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Multi-objective automatic calibration of hydrodynamic models utilizing inundation maps and gauging data

Nguyen Viet Dung (1,2), Bruno Merz (1), András Bárdossy (3), Tang Duc Thang (2), and Heiko Apel (1)

(1) GFZ German Research Center for Geoscience, Section 5.4 Hydrology, Potsdam, Germany (hapel@gfz-potsdam.de, +49 331 2881570), (2) Southern Institute of Water Resources Research, Ho Chi Minh City, Vietnam, (3) Institute of Hydraulic Engineering, University of Stuttgart, Stuttgart, Germany

Calibration is an essential, although not trivial step of modelling studies, which has become recently more popular in water related fields. Because of the lack of appropriate data and the large computational demand, this technique is hardly found in hydrodynamic modelling, especially in large scale applications. However, there are recent developments that improve the situation on both the data and computing side. Remote sensing, especially radar-based techniques proved to provide highly valuable information on flood extents, and in case high precision DEMs are present, also on spatially distributed inundation depths. And thanks to the ever growing computational power and parallelization techniques, multi-objective automatic calibrations of large scale applications become feasible with respect to computational time. In the presented study we build on these developments by calibrating a large-scale 1-dimensional hydrodynamic model of the whole Mekong Delta downstream of Kratie in Cambodia: we combined in-situ data from a network of river gauging stations, i.e. data with high temporal but low spatial resolution, with a series of inundation maps derived from ENVISAT Advanced Synthetic Aperture Radar (ASAR) satellite images, i.e. data with low temporal but high spatial resolution, in an multi-objective automatic calibration process based on a parallel version of the NSGA-II algorithm. It is shown that an automatic, multi-objective calibration of hydrodynamic models, even of such complexity and on a large scale and complex as a model for the Mekong Delta, is possible. Furthermore, the calibration process revealed model deficiencies in the model structure, i.e. the representation of the dike system in Vietnam, which would have been difficult to detect by a standard manual calibration procedure.