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Improved hydrologic conditioning of the TanDEM-X dataset for HydroSHEDS v2

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HydroSHEDS is a well-established database containing global hydrographic information. Although being widely used, the SRTM-based version 1 of HydroSHEDS has important limitations, in particular in areas above 60° N latitude. The coverage of this region is of low quality because no underpinning SRTM elevation data were available. As most hydrological models require topographic information and hydrographic data in terms of stream networks or catchment boundaries, the increased availability of accurate remote sensing data promotes the development of a second and refined version of the HydroSHEDS database. For this reason, HydroSHEDS v2 is currently created in collaboration between the German Aerospace Center (DLR), McGill University, Confluvio Consulting and the World Wildlife Fund. Foundation of HydroSHEDS v2 is the digital elevation model (DEM) of the TanDEM-X mission (TerraSAR-X add-on for Digital Elevation Measurement). This 0.4 arc-second resolution DEM with global coverage of land surfaces was created in partnership between DLR and Airbus Defence and Space. Enhanced pre-processing techniques are applied to preserve details of the high-resolution DEM in its hydrologically conditioned version. These pre-processing steps include an infill of invalid and unreliable elevation values, an automatic coastline delineation refined with manual corrections, an AI-based water detection algorithm, and a modification of elevation data in urban and vegetated areas for improved evaluation of the flow of water. Additionally, experiences and preliminary results from processing the water body mask at global scale are outlined. The hydrologically pre-conditioned DEM and the water body mask derived from the TanDEM-X dataset are in the subsequent steps further processed with refined hydrological optimization and correction algorithms to derive flow direction and flow accumulation maps. These gridded datasets are the core products of HydroSHEDS v2 and will be complemented with secondary information on river networks, lake shorelines, catchment boundaries, and their hydro-environmental attributes in vector format. The main release of HydroSHEDS v2 is scheduled for 2023 under a free license.