Geophysical Research Abstracts
Vol. 12, EGU2010-12295, 2010
EGU General Assembly 2010


# Calibrating flood inundation models: identifying and addressing uncertainty in satellite observed flood extents

Liz Stephens (1), Paul Bates (1), and David Mason (2)

(1) University of Bristol, School of Geographical Sciences, Bristol, United Kingdom (liz.stephens@bristol.ac.uk), (2) University of Reading, Reading, United Kingdom, RG6 6AL (dcm@mail.nerc-essc.ac.uk)

Improvements in the resolution of satellite imagery have enabled extraction of water surface elevations at the margins of the flood. Comparison between modelled and observed water surface elevations provides a new means for calibrating and validating flood inundation models, however the uncertainty in this observed data has yet to be addressed. Here a flood inundation model is calibrated using a probabilistic treatment of the observed data.

A LiDAR guided snake algorithm is used to determine an outline of a flood event in 2006 on the River Dee, North Wales, UK, using a 12.5m ERS-1 image. Points at approximately 100m intervals along this outline are selected, and the water surface elevation recorded as the LiDAR DEM elevation at each point.

With a planar water surface from the gauged upstream to downstream water elevations as an approximation, the water surface elevations at points along this flooded extent are compared to their ‘expected’ value. The pattern of errors between the two show a roughly normal distribution, however when plotted against coordinates there is obvious spatial autocorrelation. The source of this spatial dependency is investigated by comparing errors to the slope gradient and aspect of the LiDAR DEM.

A LISFLOOD-FP model of the flood event is set-up to investigate the effect of observed data uncertainty on the calibration of flood inundation models. Multiple simulations are run using different combinations of friction parameters, from which the optimum parameter set will be selected. For each simulation a T-test is used to quantify the fit between modelled and observed water surface elevations. The points chosen for use in this T-test are selected based on their error. The criteria for selection enables evaluation of the sensitivity of the choice of optimum parameter set to uncertainty in the observed data.

This work explores the observed data in detail and highlights possible causes of error. The identification of significant error (RMSE = 0.8m) between approximate expected and actual observed elevations from the remotely sensed data emphasises the limitations of using this data in a deterministic manner within the calibration process. These limitations are addressed by developing a new probabilistic approach to using the observed data.