

[Sign on](#)

[SAO/NASA ADS Physics Abstract Service](#)

- [Find Similar Abstracts \(with default settings below\)](#)
- [Full Printable Article \(PDF/Postscript\)](#)
- [Reads History](#)
- [Translate This Page](#)

Title: Control of mass balance error in a detailed model of surface-subsurface flow interaction

Authors: [Fiorentini, Marcello](#); [Orlandini, Stefano](#); [Paniconi, Claudio](#); [Putti, Mario](#)

Affiliation: AA(Dipartimento di Ingegneria "Enzo Ferrari," Università degli Studi di Modena e Reggio Emilia, Modena, Italy marcello.fiorentini@unimore.it), AB(Dipartimento di Ingegneria "Enzo Ferrari," Università degli Studi di Modena e Reggio Emilia, Modena, Italy marcello.fiorentini@unimore.it), AC(Institut National de la Recherche Scientifique, Centre Eau Terre Environnement (INRS-ETE), Université du Québec, Quebec City, Canada), AD(Dipartimento di Matematica, Università degli Studi di Padova, Padova, Italy putti@dmsa.unipd.it)

Publication: EGU General Assembly 2014, held 27 April - 2 May, 2014 in Vienna, Austria, id.7433

Publication Date: 05/2014

Origin: [COPERNICUS](#)

Bibliographic Code: [2014EGUGA..16.7433F](#)

Abstract

Several process-based catchment-scale hydrologic models have been developed in recent years to describe the interactions and feedbacks between different components of the water cycle, but few studies have considered the sources of coupling error in these models. In this work we analyze the sequential iterative coupling scheme of the distributed model CATHY (CATchment HYdrology) in order to identify the different sources of mass balance error and to examine how these are influenced by topography, hydraulic properties, and atmospheric forcing. A pair of adimensional indices that quantify the degree of coupling and of flux partitioning is presented. Our analysis shows that mass balance errors increase during the flood recession limb because of the exchange of information between surface and subsurface water flow. Surface water propagation is cell centered, while the subsurface flow equation is solved on the vertices of surface cells. Evaluation of surface pressure heads and exchange fluxes is critical on this staggered surface-subsurface mesh, especially during transitions from unsaturated to saturated conditions and vice versa. A modified version of the flux exchange algorithm is introduced that considers the effective availability of water on surface cells. The performance of the model is also improved by introducing a heuristic procedure to control and adapt the time step interval. Starting from numerical stability and convergence constraints, this procedure varies the computational interval as a function of the rate of change of surface saturation via the coupling degree index. A final improvement made to the sequential coupling scheme in CATHY is to solve the surface routing equation after rather than before the subsurface

module. We find that the modified version improves the water balance by more than 50% in most of the tests considered for a simple v-shaped catchment. The results so far obtained for the synthetic v-catchment indicate the need for a more comprehensive analysis including real catchments.

[Bibtex entry for this abstract](#) [Preferred format for this abstract](#) (see [Preferences](#))

Add this article to private library

Remove from private library

Submit corrections to this record

View record in ADS Bumblebee **NEW!**

Find Similar Abstracts:

Use: Authors

Title

Abstract Text

Return: Query Results Return items starting with number

Query Form

Database: Astronomy

Physics

arXiv e-prints

Send Query

Reset
