Assessing Natural River Fragmentation Through Waterfalls at a Global Scale

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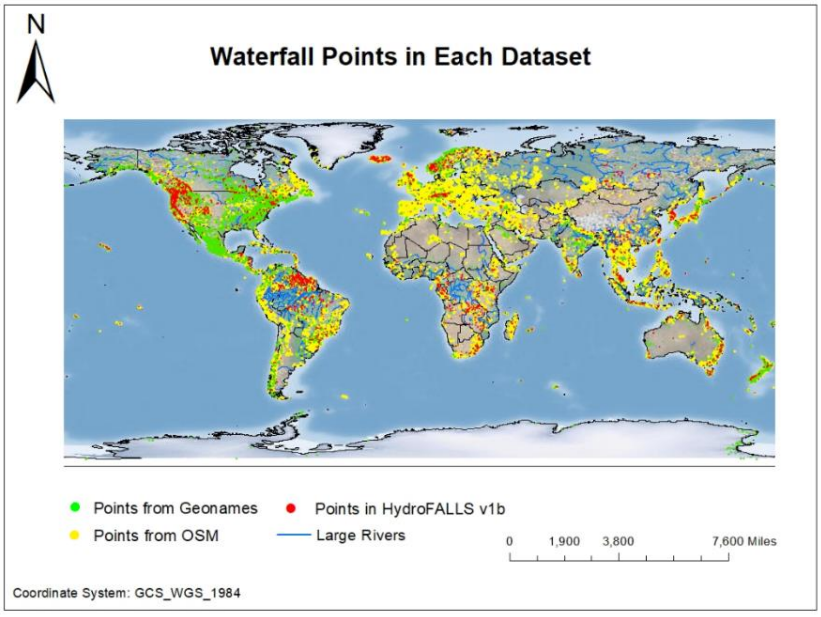
Waterfalls are normally vertically steep falls sitting on a river. Since they create barriers that cut the river network, they cause river and habitat fragmentation which has a series of environmental significance such as promoting the isolation of aquatic populations and facilitating genetic diversification. However, large-scale studies on river fragmentation by waterfalls are constrained by the lack of high-quality dataset with sufficient spatial coverage and completeness. This thesis improves the current version of the global waterfall database HydroFALLS v1a and produces the updated version HydroFALLS v1b by drawing new waterfall points from a national dataset of China. Points collected were cleaned up, consolidated, validated, and georeferenced with a global river network that is part of the global hydrographic data framework HydroSHEDS. In addition, a standardized workflow of global waterfall data processing was developed to for future updates of the database using points collected from two global datasets. The global-scale usage and applicability of HydroFALLS v1b is tested with the relationship between freshwater fish diversity distribution and the presence of waterfalls as a natural habitat fragmenting factor. A variety of levels of correlation in different ecozones reveal large-scale impacts of natural river fragmentation and the feasibility of related studies, which highlights the necessity of building a high-quality global waterfall database.



Map of waterfall points in HydroFALLS v1b and new points collected from the two global datasets, OSM and Geonames (Designed by author, 2022).