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Hydrology and Earth System Sciences Discussions

Interactive comment on "A method for low flow estimation at ungauged sites, case study in Wallonia (Belgium)" *by* M. Grandry et al.

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We first want to thank you for your constructive comments on our paper.

Regarding the first comment, we will add some more explanations in the introduction about the importance of low flow estimation.

Par 2.5. There is an ambiguity concerning the verb. Percolation was indeed simulated by the model while meteorological data were interpolated by the model for each catchment from meteorological data measured at some locations in Wallonia, by means of the Thiessen polygon method. PET was also computed by this model, using Penman equation and meteorological data. For the calculation of the recession coefficient, the

method of Lang and Gille (2006) is based on streamflow records. For each catchment, recession periods are first defined according to flow and precipitation thresholds, and by removing overland flow influence. A mean or master recession curve was then constructed using a method based on the correlation method. The recession coefficient is the parameter of this exponential curve. The paper of Lang and Gille (2006) is however available online at http://norois.revues.org/1743 but in French. We can add this website in the reference if needed. We will clarify this in the paper.

Par 3.1. For low flow frequency analysis, we prefer to keep the comparison between the 6 different distributions, which makes this study more complete. Moreover, this does not influence the model structure as frequency analysis was only used to calculate AM7 for different return periods from AM7 series. Par 3.3.1. The equations can certainly be presented using a parametric equation and a table of regression coefficients by return period and by regression method if it is clearer and helps the reader (see attached file).

Explanations about the physical role of the parameters RC and PE: The recession coefficient and percolation are both linked to geology: the more permeable the substratum is, the higher percolation is and the lower the recession coefficient is. The main component of low flow is base flow which depends on geology and in particular on substratum permeability. Percolation allows to estimate groundwater recharge, and the recession coefficient helps characterise water input from groundwater to the river during low flow periods. WP: In our region, the precipitation from October to April quantifies water input during the period of groundwater recharge. S: The hydrological type of soil describes the infiltration rate (high for A to very low for D) and drainage (excellent for A to very bad for D) of soils. Yet, higher infiltration favours higher groundwater recharge, and groundwater is the main source of water in rivers during low flow periods. Therefore, soils of the hydrological group A permit a higher groundwater input into the rivers during low flow periods than soils of the hydrological groups B and C. Lg: Grasslands favour infiltration thanks to their dense root system. The renewal of the roots creates preferential infiltration paths. We will take your comment into account

and add these explanations in the discussion of the paper.

We would not eliminate regional models from the paper because we want to present a complete methodology. We think that, in a low flow estimation study, it is important to consider the possibility of developing regional models and to compare them with a global model. In addition, we demonstrated that the Walloon region is heterogeneous and could be divided in four hydrologically homogeneous regions which can be used in the future when more data are available, or even for another area in hydrology than low flow estimation. So we would not eliminate completely regional models from the paper but we will consider your remark and make this part more concise.

Technical corrections: - reference for HYFRAN software: El Adlouni, S., Bobée, B. and Ouarda, T. B. M. J.: On the tails of extreme event distributions in hydrology, J. Hydrol., 355, 16-33, 2008. - We do not understand your comment about the different format of Table 1 and Table 2. They both present the same performance indices of models for each return period. Table 1 compares the different regression methods used for the global model, while Table 2 compares global and regional models for Region 1 and Region 3. The numbers in bold are the highest values of indices, comparing the methods for Table 1 or the models for Table 2. - We will ensure to make the ticks and labels bigger in Figures 1, 4 and 5.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/9/C5820/2012/hessd-9-C5820-2012-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 11583, 2012.