Development of a 'bare-earth' SRTM DEM product

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We present the methodology and results from the development of a near-global 'bare-earth' Digital Elevation Model (DEM) derived from the Shuttle Radar Topography Mission (SRTM) data. Digital Elevation Models are the most important input for hydraulic modelling, as the DEM quality governs the accuracy of the model outputs. While SRTM is currently the best near-globally [60N to 60S] available DEM, it requires adjustments to reduce the vegetation contamination and make it useful for hydrodynamic modelling over heavily vegetated areas (e.g. tropical wetlands).

Unlike previous methods of accounting for vegetation contamination, which concentrated on correcting relatively small areas and usually applied a static adjustment, we account for vegetation contamination globally and apply a spatial varying correction, based on information about canopy height and density.

In creating the final 'bare-earth' SRTM DEM dataset, we produced three different 'bare-earth' SRTM products. The first applies global parameters, while the second and third products apply parameters that are regionalised based on either climatic zones or vegetation types, respectively. We also tested two different canopy density proxies of different spatial resolution. Using ground elevations obtained from the ICESat GLA14 satellite altimeter, we calculate the residual errors for the raw SRTM and the three 'bare-earth' SRTM products and compare performances.

The three 'bare-earth' products all show large improvements over the raw SRTM in vegetated areas with the overall mean bias reduced by between 75 and 92% from 4.94 m to 0.40 m. The overall standard deviation is reduced by between 29 and 33 % from 7.12 m to 4.80 m. As expected, improvements are higher in areas with denser vegetation. The final 'bare-earth' SRTM dataset is available at 3 arc-second with lower vertical height errors and less noise than the original SRTM product.