saturated hydraulic conductivity, as it is described in Francés et al. (2007) pages 228-229, the infiltration capacity is infinity until the static tank is ponded and it is equal to the saturated hydraulic conductivity after ponding. This is a common simple hypothesis in Hydrology and, in any case, it works well in the case study. Therefore, the upper soil vertical saturated hydraulic conductivity maintains completely its physical meaning in our model. Similar with the rest of parameters. Maintaining their physical meaning is one of the key points in controlling the initial ranges for the automatic calibration of the correction factors (Francés et al., 2007). In other words, if

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they loose their physical meaning, we don't have any a priori idea about their range.

The criteria which are applied in the parameter estimation are missing (sampling criteria, surface roughness, etc.) What are the nine geomorphological parameters in the GKW-equation. Give a sample of parameter estimation. Perhaps you can give this information in a table for the most relevant parameters.

The criteria for the soil related parameters are described in section 3.1.: the sampling criterion was the intersection of all cartographic units with an estimated value for the main variables. With these data the parameters of each regression were obtained and finally applied to each cell. A figure with an example of the resulting regression can be added in the final version of the paper (figures are not allowed in the discussion).

Concerning the estimation of rest of the parameters (vegetation cover index, hill slope velocity and GKW parameters) we must refer to Francés et al. (2007). For example for the GKW parameters you are specifically asking, we must add the following sentence at the end of section 3.1 that "The GKW parameters can be found in Table 1 of Francés et al. (2007)."

I miss detailed discussion of the correction factors found in the validation process. What can we learn from them. I can not see the prove that you can extapolate the parameters to ungauged basins. It seems that the correction factors fluctuate rather random. At least the author should give some criteria to assess the validity of the correction factors for extrapolation.

The correction factors are not found in the validation process, section 4.5. The correction factors are found in the calibration process, section 4.4. With only one exception, in this work we did one calibration for each gauged basin. We use the rest of the gauged points in the spatial and temporal-spatial validation process to check the performance of the calibrated correction factors at ungauged internal basins. Therefore, this validation process is the key point to extrapolate the a-priori estimated parameters to ungauged basins. See our last comment to referee 1 about the importance of Figure

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10b to asses the validity of the model (including the correction factors) at ungauged basins.

As explained in previous paragraph, we have one set of correction factors for all possible simulation points within each basin (most of them truly ungauged) and in some cases for neighboring ungauged basins. With only one set of correction factors for the whole region, obviously the results would be poorer and, from the case study point of view, we wanted to properly exploit all available information in order to have good simulated series. There are two types of correction factor fluctuations between the 20 sets of correction factors shown in Table 2:

1. For correction factor 7 (groundwater outflow) and for β; (precipitation increment with altitude) the differences from one basin to another are not random, because these two variables depend on the basin water balance of each basin. In fact, they can not be automatically transferred to other basins without a minimum of expert judgment.

2. For the rest of correction factors, the fluctuation is random (it must be) and reflects the correction factor uncertainty produced mainly by the basin differences of each flow gauge station used for calibration:

    - Different spatial information (in this case study not different source of information) and inputs (location, density, ...) and their uncertainty.
    - Different hydrology at each basin, or equivalently, different model conceptualization error.

We will introduce these comments in the final paper version section 4.4.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 909, 2007.