



Watershed Analysis of Tibetan Lakes

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Zedong Li

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Introduction

Tibetan Plateau is the highest altitude area in the world, and it also possesses numerous lakes. The existence of lakes shows there are large drainage networks in the area, and it is crucial to analyze the basins to know the water balance of the lakes. Here we conduct a watershed analysis of Tibetan lakes using a Digital Elevation Model (DEM).

Picking a Suitable Threshold is Important

It is essential to analyze the watershed boundaries and streams based on the DEM dataset for watershed analysis. Also, a comparison of different DEM files is beneficial. Map 1 indicates the differences between two DEMs (raw DEM subtracted from filled DEM) and shows the places where DEM elevations were filled using a procedure called pit-filling, in order to remove erroneous pits in the DEM. In addition, it is helpful to test four different thresholds and then pick a reasonable one to obtain a stream network of a realistic density, and to compare it with flow accumulation. I examined thresholds of 25000, 8000, 1000, and 500, which are two big and relatively small numbers, as the thresholds for the comparison map to show the apparent contrast. Furthermore, we have to pick one reasonable threshold to derive the streams and basins. I picked 1000 as the appropriate threshold because the streams made by the threshold of 1000 are the most similar to the HydroSHEDS streams. Later on, when we derive the basins, it is useful to create some catchments points on the software manually, and then we can derive detailed basins. Also, we have to create the comparison maps to compare the derived basins with HydroSHEDS basins and compare the derived streams with HydroSHEDS streams. When making these comparison maps, choosing complementary colors and sizes to present the streams and the boundaries of basins is convenient for the readers to interpret the results better. For example, blue and red are suitable complementary colors to indicate the differences between the basins and rivers.

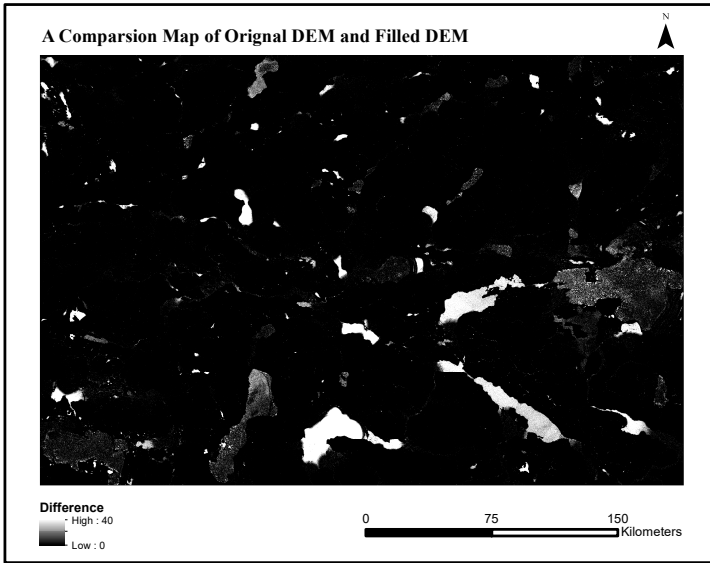
The Comparisons Tell the Truth

There is a lot of information that directly comes from the comparison maps. From Map 2, even though the four thresholds streams are messy, it is easy to pick the suitable thresholds stream, and we can see that the 1000 threshold streams have the most detail but not the most error in flow directions. After that, when we compare Map 3 and Map 4, we can know that even though the DEMs may possess some differences, their overall appearances look similar, and there are some small different streams and basins located at the edges of the maps. Also, we can see the details when we compare Map 5 and Map 6, and we can see that the most different places are at the right bottom of these maps, and the differences also existed because of the complex river networks and lakes here.

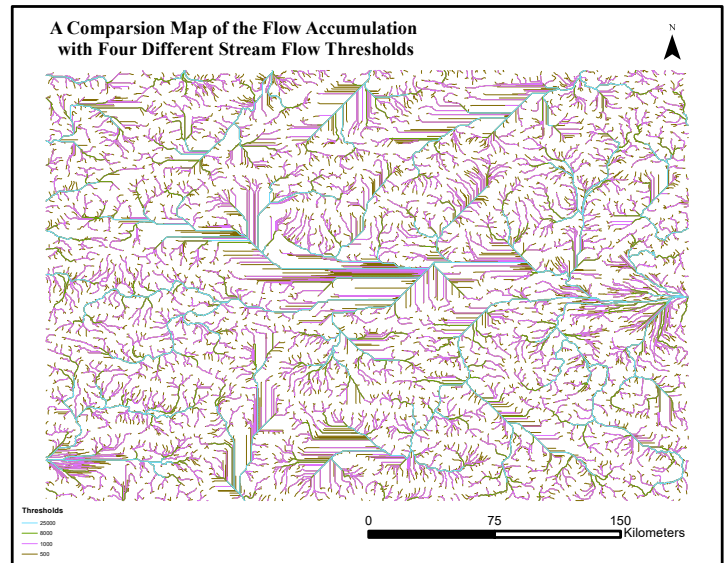
Conclusion

Through the watershed analysis, these maps show the minor differences on different DEMs will not affect the overall network and basin results, and messy river networks and lakes will slightly change the distribution of small basins and streams. The complex watershed environment of the Tibetan lakes indicates the distribution of small basins and streams will frequently change in this area and impact the water balance of the lakes.

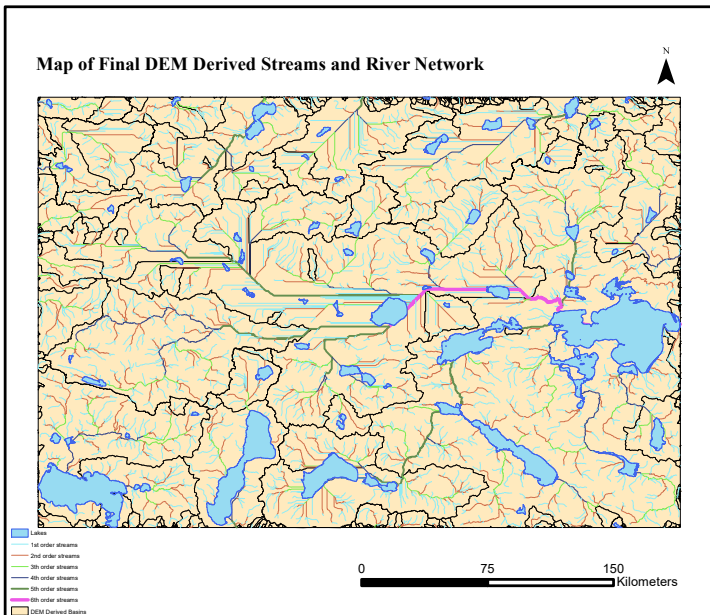
Appendix



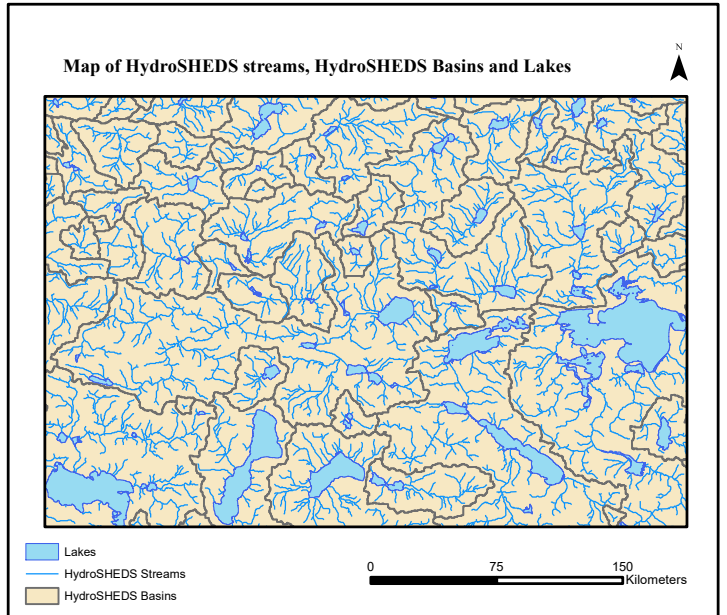
Map 1: A Comparison Map of Original DEM and Filled DEM



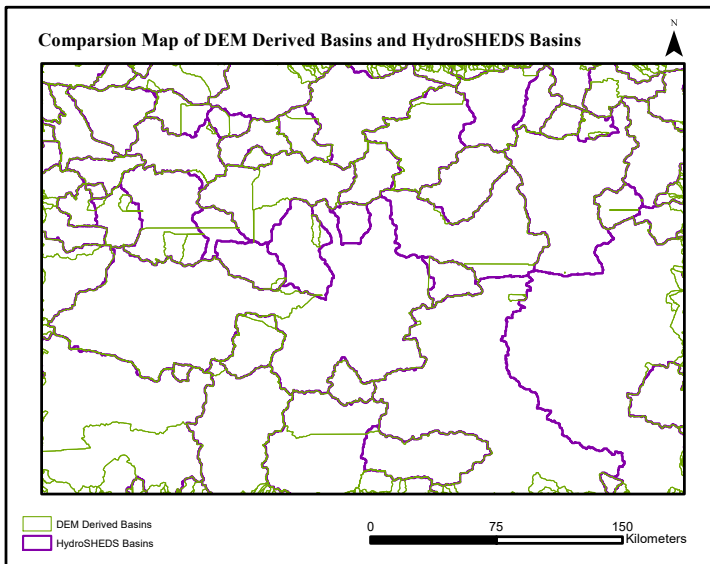
Map 2: A Comparison Map of the Flow Accumulation with Four Different Stream Flow Thresholds



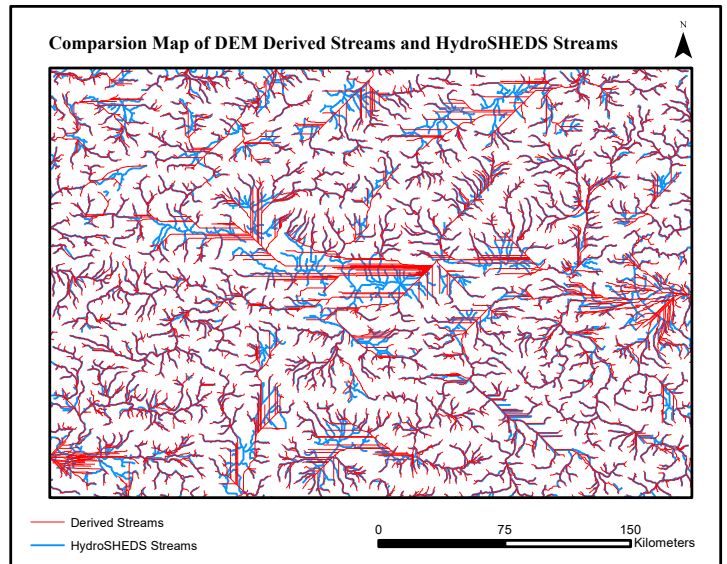
Map 3: Map of Final DEM Derived Streams and River Network



Map 4: Map of HydroSHEDS streams, HydroSHEDS Basins and Lakes



Map 5: Comparison Map of DEM Derived Basins and HydroSHEDS Basins



Map 6: Comparison Map of DEM Derived Streams and HydroSHEDS Streams