

## ***Interactive comment on “Accessible integration of agriculture, groundwater, and economic models using the Open Modeling Interface (OpenMI): methodology and initial results” by T. Bulatewicz et al.***

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### **Reviewer Comment**

“OpenMI was developed and launched in 2005 with exactly the needs of the authors in mind: bringing together model domains and disciplines to jointly develop an integrated model for assessment of human-environmental issues. Such exercise will generate new insight in the system being studied, but it will also generate new areas for research on the validity of the integrated model. Are the connections scientifically sound? Allow

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the vocabulary and modelling concepts such combination? Can you combine individual calibrated models together without recalibration? As one of the first applications in this field, the paper provides valuable lessons for the new modelling paradigm. The authors have in a pragmatic way addressed various of these issues (e.g. page 7226-7227). Unfortunately, some of these aspects remain neglected in the concluding remarks. The authors are requested to highlight in their conclusions that the original parameter set of the agricultural model required replacement for an overall model consistency.”

### Author Response

We agree that the conclusion should highlight that an alternative parameter set was used for the agricultural model.

### Changes to the Manuscript

*Add to page 7231, line 5:*

“The initial parameter set selected for the agricultural model was found to induce error in the groundwater model that compounded on each year of simulation. Through the use of an alternative parameter set, the error was reduced and the overall consistency of the linked model was maintained. This highlights the challenge of ensuring that the quantities provided by a model meet the specific accuracy requirements of the model that consumes them, and that the error is not accumulated or amplified beyond acceptable limits on successive iterations of the linked model.”

### Reviewer Comment

“In Section 2.3 (Creating Linkable Components), it would be informative to readers to highlight the effort involved in turning the models into linkable components. Technical correction: Fig.2 is basically incorrect. At run-time, OpenMI Linkable Components communicate directly to each other by memory-based data exchange, i.e. there is basically no ‘run- time’ system. Figure 2 needs to be corrected, e.g. by showing two

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linkable components only.”

### **Author Response**

We agree that it would be informative to the reader to highlight the effort involved in creating the linkable components. Thank you for pointing out the error in Figure 2. It has been corrected, as well as the relevant text.

### **Changes to the Manuscript**

*Add to page 7223, line 18:*

“We found that it required approximately one week for a skilled software developer to create working components from the three models.”

*Replace Figure 2 on page 7243 of the manuscript with the image at the end of this document (Figure 1).*

*Replace the following text on page 7222, line 11:*

“Note that linkable components only advance their simulation time when requested by the runtime system (which is part of the available software tools and coordinates the execution of linked models).”

*With:*

“Note that a linkable component only advances its simulation time in response to a request for a quantity at a later point in simulation time.”

*Replace the following text on page 7224, line 14:*

“The runtime system repeatedly asks this component to advance its simulation

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time until the simulation completes. Before the groundwater component can advance its simulation time for each request, it must obtain the water use from the agricultural component, so the runtime system asks the agricultural component to first advance its simulation time to the point needed by the groundwater component. Similarly, before the agricultural component can advance its simulation time, it must obtain the crop choice from the economic component, so the runtime system asks the economic component to advance its simulation time to the point needed by the agricultural component."

*With:*

"The trigger asks the groundwater component to perform its simulation. Before the groundwater component executes a time step, it must obtain the current water use from the agricultural component by requesting it. When the agricultural component receives a request, it advances its simulation time to the requested time. Similarly, before the agricultural component executes a time step, it must obtain the current crop choice from the economic component by requesting it, which causes the economic component to advance its simulation time to the requested time."

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 7213, 2009.

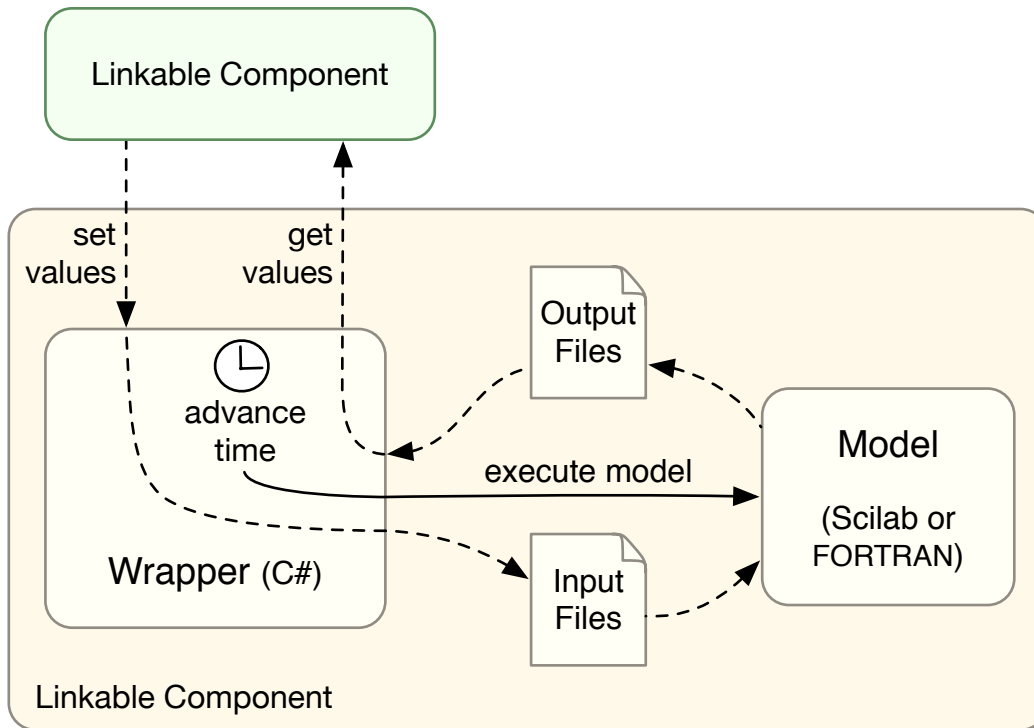
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**Fig. 1.** Corrected Figure 2