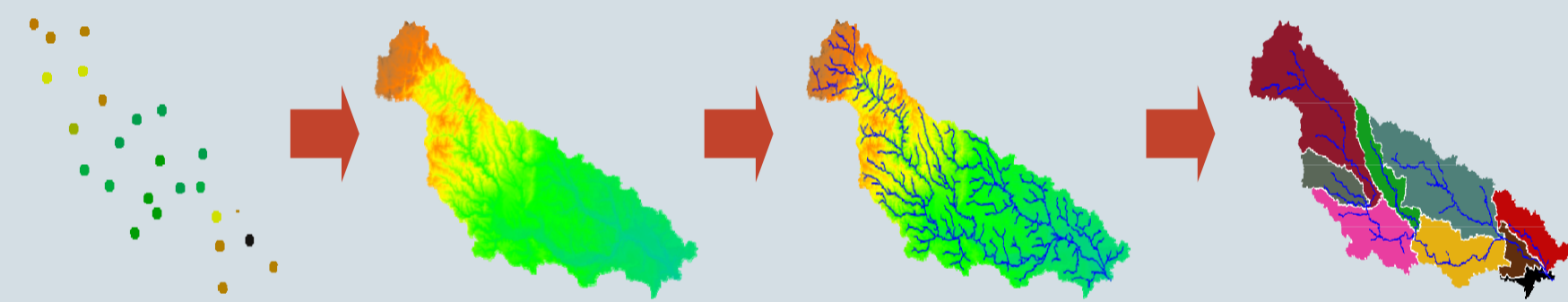
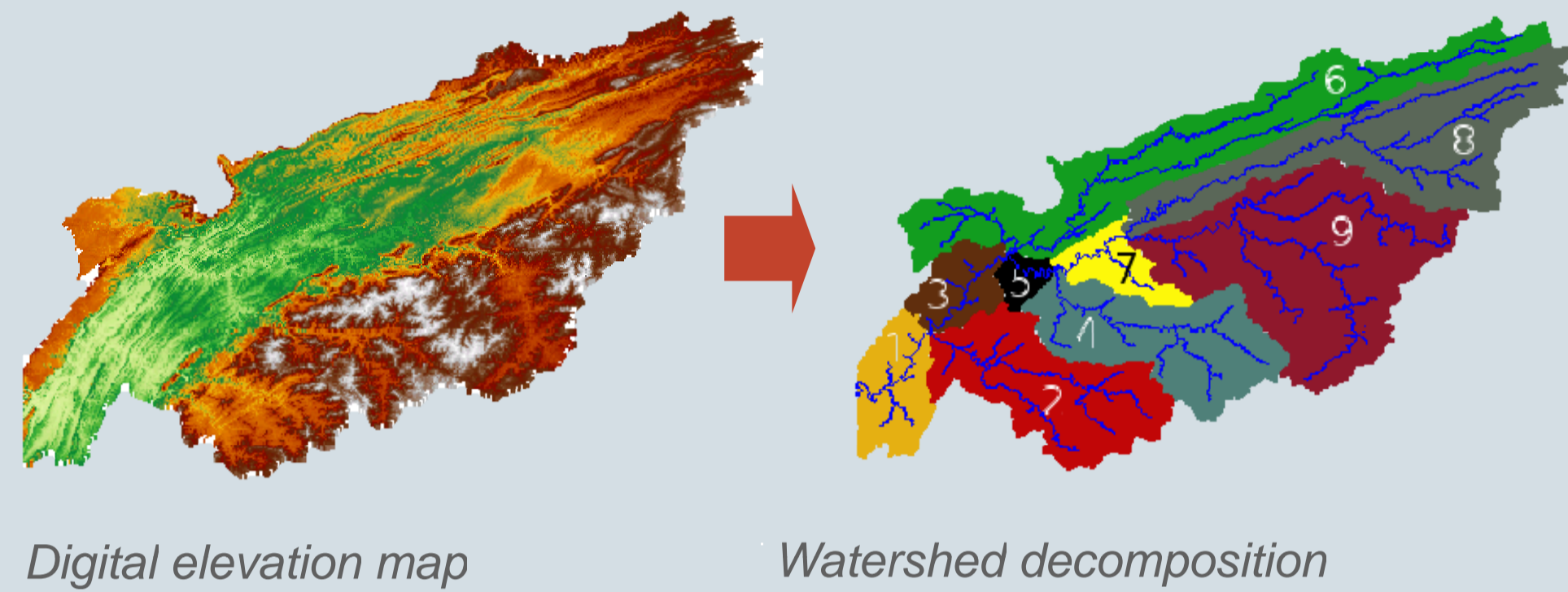


TerraSTREAM: Pfafstetter Labeling

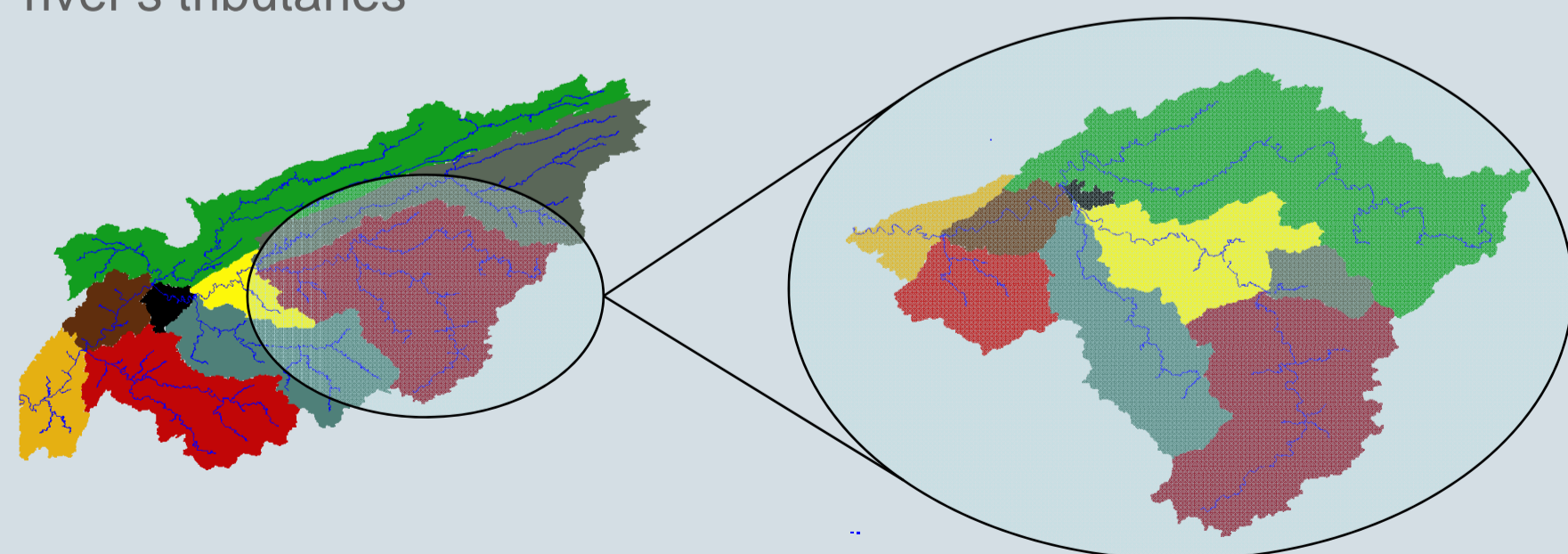
Watershed Decomposition

- 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



Subdividing into Watersheds within TerraSTREAM

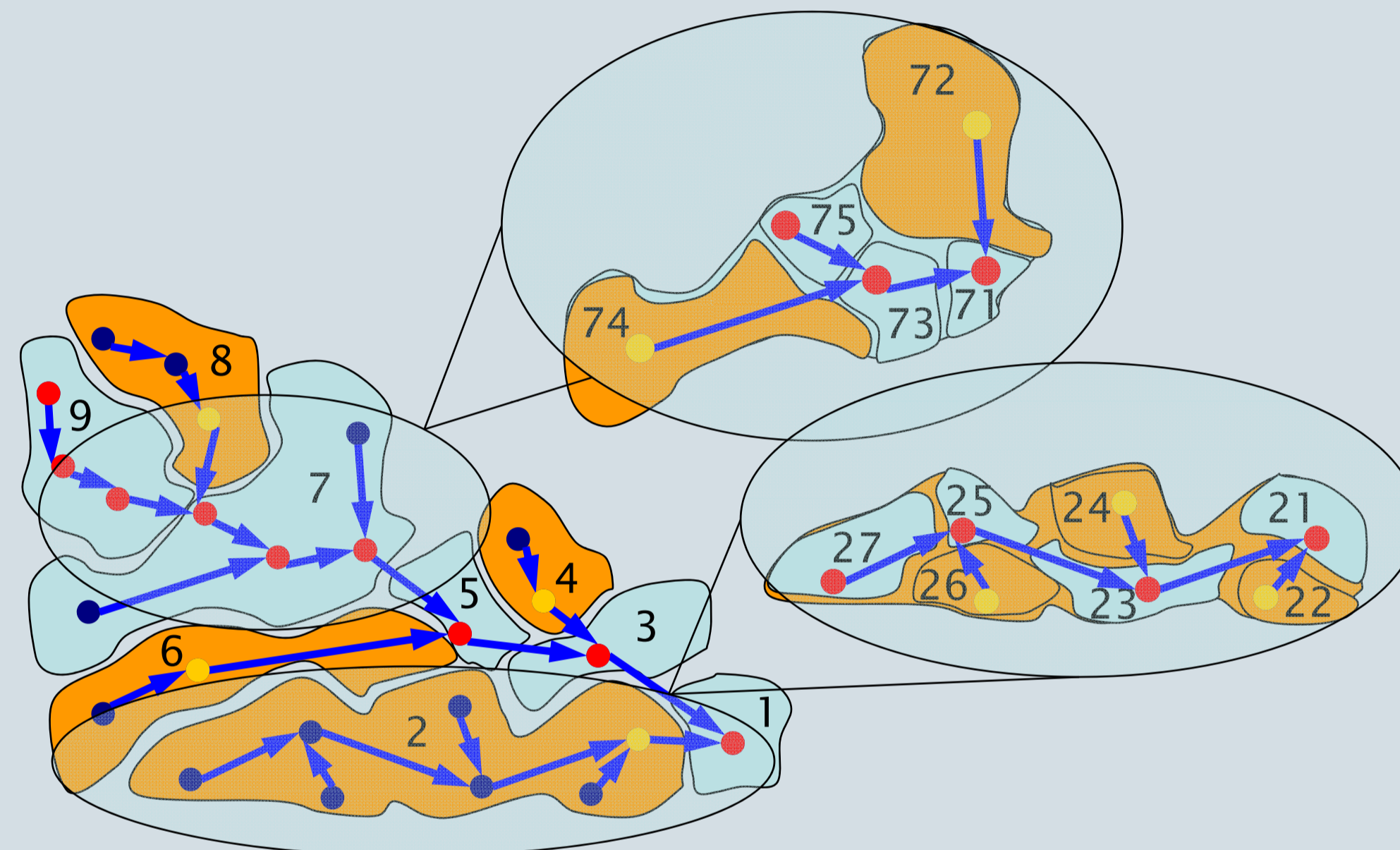
- A river's watershed can be subdivided into the watersheds of the river's tributaries



Subdivision of a watershed

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



Pfafstetter labels

USGS (manually)

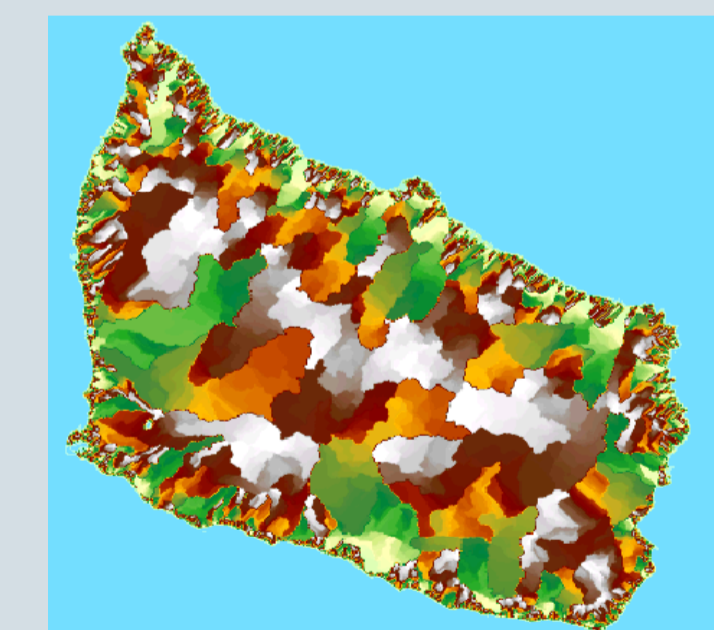
Overlay

I/O-Efficient Algorithm

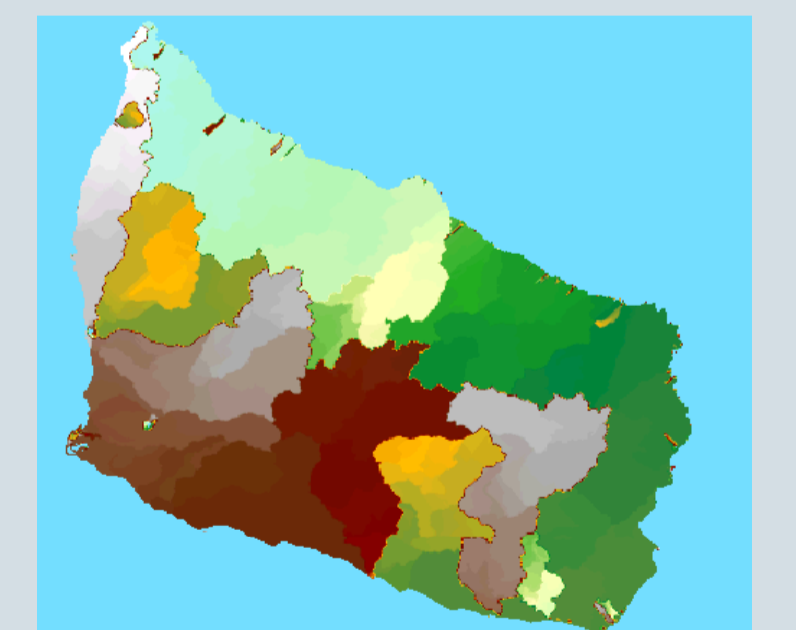
- Modern terrain data is massive
→ I/O-efficient Pfafstetter labeling algorithms needed
- We develop I/O-efficient algorithm by exploiting
 - Terrain decomposable into rivers, i.e. into tributaries
 - Tributaries form a tree
 - Rivers can be labeled individually
 - Label prefixes can be "forwarded" to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



Independent coastal watersheds



Connected coastal watersheds

References

- 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.
- 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.