Cartographic Depth-to-Water (DTW) index maps for Finland, 2m, 2023, Aura Salmivaara, LUKE

Cartographic depth-to-water index (Murphy et al. 2007, 2008, 2009) is calculated in centimeters based on digital elevation model and stream networks. Stream networks are created based on various thresholds to simulate different hydrological situations. Smaller threshold means that the amount of water e.g. precipitating to that threshold area is sufficient to generate a stream, water visible in surface. The DTW index is solely based on digital elevation model and soil or weather information is not considered, which introduces uncertainty to using certain DTW threshold map (Ågren et al. 2015, Lidberg et al. 2020).

Generally DTW map with 0.5 ha threshold represents very moist conditions, e.g. after snow melt or elongated or heavy rainfall events. DTW with 1 ha threshold represent also more moist than average conditions. DTW with 2 ha threshold represent average conditions. DTW with 4 ha threshold is generally thought to represent conditions in end-of-summer (Ågren et al. 2014). DTW with 10ha threshold is representing somewhat dryer conditions.

DTW index is measured in centimeters and usually areas with DTW index values less than 100cm are considered to be wet. The DTW index value should not be thought to directly relate to the actual depth of water table but can be used as an indicator of wetter areas that should be carefully considered e.g. when planning forest operations, delineating buffer zones or identifying areas that are naturally more moist compared to surrounding areas.

The calculation of DTW is done based on 2m DEM (NLS , 2023a), which is first pre-processed in order to get the flow of water consistent by burning the intersections of roads (NLS, 2023b) and streams (NLS, 2023c) into the DEM (i.e. lowering the DEM values on roads to allow the flow of water along the stream). The details of pre-processing of the DEM will be described in Kesälä et al. (to be submitted in 2024).

The stream network provided in topographic database represents streams that are round-the-year active and this is often more scarce compared to the stream networks created for calculation of the DTW. After the remaining spurious pits are removed from DEM by breaching method (Lindsay, 2016) the calculation of flow direction and flow accumulation rasters is possible. The D8 methods was used for flow direction and accumulation calculation (Jenson & Dominque, 1988). Various stream networks are calculated by using 0.5ha, 1ha, 2ha, 4ha, and 10ha threshold on the flow accumulation raster. The DTW is finally calculated based on these stream networks and slope with cost accumulation analysis.

The DTW calculation was done per buffered mapsheets of flow accumulation rasters using virtual rasters, GDAL commands, Whitebox tools in the CSC Puhti supercluster.

Coordinate system: ETRS89 / ETRS-TM35FIN (EPSG:3067) Geographic location: Entire Finland

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