Hydrol. Earth Syst. Sci. Discuss., 4, S1234–S1238, 2007
www.hydrol-earth-syst-sci-discuss.net/4/S1234/2007/

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.

Anonymous Referee #4

Received and published: 18 October 2007

General comments : (Notation P= Page; L = Line)

The paper aims to present a parameterization strategy of a conceptual distributed model for regional water resources applications on ungauged basins. The model TETIS was used, and an original approach was developed for the model parameterization, calibration and validation. The Basque region (8500 km^2) located northern Spain was used as application case, and all long-term discharge gauge stations were used : calibration on 20 gauged catchments, validation on 62 gauged catchments and prediction on more than 500 points. This topic is of international interest for both research and engineering applications. The data are of good quality (and quantity). My major comments concern :

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1. The paper mixes a research approach and an engineering approach. The authors needs to focus more the paper on the research approach. The introduction, the discussion and conclusion need to be restructured and rewritten in order to show clearly the state of the art on the topic, the originality and the genericity of the approach: i) indicate clearly the objective of the paper (not only as an application on the Basque region); ii) justify the choice of TETIS in comparison to other models (particularly to physically based spatially distributed grid models); iii) discuss the specificities of the study case in comparison to other cases; iv) discuss if the parameterization strategy proposed in the paper can be applied for other models on other catchments; what are the domain of application and limitations of the approach?

2. The state of the art must refer to the various approaches developed the last decade on research projects on Prediction on Ungauged Basins (PUB).

3. Discuss also the scale effect : i) parameterization strategy and estimation of parameter values : from the grid size on a map to the grid size of the model (P925, L15-18); see also P926, L17-20 when moving from a DTM 25x25m to 500x500m; please discuss the uncertainty on parameters; ii) The problem of space and time steps needs to be addressed more clearly and in detail for the TETIS model. What are the domain and limitations of the model. What time and space steps can be used. Is there any link between the grid size (space step) and the time step of the model (P917, L18-23); iii) the problem of scale effects : what domain of application of the model in space (what catchment size) and in time (what data time steps).

4. The paper lacks of uncertainty analysis. This point is very important as one objective of the paper is water resources management. The authors have to discuss the uncertainty on the results given during the calibration, validation and prediction (Tables 2, 3, 4 and 5). The uncertainty depends on input variables (uncertainty on rainfall, temperature), on parameters (how parameters are estimated from maps), on output variables used for calibration (uncertainty on discharge), and on model structure and calibration strategies.

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Interactive Comment

Specific comments :

P 910, L 3-5. In the abstract, the objective focus on the application case on the Basque region. Please give a more general and generic objective. The Basque region becomes an application case.

P 910, L13 : Please correct (at the cell scale).

P 910, L15-18 : The term (correction factor) is not defined in the abstract, and it is not clear how it is defined and used. Also there is a confusion between (correction factor) and (correction function). Please define clearly the terms.

P 911, L8-26 : The introduction starts with details of the study site. The introduction must be strengthen as stated above.

P912, L11 : Give details for (temporal fluctuations); what variables or processes?

P912, L23 : Define the term (effective parameters), and indicate clearly what hydrological processes will be studied.

P912, L25-30 : Justify the choice of TETIS in comparison to other distributed models.

P914, L15 and L28 : Refsgaard instead of Refsgaars. Check also the references (P936, L25).

P916, L20-30: The term (correction factor) is not defined. Please define clearly this term when it is defined for the first time in the text.

P916, P917 : Please give a complete list (in a Table for example) indicating what are the model parameter, and how they are estimated. For each parameter indicate the source (soil map, land use, tables of hydrodynamic properties, topography, etc.).

P917, L1-3 : The unit is given for beta (mm/m in the text and I think m/m in Table 2; I am not sure please check), however it is not mentioned that the correction factors are non-dimensionalized.

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P917, L4-6 : Give details concerning the nine geomorphologic parameters.

P918, L23 : Please explain what represents i = 1 to 12 (months?)

P920, L10 : Explain what are the three main variables.

P924, L11-15 : The two criteria RMSE and E are linked. We obtain the same optimal parameters when calibrating a model using one of these two criteria. Please justify this choice. What about other criteria.

P926, L27 : The word (maps) is repeated three times.

Indicate on a map the location of the stations (for calibration in Table 2, validation in Table 4, and prediction in Table 5). Also indicate on a map the location the (lower basin zone) and (upper basin zone) (P927, L18-25). Also indicate on the map the location of (northern basins) and (southern basins) (P930, L11-13).

P928, L1-5 : The paragraph is not clear.

P929, L12-19 : Define the notations DR, BF, RET, etc.

P930, L1 and in other parts of the text : Define clearly how to rate a model as good, very good, excellent, etc. What criteria (or combination or criteria) id used? What about uncertainty on data? The same remark for P933-L29 and P931 L1-4.

P930, L22 : How many negative indexes? and what was the total number?

P931, L8 : The title (4.6 Simulation) needs to be modified in order to focus on what kind of simulations? The conclusion needs to discuss more the generalization of the results and the methodology for applications with other models, or on other catchments.

P939, Table 2. Indicate the unit of beta (is this mm/m or m/m herein). Give a criteria in order to compare the variability of the CF-i between catchments. Is the criteria is the mean value and the standard error for example?

P941, Table 4: The first basin Bidasoa does not figure in tables 2 and 3. How the

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parameters were calibrated for this basin?

The text must be checked to correct English errors (i.e. the term dramatically is used in various places probably instead of drastically please check (P910, L19 ; P916, L22 ; P918, L13).

The paper is of good quality and worth publishing in HESS after making the modifications suggested above.

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