

Meta-tools: Helping engineers select adequate modelling methods

Peter A. Vanrolleghem

modelEAU, Département de génie civil et de génie des eaux, Université Laval, 1065 av. de la Médecine, Québec (QC), G1V 0A6, Canada (Peter.Vanrolleghem@gci.ulaval.ca)

ABSTRACT

When one evaluates recent modelling methodology focused publications that are related to water systems, it is striking to note that many of these publications do not deal with the presentation of innovative methods, but rather contribute by interesting comparisons of methods. It is hypothesized that the water industry searches for help in choosing the right method to use in a modelling project, rather than needs efforts to develop new methods that solve certain model-methodological problems. This seems a situation very similar to the one provokingly addressed by Willi Gujer in his Leading Edge Technology contribution in 2005 in Sapporo Japan where he called for a moratorium on activated sludge model development (Gujer 2006).

Rather than suggesting a moratorium, this paper calls for R&D efforts to create tools about modelling tools, i.e. meta-tools, that help the modeller pick up the right method among the large variety of methods he can choose among. Indeed, the modeller may not have the background, training or experience to make a proper judgement about the pro's and con's of individual methods and may stick to the default methods provided by the modelling software he/she is using.

The paper is not intending to present (the development of) such meta-tools, but wants to illustrate that in recent years quite some material has been collected that would allow the creation of a number of such meta-tools. The author has been involved in a number of such comparative studies that could form the basis for creating a meta-tool about, including:

- 1) Control strategy development (Ulf Jeppsson, this conference: "*Quo vadis benchmark simulation models?*", work of the BSM Task Group)
- 2) Life cycle assessment (Lluís Corominas, this conference: "*Towards a standard method for life cycle assessments (LCA) of wastewater treatment*")
- 3) Numerical solvers for ODE models (work of Claeys et al., 2010)
- 4) Optimization methods (an early comparison: Vanrolleghem & Keesman, 1996)
- 5) Process Monitoring methods (see the work of the BSM Task Group, among others)
- 6) Quality evaluation of models (Sylvie Gillot, this conference: "*Towards quantitative quality criteria to evaluate simulation results in wastewater treatment*")
- 7) Sensitivity analysis methods (Giorgio Mannina, this conference: "*Global sensitivity analysis in ASM applications: comparison of different methods*")
- 8) Uncertainty analysis methods (Peter Vanrolleghem, this conference: "*Uncertainties in water system models - breaking down the water discipline silos*", work of the DOUT Task Group)
- 9) Verification of model implementation (Copp et al., 2008; Hauduc et al., 2010)

It is hoped that this contribution to Watermatex2011 may incite further research into method comparison and the development of meta-tools that will support the modeller with his/her selection among the increasing number of advanced modelling methods.

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