Pixel-based flood mapping from SAR imagery: a comparison of approaches

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Due to their all-weather, day and night capabilities, SAR sensors have been shown to be particularly suitable for flood mapping applications. Thus, they can provide spatially-distributed flood extent data which are valuable for calibrating, validating and updating flood inundation models. These models are an invaluable tool for water managers, to take appropriate measures in times of high water levels.

Image analysis approaches to delineate flood extent on SAR imagery are numerous. They can be classified into two categories, i.e. pixel-based and object-based approaches. Pixel-based approaches, e.g. thresholding, are abundant and in general computationally inexpensive. However, large discrepancies between these techniques exist and often subjective user intervention is needed. Object-based approaches require more processing but allow for the integration of additional object characteristics, like contextual information and object geometry, and thus have significant potential to provide an improved classification result. As means of benchmark, a selection of pixel-based techniques is applied on a ERS-2 SAR image of the 2006 flood event of River Dee, United Kingdom. This selection comprises Otsu thresholding, Kittler & Illingworth thresholding, the Fine To Coarse segmentation algorithm and active contour modelling. The different classification results are evaluated and compared by means of several accuracy measures, including binary performance measures.