

To: Committee Members Validation Workshop
From: Herman Gerritsen

When reading through the proposal, v3, 7.5.2009, some thoughts came up.

Definition of the word: Model – model code or application

In my view, when discussing model verification and model validation we should be clear on what we want to mean by the word "model".

Do we mean:

- A: a computer code or modeling system that that resulted from implementing a solution method or methods for a set of discretised equations which describe certain physical processes?
- B: the application of a computer code to a specific domain, with a specific aim?

While in practice both interpretations will come in play, there is an essential difference these days. Models in the interpretation of type A are very generic and describe a wide range of applications (particularly for hydrodynamics). Models in the sense of type B concern a specific type of application - the generality is either of limited or of no interest.

For validation / verification this difference is essential: in my view we should focus on model codes that aim or claim to be applicable to a wide range of application - those are the once more and more used. For hydrodynamics one may think of POM, HYCOM, NEMO, HIROMB, NEMO, TELEMAC, MIKE21, MIKE3, Delft3D, and many more so-called "portable modeling systems", and less of concepts like: "Model of the Northwest European Shelf".

The above also has consequences on the issue of database description: much more in terms of "types of data", requirements on data and meta data, than in terms of actual data sets.

Previous initiatives

Secondly, there have been several validation or QA initiatives before, on which we can build. For coastal hydrodynamics, I mention the Tidal Flow Forum (1987), GESAMP Workgroup 43, with its report (early 1990-ies), the IAHR Guidelines on Model Validation (1994), FWR/FR0374, and the EU/HARMONI_QUA project. Many of the institutes listed in the excel sheet participated in these initiatives.

Efforts involved in realizing QA / consensus

The latter brings me to my third point: in my view, based also on actual involvement in some of the above activities, the activity of QA of (operational) marine models is very ambitious and should not be underestimated in terms of scientific and practical effort. It is just intelligent and time consuming work to design and conduct model experiments that allow useful (and sufficiently generic!) conclusions on QA, even assuming that the necessary bench mark data sets are in place and are more than adequate.

With the ultimate aim, to get consensus and acceptance of guidelines or standards for verification and validation among developing organisations and organisations that wish to apply models, this cost aspect of compliance cannot be discarded.

Both the GESAMP and the IAHR initiatives failed in the implementation stage: institutes had difficulties allocating sufficient money for getting benchmark data, performing critical test and solid reporting.

Suggestions; how to go forward?

The above comments are not intended as discouragement - absolutely not. I think we should continue, but that we should be aware of the past experience with these initiatives, and use those. Some items are practical:

- Let's formulate beforehand the target audience and the desired international follow up if the methodologies / frameworks for QA are developed, their status and how these can be implemented
- Set our ambitions at a level that is not too far above what is practically manageable – no white elephant
- Let us try to apply useful definitions that have already introduced before instead of introducing a complete new terminology. For instance: . conceptual model, algorithmic implementation (discretisation, order of approximation, numerical accuracy, etc), software implementation (solution techniques, matrix inversions, etc.)
- Identify the different scales of variation and set things up from those concepts
- Decide on whether or not to include chains of models – in my view first validate the separate modeling codes; only then we can validate their integrated use
- Invite to the workshop not only model developers, but also representatives of organizations that can bring in aspects as user requirements in terms of verification and validation.
- Invite scientists who have been involved in similar exercises
- Invite scientists who have been involved in creating or developing benchmark data sets (e.g. the ERCOFTAC database)
- etc.

Hope this can contribute to focusing our workshop and initiative.

Kind regards,

Herman Gerritsen