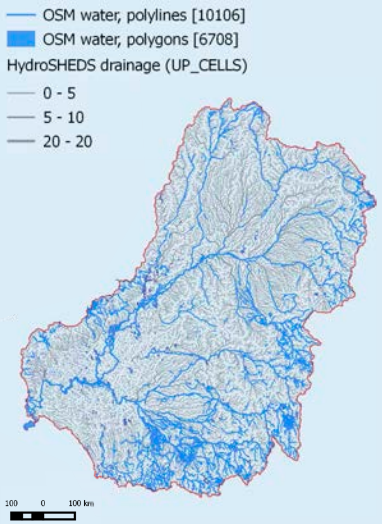
Contact

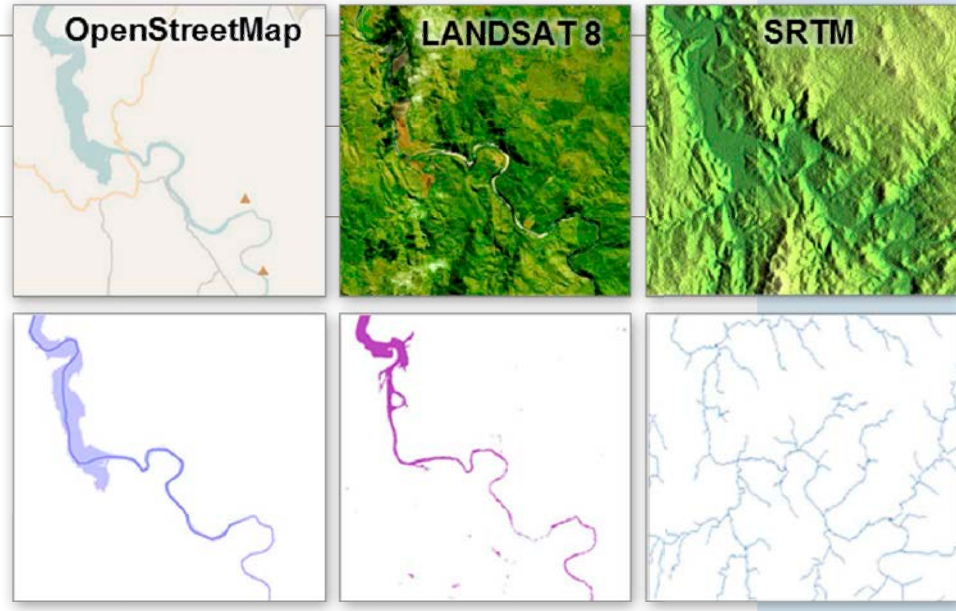
gennadii.donchyts@deltares.nl
T +31(0)6 4691 4642

jaap.schellekens@deltares.nl
T +31(0)88 335 8223

hessel.winsemius@deltares.nl
T +31(0)88 335 8465



Where are the rivers?



Detailed maps of surface water are essential for many environmental applications. Maps of surface water can be generated by combining data from LANDSAT satellite imagery, digital elevation models from the Shuttle Radar Topography Mission (SRTM) and OpenStreetMap (OSM). Accurate identification of surface water using satellite imagery remains a challenging task for remote sensing due to sensor limitations, complex land cover, topography and atmospheric conditions. An alternative in hilly landscapes is to extract drainage networks from high-resolution digital elevation models in SRTM. A third approach is to use OpenStreetMap, which provides data that are regularly digitised and validated manually using the most widely-available data sources. In this study, Deltares developed a high-resolution water mask using OSM, LANDSAT 8 imagery and SRTM.

The approach to developing a surface-water mask using Landsat 8 imagery includes drawing on methods from remote sensing, machine learning, and geospatial processing. The algorithms are applied to process petabytes of geospatial data in the Cloud using the Google Earth Engine parallel processing platform. A new method has been developed based on image-processing algorithms such as Canny edge filtering and Otsu thresholding for the accurate detection of water in flat areas. Additional steps are performed on the basis of supervised classification and Height Above the Nearest Drainage (HAND) derived from SRTM to detect surface water accurately in hilly areas.

The new method was tested successfully in the Murray & Darling River Basin, Australia. It was found that the best surface-water mask is generated by combining all three datasets. Only 32% of the total OpenStreetMap and Landsat 8 water mask match. When the drainage network derived from SRTM was used, it was possible to confirm about 50% of the OpenStreetMap linear water features. The data are clearly complementary. As far as positional accuracy is concerned, the observed differences between river features derived from OSM and Landsat 8 are mostly less than 60 m, which can be considered an excellent match. The differences between the OSM water features and the SRTM analysis are slightly larger (110 m) for the drainage network.

The research demonstrates that using the new satellite imagery acquired by Landsat 8 mission to detect water bodies, in combination with water masks derived from other sources, has clear benefits. We have also found the SRTM to be an excellent complementary dataset that can be used to improve the water-mask detection method for hilly areas after its transformation into HAND. The new Landsat 8 water mask reveals many new water bodies that were previously not present in OSM or any other vector dataset we have explored. A large proportion is made up of small but plentiful agricultural reservoirs located in the northern and southern parts of the catchment.

Further reading:
http://osm water.appspot.com/