

Home

Online Library HESS

- Recent Final Revised Papers
- [Volumes and Issues](#)
- Special Issues
- Library Search
- Title and Author Search

Online Library HESSD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper

Impact
Factor
2.270

ISI
indexed



[Volumes and Issues](#) [Contents of Issue 3](#)

Hydrol. Earth Syst. Sci., 7, 257-267, 2003
www.hydrol-earth-syst-sci.net/7/257/2003/

© Author(s) 2003. This work is licensed
under a Creative Commons License.

Balancing the books – a statistical theory of prospective budgets in Earth System science

J. P. O'Kane

Environmental Institute and Department of Civil and Environmental Engineering,
National University of Ireland, Cork, Republic of Ireland

Email: p.okane@ucc.ie

Abstract. An honest declaration of the error in a mass, momentum or energy balance, ϵ , simply raises the question of its acceptability: "At what value of ϵ is the attempted balance to be rejected?" Answering this question requires a reference quantity against which to compare ϵ . This quantity must be a mathematical function of all the data used in making the balance. To deliver this function, a theory grounded in a workable definition of acceptability is essential. A distinction must be drawn between a retrospective balance and a prospective budget in relation to any natural space-filling body. Balances look to the past; budgets look to the future. The theory is built on the application of classical sampling theory to the measurement and closure of a prospective budget. It satisfies R.A. Fisher's "vital requirement that the actual and physical conduct of experiments should govern the statistical procedure of their interpretation". It provides a test, which rejects, or fails to reject, the hypothesis that the closing error on the budget, when realised, was due to sampling error only. By increasing the number of measurements, the discrimination of the test can be improved, controlling both the precision and accuracy of the budget and its components. The cost-effective design of such measurement campaigns is discussed briefly. This analysis may also show when campaigns to close a budget on a particular space-filling body are not worth the effort for either scientific or economic reasons. Other approaches, such as those based on stochastic processes, lack this finality, because they fail to distinguish between different types of error in the mismatch between a set of realisations of the process and the measured data.

Keywords: balance, budget, sampling, hypothesis test, closing error, Earth System

[Final Revised Paper](#) (PDF, 605 KB)

Citation: O'Kane, J. P.: Balancing the books – a statistical theory of prospective budgets in Earth System science, Hydrol. Earth Syst. Sci., 7, 257-267, 2003. [Bibtex](#) [EndNote](#) [Reference Manager](#)

Search HESS

Library Search

Author Search

News

- [New Service Charges](#)
- [Financial Support for Authors](#)
- [ISI Impact Factor: 2.270](#)

Recent Papers

01 | HESSD, 12 Mar 2009:
Distributed modeling of land surface water and energy budgets in the inland Heihe river basin of China

02 | HESSD, 12 Mar 2009:
Comparison of six algorithms to determine the soil thermal diffusivity at a site in the Loess Plateau of China

03 | HESS, 11 Mar 2009:
Large-scale lysimeter site St. Arnold, Germany: analysis of 40 years of precipitation, leachate and evapotranspiration