IAHS-PUB Working Group on Top-Down Modelling

Terms of Reference

The Top-Down modelling Working Group (TDWG) is one of several WGs formed for the International Association of Hydrological Sciences (IAHS) Decade for Prediction in Ungauged Basins (PUB), 2002 – 2012. Details of PUB can be found at http://iahs.info and http://cee.uiuc.edu/research/pub/. WG activities will be directed towards the aims and objectives of PUB given in the Science and Implementation Plan, but each WG has autonomy to plan its activities.

The TDWG is an informal international group of hydrologists with interests and expertise in the top-down approach to computer modelling (see below for a working definition), particularly its application and further development for estimating hydrological variables in ungauged catchments. Key areas of interest will be (a) scientific aspects of the conversion of systematic and field research measurements to information useful for catchment management (with feedback to measurement network design and associated data management issues) and (b) the need to reduce uncertainty in variables estimated for catchment management. Important aspects of hydrological science for the TDWG will include: model structure; model parameter calibration techniques and methodologies (including spatial and temporal scaling aspects); parameter identifiability issues; statistical techniques; assimilation of data from field process studies and new measurement techniques; and computer software. The variables of interest include but are not restricted to the following: precipitation; streamflow; groundwater levels and volumes; hydro-ecological indicators (e.g. biodiversity variables, in-stream physical habitats); fluvial mass loads (fluxes) of sediment, adsorbed material on sediment, and solutes (including diffuse pollution components); soil moisture; atmospheric deposition; evaporation; transpiration.

The TDWG will address the following components of **Target 1** given in the PUB Science and Implementation Plan, interacting with other Target 1 issues (and the Target 2 issues) when necessary.

Target 1: Examine and improve existing models in terms of their ability to predict in ungauged basins through appropriate measures of predictive uncertainty:

> Advance new approaches to learning from existing data: data mining and re-analysis, basin inter-comparisons and global hydrology; Advance learning from the application of existing models, through uncertainty analyses and model diagnostics.

The TDWG will address **Themes 1 and 3** given in the PUB Science and Implementation Plan, interacting with other Themes as necessary for the PUB programme as a whole.

Theme 1. Develop new approaches for hydrological interpretation from existing data archives: data rescue and re-analysis, basin inter-comparisons and global hydrology.

Theme 3. Advance learning from the application of existing models, through uncertainty analyses and model diagnostics.

The first task of the TDWG will be to share information about the skills, interests and resources of its inaugural members, and for appropriate sub-groups to formulate project proposals to funding sources of their choosing.

In the spirit of PUB, the TDWG will facilitate collaboration between scientists internationally, with a view towards delivering techniques, software, etc. useful to other sectors of PUB and for water resources management in a range of hydro-climatic regions worldwide (including information and technology transfer to socio-economically developing regions). The TDWG will initially comprise a core group of inaugural Members but during the course of the PUB Decade it will seek to involve a wider range of relevant expertise and experience. The TDWG will aim to be open to all hydrologists with relevant interests and expertise who wish to participate.

Every attempt will be made to keep administrative business of the TDWG to a minimum. Business that cannot be dealt with by email will be undertaken at meetings coincidental with conferences, etc., of IAHS or The International Environmental Modelling and Software Society (iEMSs).

The TDWG comprises an Organiser, two Co-organisers and its Members, and will communicate as required with the PUB Scientific Steering Group (SSG) and through the SSG with the PUB Strategic Advisory Group (SAG). The TDWG Organiser will be the formal link with the SSG. Confirmation of the Organiser and Co-organisers will be sought at the first business meeting of the TDWG, which will be held during the session on Modelling Hydrological Responses in Ungauged Catchments, iEMSs 2004, 14-17 June 2004, University of Osnabrück, Germany – see http://www.iemss.org/iemss2004/ for details. These Terms of Reference (TOR) will be adopted at that meeting.

Hydrologists who wish to become TDWG Members should contact the TDWG Organiser. TDWG Membership is open to hydrologists internationally who (a) are actively involved in the development and application of top-down methods and software for estimating hydrological variables in ungauged catchments and (b) will contribute to the success of the TDWG specifically and to PUB more generally. TDWG Members can belong to other PUB WGs. Indeed, given that increasing interaction between WGs is likely as PUB develops, individual membership of different WGs is encouraged. Members of other PUB WGs (e.g. geographically regional WGs or other modelling-oriented WGs) are welcome to belong to the TDWG.

What is top-down modelling in the context of the TDWG?

The term 'top-down modelling' may mean slightly different things to different hydrologists. The following non-exhaustive description is for illustration in the context of the TDWG.

A top-down computational model seeks to explain, encapsulate understanding, and provide adequate predictive capability, using process conceptualisation (representation) at a level of complexity appropriate to, but not usually exceeding, (a) that required to address the problem in question (Occam's Razor) or (b) that which is justifiable on the basis of information extractable from available observational data. Different models may be required to address different problems.

The top-down approach is counter but highly complementary to the deterministic or bottom-up approach whereby explanation, understanding and predictive capability are sought by including representation of all processes considered relevant. Such models can be exceedingly complex structurally. Ideally, a single deterministic or bottom-up model would be able to address all questions.

The strengths and weaknesses of each approach, and their complementarities, are well-known. The TDWG will deal with hybrid approaches incorporating features of both approaches but with an emphasis on the top-down end of the spectrum of hybrid models.

Bibliography

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