Hydrol. Earth Syst. Sci. Discuss., 8, C3589–C3591, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C3589/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "A trading-space-for-time approach to probabilistic continuous streamflow predictions in a changing climate" *by* R. Singh et al.

Anonymous Referee #1

Received and published: 22 August 2011

The paper discusses the sensitivity of modelled streamflow changes to climate change whether model parameters are allowed to change with climate or not (i.e., they are kept fixed as calibrated on historic data). A trading-space-for-time approach coupled to a Bayesian Monte-Carlo procedure is proposed in order to evaluate how model parameters would change with climate. Results of the sensitivity analysis are presented for 5 watersheds in USA, characterised by very different climatic conditions, and discussed. Even if a comprehensive validation of the method is not possible since the available data period is characterised by limited climatic variability, the results suggest that the performance of predictions based on changing parameters with climate is higher than

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

if parameters are kept fixed in time, particularly when input changes are relevant and in dry climate.

I really enjoyed reading this paper, which is synthetic, well organised and well written. I like the idea of looking at regional signature gradients to constrain model parameters for future scenarios and I like the method suggested in this paper, the Bayesian one, which allows to account for uncertainties in model parametrisation as well. I therefore strongly recommend the publication on HESS after considering some minor points listed below.

Page 6392, eq. (1): I am a bit confused by the formulation of the Bayes theorem. That's probably just because I am not used to see it written like that. The common formula is p(theta|data) = L(data|theta)*p0(theta) / (...), which expresses the gain of knowledge on parameters range (theta) after evidence has been observed (data). Now, S* is the signature predicted by the regional regression, i.e., the observed regional data. Is this the only information used in this paper to evaluate the posterior distribution of model parameters? In ungauged situations, that's the only data one has. What about the gauged streams? In general, one would also use streamflow data to calibrate the model. Are the calibration-streamflow-data represented somehow in Eq. (1)?

Page 6394, lines 21-23: Maybe a brief comment would be useful here about the assumption of changes in the mean and not in the standard deviation (variability) of precipitation and temperature. If extremes were of interest (e.g., changes in floods), then changes in variability of the inputs would probably play a major role.

Page 6397, lines 11-13: "Figure 3 shows that...". Just a suggestion: it is not very clear from Fig. 3 that C is closer than H to the observed points... Maybe another scatterplot would be useful here, "observed changes in streamflow" vs. "predicted changes in streamflow".

Page 6399, lines 18-29: is there any interpretation of why the uncertainty in predicted streamflow varies in the way showed in Fig. 4? Looking at the type C predictions, is

HESSD

8, C3589–C3591, 2011

Interactive Comment

there any reason why in wet catchments the uncertainty is more sensitive to changes in temperature than to changes in precipitation, while the opposite holds for dry catchments?

Page 6399, lines 28-29: "The uncertainty is lowest in the dry catchments". This is a bit counterintuitive if one looks at Fig. 3, where greater prediction intervals are obtained for the drier catchments.

Page 6400, line 10: I would not discuss floods here because the graph relates to monthly values.

Page 6404, line 8: the fact that "uniform random sampling" of parameters was used is mentioned here for the first time. It would be better to discuss it before, e.g., in the method section.

Page 6404, Conclusions section: In the sensitivity analysis, the changes in the inputs are assumed certain and the output changes are derived with uncertainty related to model parameters. Changes in the inputs, precipitation and temperature, are also uncertain. Would it be possible, through the procedure discussed in this paper, to propagate uncertainties in the inputs to the output? One comment on this issue could be proper in the conclusion section.

Fig 5a: the y-axis label should be "log(Predicted...)", isn't it?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 6385, 2011.