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Interactive Comment

## Interactive comment on "GIBSI: an integrated modelling system for watershed management – sample applications and current developments" by R. Quilbé and A. N. Rousseau

## Anonymous Referee #1

Received and published: 18 June 2007

GIBSI: an integrated modelling system for watershed management - sample applications and current developments

By Renaud Quilbé and Alain N. Rousseau

General comments

The article presents the main lines and example applications of the GIBSI decision support system (DSS). The article is clear and well-written. GIBSI appears to be a powerful DSS, with a wide range of possible applications, which may be of interest for many water managers and decision makers.



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The article does not bring much new scientific insights since its main merit is to review and summarize previous work that was done on the Chaudière River catchment using the GIBSI DSS.

The authors first provide a short description of the DSS structure and then review seven applications on the Chaudière River catchment in Canada for different issues of water management:

- 1. effect of timber harvesting,
- 2. impact of municipal clean water program
- 3. determination of environmental load allocation
- 4. environmental benefit-cost analysis
- 5. influence of past land use evolution
- 6. influence of future land use evolution
- 7. definition of achievable agroenvironmental performance standards

Each case study is presented following the same format (context and objectives; scenarios and simulations; results) which eases the reading. However, this presentation is a bit long and could probably be shortened.

The article makes a nice presentation of the software and its possible applications, but this makes the article look like a demonstration manuals rather than a scientific paper. This could be changed by strengthening the discussion on some important aspects:

- Limitations: the limitations of the different applications are only shortly discussed at the end of the article (section 4.2), whereas they may represent crucial points in the implementation of the DSS and in the decision making process. This could be better discussed.

- Generality: the GIBSI DSS was applied on a single catchment, which obviously pre-

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vents any generalisation of the conclusion. A better discussion should be proposed using the known limitations of the models included in GIBSI

The objectives of the article could also be more clearly stated. Detailed comments are provided below. Minor revision is requested.

Answers to HESS queries:

1) Does the paper address relevant scientific questions within the scope of HESS? Yes

2) Does the paper present novel concepts, ideas, tools, or data? Yes, GIBSI seems innovative

3) Are substantial conclusions reached? No, except that GIBSI seems a good candidate for decision support in the water domain

4) Are the scientific methods and assumptions valid and clearly outlined? The article reviews several past applications, which are quite well described

5) Are the results sufficient to support the interpretations and conclusions? Some conclusions of model applications are probably too general since the DSS is applied on a single case study

6) Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? No, but appropriate referencing is provided

7) Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes

8) Does the title clearly reflect the contents of the paper? Yes

9) Does the abstract provide a concise and complete summary? Yes

10) Is the overall presentation well structured and clear? Yes, but sections 3.6 and 3.7 could be placed just after 3.2 since they all refer to land use and land cover

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11) Is the language fluent and precise? Yes

12) Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes

13) Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? The description of case study applications could probably be shortened.

14) Are the number and quality of references appropriate? Yes

15) Is the amount and quality of supplementary material appropriate? Yes

Specific comments:

p. 1303, last paragraph: the objective of the article (presentation of the software and review of past applications) should be more clearly stated

p. 1304-1306: it would be interesting to know the main differences between the GIBSI DSS and other DSSs. What are the advantages/drawbacks/limitations of this DSS in comparison with existing ones. This may help the reader to orientate his/her choice of a DSS. The way the different GIBSI models communicate with each other is unclear. Hydrology seems to be provided by HYDROTEL. Does it mean that the hydrological modules of the other models (e.g. SWAT, EPIC) are not used at all in the GIBSI modelling structure? Brief information could also be provided on the way models are calibrated.

p. 1306 and following: the description of model applications is clear but is quite long. It may be better to give a general picture of the DSS functionalities at the beginning of section 3 with appropriate referencing and then only detail a few applications to give examples of model application. In section 2, the authors mention that four types of management scenarios can be defined. Giving one example for each type of scenario is probably sufficient. In this general presentation, it would be interesting for the end-user to describe the amount of effort needed to implement the DSS on a catchment.

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Does it require one day or one year of work (I guess it is somewhere in between)? What is the amount of data needed? How long is it to calibrate the full DSS?

The homogeneous way of presenting model applications is very good, but I would add two sub-sections each time to provide a better scientific ground to the presentation:

- the results discussed here are mainly simulations using different scenarios, for which obviously no confrontation to measures (i.e. no model assessment) is possible. However the reliability of the DSS output will strongly depend on the quality of the model used to run the scenarios. This quality may be evaluated in a generic way (for this objective, was the model found reliable on past applications on other case studies?) or more specifically on the studied catchment (a first measure of model credibility could be to evaluate to which extend the model is able to make simulation close to the observations of the current state for the variable of interest. The model will be all the more credible for scenario testing as it is able to simulate observed conditions). Hence after presenting the context and objectives of the study, a section "Model credibility" could be added to shortly review past applications on the model (not limited to the Chaudière) and its performance for current conditions on the studied catchment.

- After the "Results" sub-section, I would add a section discussing shortly the application implementation and the strengths/limitations of the application. Indeed it may be very interesting for the end-user to know which efforts (e.g. in data collection, construction of scenarios) are necessary. It would be also interesting to know if there are known limitations and the possible strengths over other existing approaches (other DSS).

p. 1307, line 14: the authors could give the Nash-Sutcliffe criterion obtained in the spatial and temporal validation.

p. 1308, line 6-7: the initial conditions may play a role on model results. How the model was initialized at the beginning of each year? Was there any warm-up period used?

p. 1308, lines 18-19: the authors state that "These results confirm the fact that de-

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forestation has a great effect on runoff during summer". However this is in no way a confirmation. The results of the different scenarios are just to be linked to the hypotheses put in the model. If another model with different hypotheses had been used, other results would be obtained. The demonstration of the impact of deforestation can only be obtained by observation.

p. 1313, line 21: Is it of general reach that watershed hydrology is "highly sensitive to land use"?

p. 1313 - 1316: sections 3.6 and 3.7 may be better placed after section 3.2 as they refer to the same type of application.

p. 1314, results sub-section: were the required modifications of model parameters needed to account for the change physically realistic?

p. 1318, lines 23-24: why would the transposition to other pesticides or catchments be easy? Is there any result that provides evidence of that?

p. 1333: Figure 4 is a bit unclear. Precipitation could be represented using a reversed Y-axis or on a separate graph

**Technical corrections** 

p. 1302, line 24: it should be "European Water Framework Directive" instead of "European Directive Framework"

p. 1305, line 11: "they are" instead of "there are"

- p. 1313, line 11: "This result" instead of "This results"
- p. 1313, line 12: "is due to" instead of "due to"

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