

# SUNGLASSES: Sources of UNcertainty Global Assessment using Split SamPLIES - Ann van Griensven and Tom Meixner

PUB-IAHS Workshop  
Uncertainty Analysis in  
Environmental Modelling  
6<sup>th</sup> – 8<sup>th</sup> July 2004

## a) Introduction:

In order to getting a stronger evaluation of the model prediction power, the Sources of Uncertainty Global Assessment using Split SamPLIES (SUNGLASSES) is designed to assess predictive uncertainty that is not captured by parameter uncertainty. The method accounts for strong increases in errors when simulations are done outside the calibration period by using a split-sample strategy whereby the validation period is used to set uncertainty ranges.

These uncertainty ranges depend on the GOC, representing the objective functions, at one side and an evaluation criterion (to be used in decision making) at the other side. The GOC has the role to assess the degree of error on the process dynamics, while the evaluation criteria define a threshold on the GOC. This threshold should be as small as possible, but the uncertainty ranges on the criteria should include the "true" value for both the calibration and the validation period, e.g. when mass balance is used as criteria, these "true" values are then a model bias equal to zero. Thus, the threshold is increased till the uncertainty ranges on the mass balance bias includes zero. SUNGLASSES operates by ranking the GOCs (figure 1). Statistical methods can be used to define a threshold considering parameter uncertainty. In this case, ParaSol was used to define such a threshold. However, when we look at the predictions, it is possible that unbiased simulations are not within the ParaSol uncertainty range, which means that there are some more unknown uncertainties acting on the model outputs (figure 2). Thus, a new, higher threshold is needed in order to get unbiased simulations included in the uncertainty bounds (figure 1 and 2).

## b) Advantages

- Tackles the problem of biases in the outputs of importance due to model structural errors
- Evaluation method according to purpose of the method
- Efficient
- Deals with multi-objective problems
- Global method

## c) Disadvantages

- Not a truly statistical method.
- Method needs enough observations to create split-sample series.

## d) Assumptions

- Biases in outputs are due to errors in model structure and suitability of data sets for procedure

## e) Most appropriate application areas

Complex models that support decision making (such as water quality models)

## f) Reading list

van Griensven A. and Meixner T. , 2004. Dealing with unidentifiable sources of uncertainty within environmental models. Proceedings of the International Environmental Modelling and Software Society (iEMSs 2004), 14-17 June 2004 University of Osnabrück, Germany.

## g) Software availability

Codes downloadable from website

## h) Web links or other information

<http://homepages.vub.ac.be/~avgriens/work/uncert.html>

## i) Figures

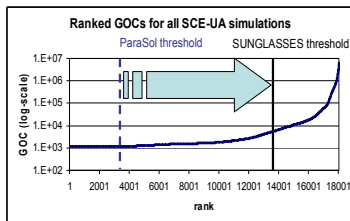


Figure 1: Selection of good parameter sets using a threshold imposed by ParaSol or by SUNGLASSES

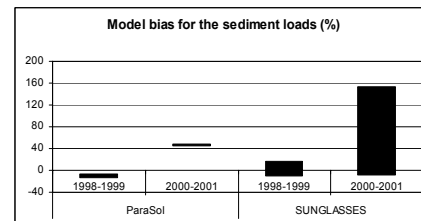


Figure 2: Confidence regions for the sediment loads calculations according to ParaSol and SUNGLASSES

## j) Delegates Comments (please add !!)