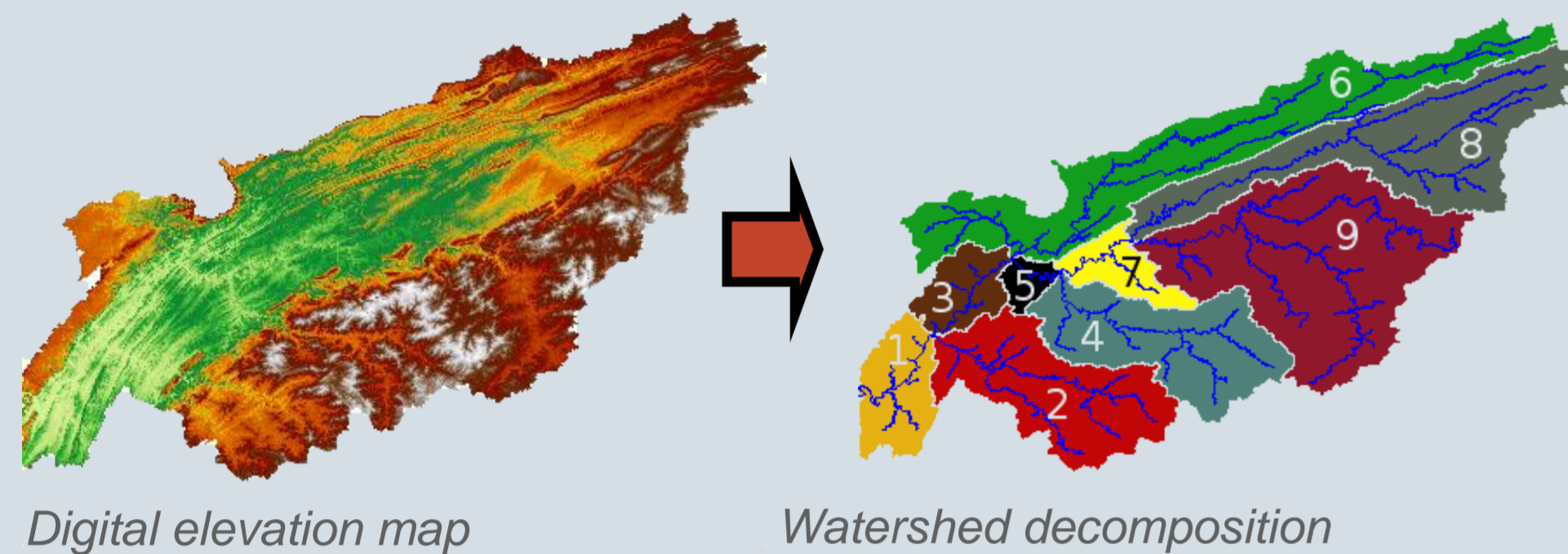


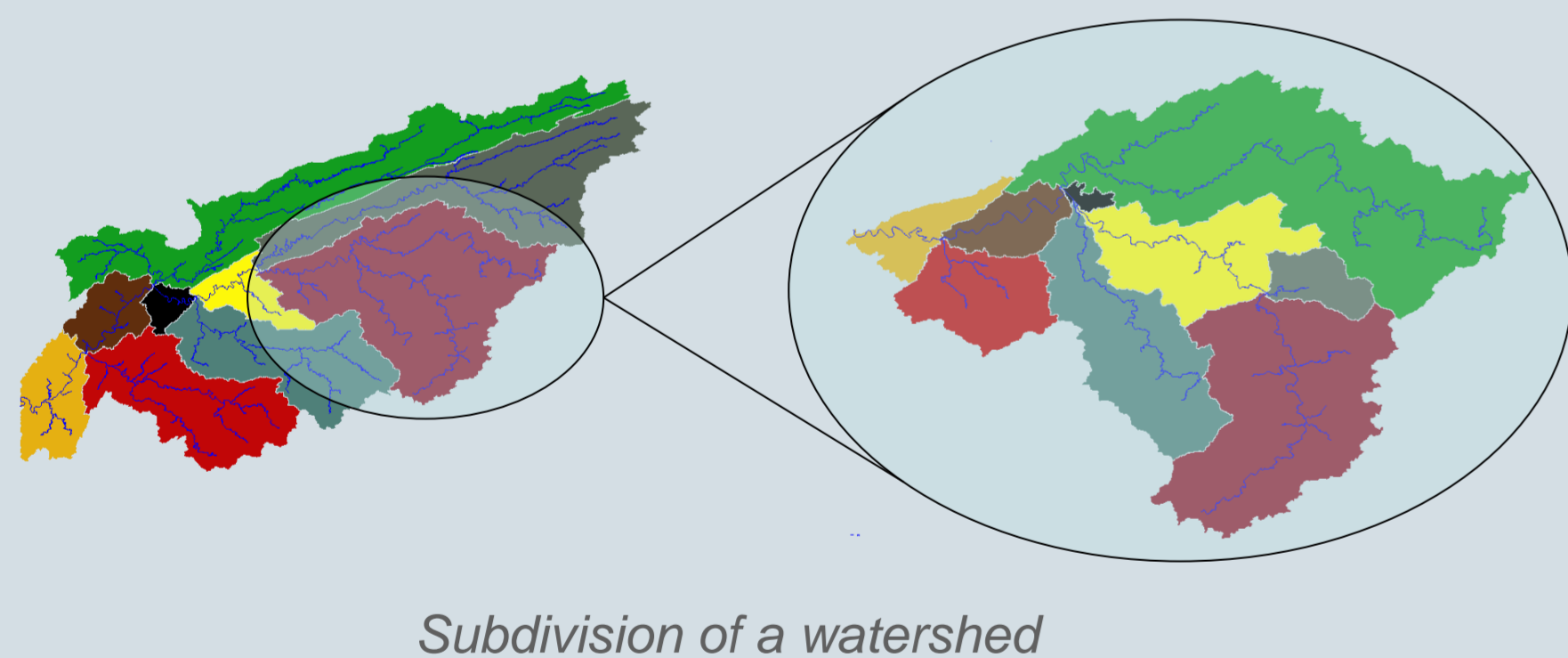
# TerraSTREAM: Pfafstetter Labeling

## Watershed decomposition

- Watershed decomposition is a fundamental task in terrain analysis
- Watershed of a river = area which drains to the river
- Terrain dividable into (hierarchy) of watersheds

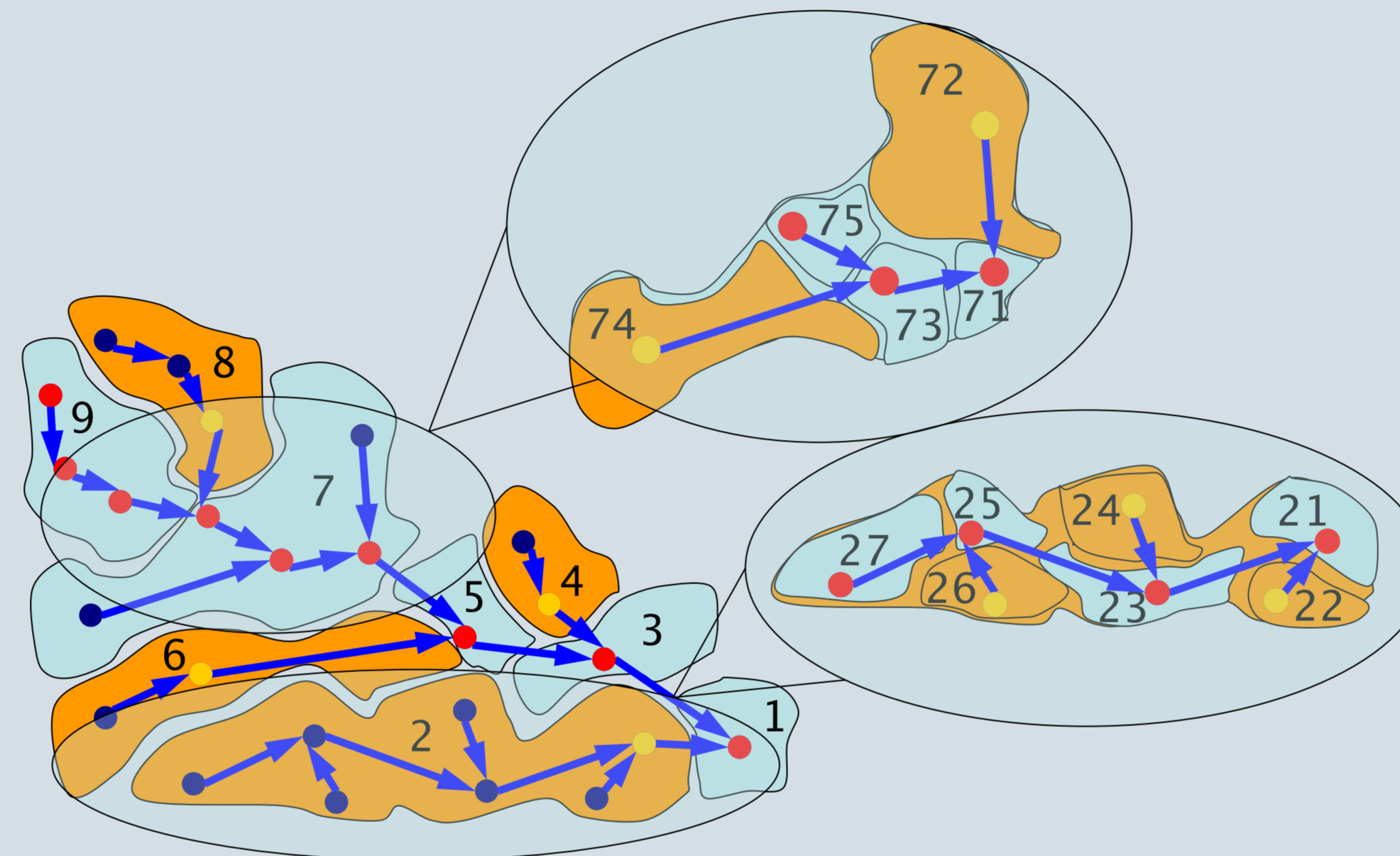


- A river's watershed can be subdivided into the watersheds of the river's tributaries

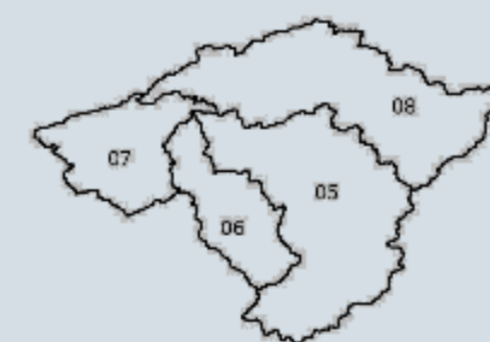


## Pfafstetter labels

- Identify main river
- Find the 4 largest tributaries (orange)
- Label tributaries (even) and interbasins (odd)
- Recursively label all tributaries and interbasins



"Sanity check": Pfafstetter decomposition "matches" manually constructed watershed decompositions

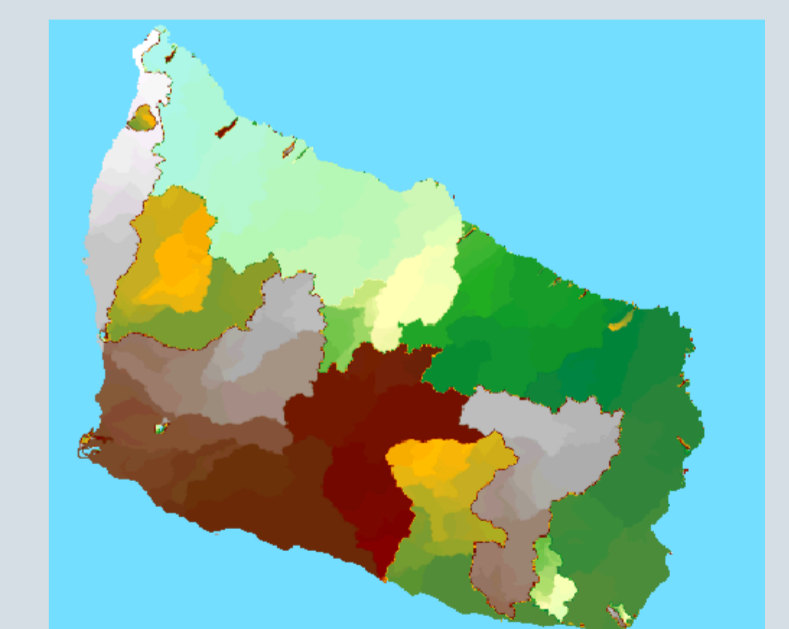
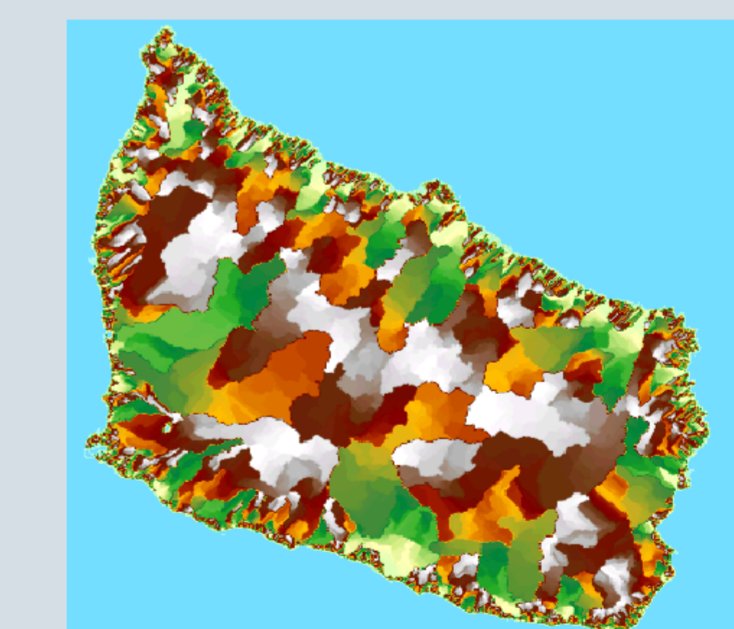


## I/O-efficient algorithm

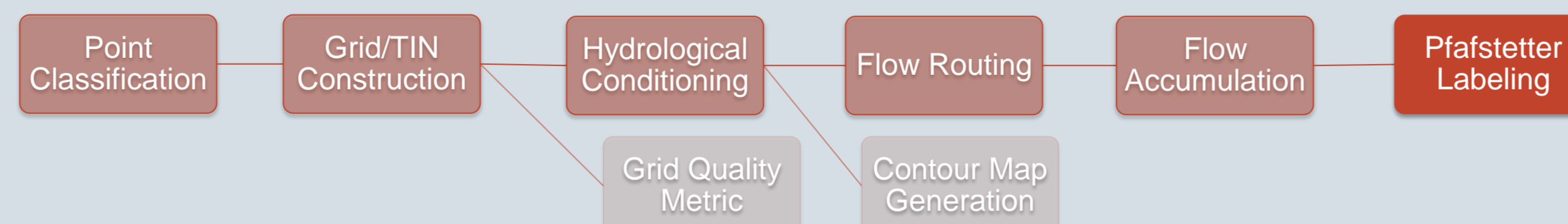
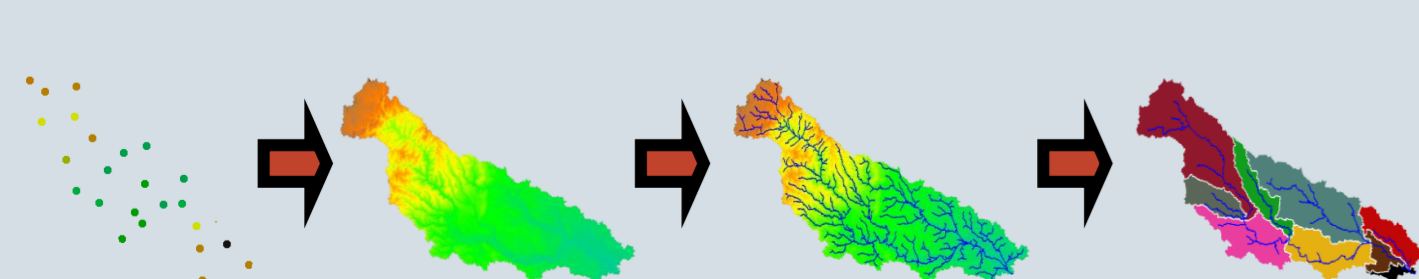
- Modern terrain data is massive  
→ I/O-efficient Pfafstetter labeling algorithms needed
- We develop I/O-efficient algorithm by exploiting
  - Terrain decomposable into rivers, i.e. into tributaries
  - Tributaries form a tree
  - Rivers can be labeled individually
  - Label prefixes can be "forwarded" to tributaries

## Current and future work

- Watershed queries: Retrieval (and decomposition) of watershed for individual user-specified location
- Meaningful labeling along coast lines, e.g., label the coastal watersheds independently or as tributaries of the "coastal river"



## Integration into TerraSTREAM



## References

[1] L. Arge, A. Danner, H. Haverkort, and N. Zeh. *I/O-Efficient Hierarchical Watershed Decomposition of Grid Terrain Models*. In Proc. 12th Intl. Symp. on Spatial Data Handling, SDH, 2007.

[2] K. L. Verdin and J. P. Verdin. *A topological system for delineation and codification of the Earth's river basins*. Journal of Hydrology, 218, 1-12, 1999.