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Examples of TerraHidro Use for Watershed Management

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TerraHidro

Distributed Hydrological Modeling System using Graph Structure for Unified Water Flow Representation

Local Drainage Direction – LDD - extracted from terrain data

TerraHidro

Usual Solution for Flow Representation

Different data structures for terrain representations using: regular grids, triangular irregular networks, contour lines, irregular polygon tessellations

Our Solution

One data structure based on Graph Theory, independent of the data structures used for terrain representation
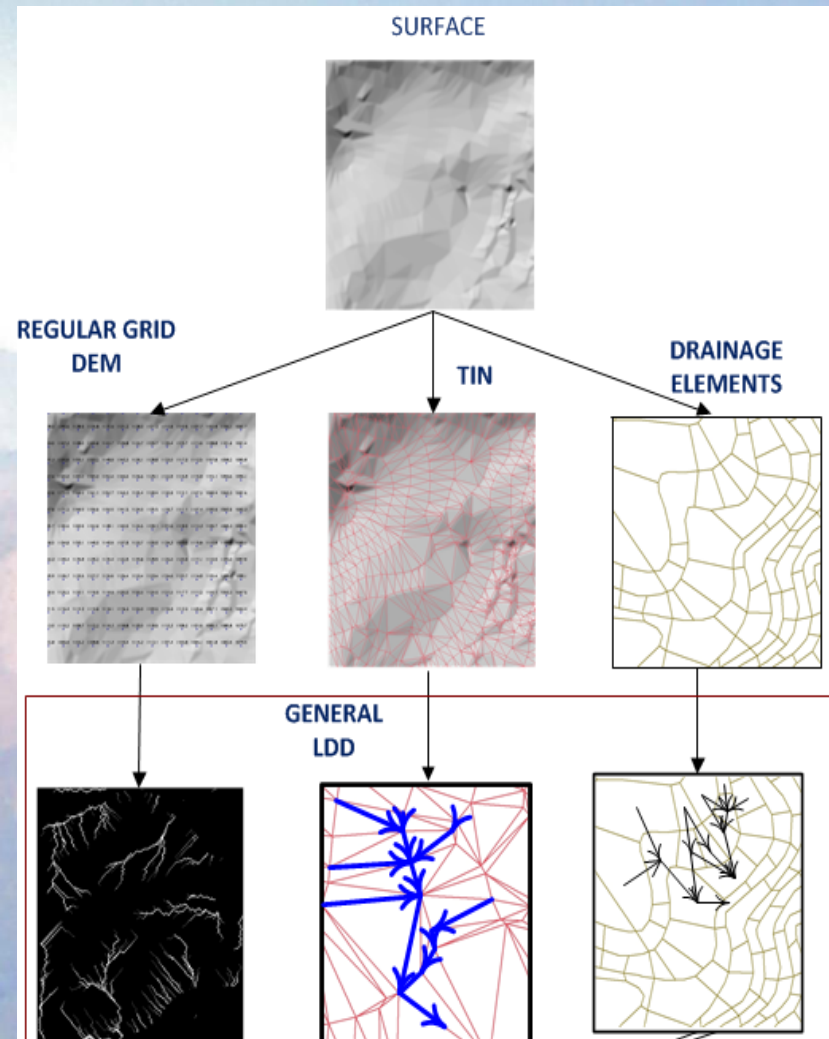
One Implementation for Water Flow Operations

Concept: Usual Solution

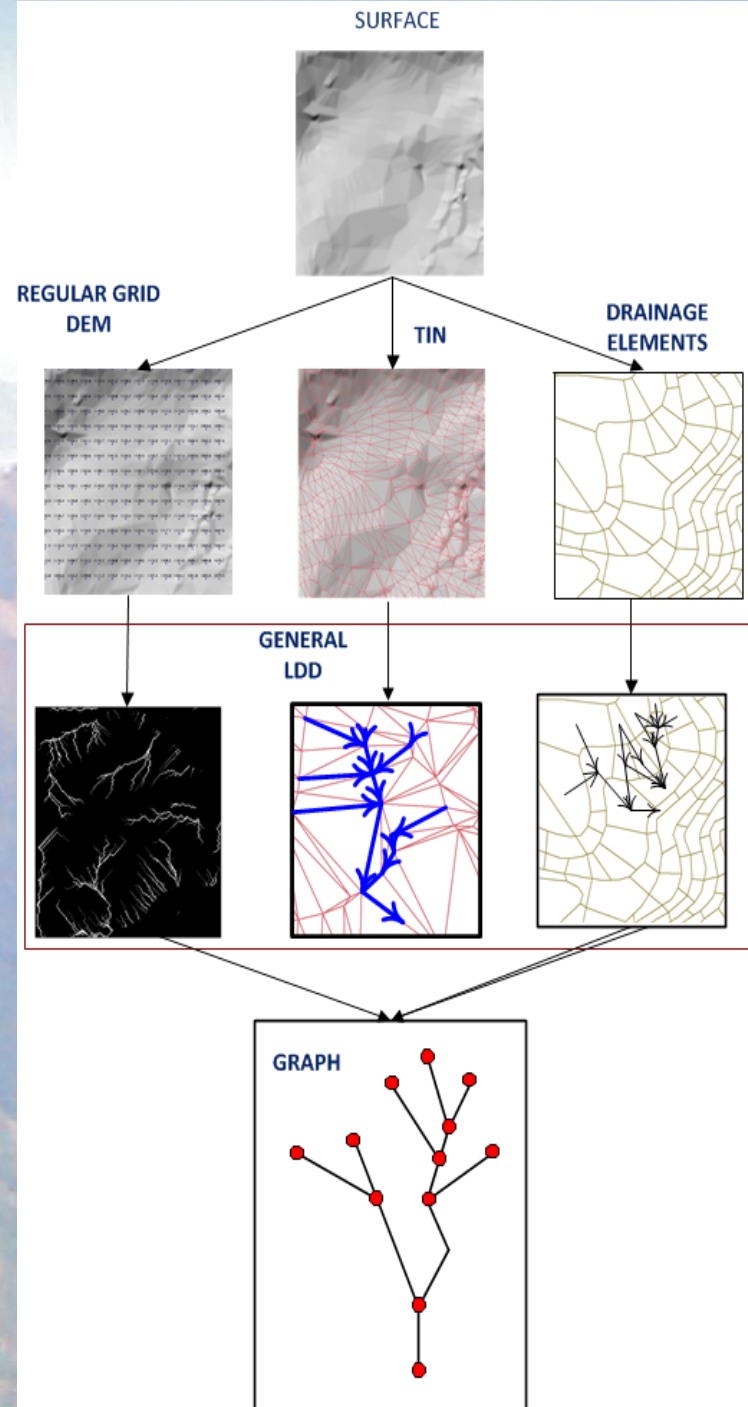Extract local flows from different terrain representations

Local flows are mapped in a structure similar to terrain representation structure

Concept: TerraHidro Solution

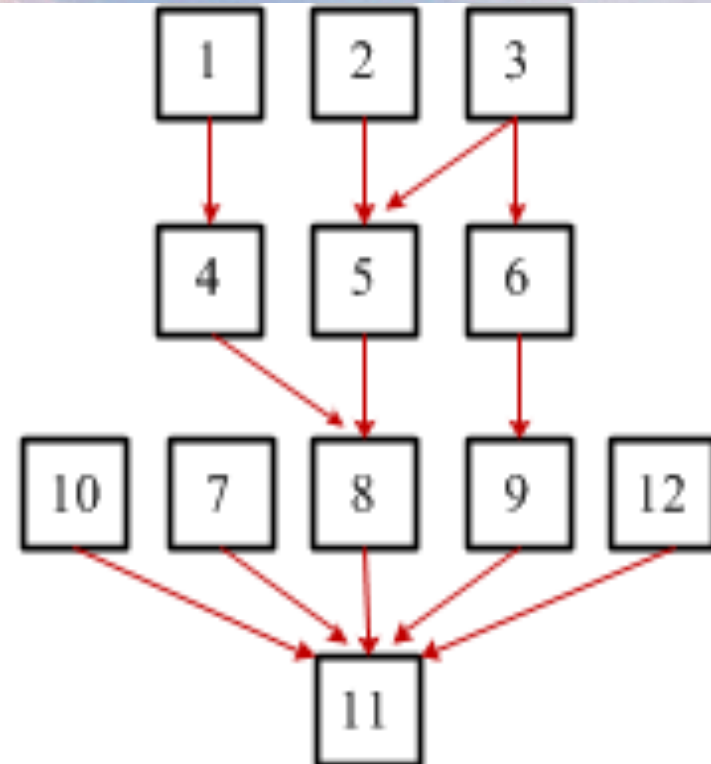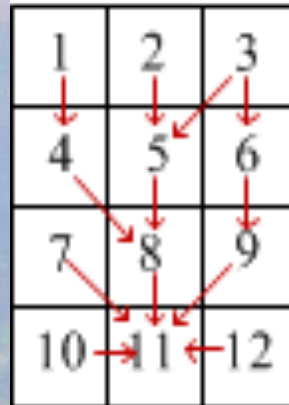Local flows are mapped to the same data structure

Applications do not depend on the terrain data structure

Regular Grid LDD to Graph

Each LDD grid cell represents a graph node

Flow from a cell to a neighbor cell defines a
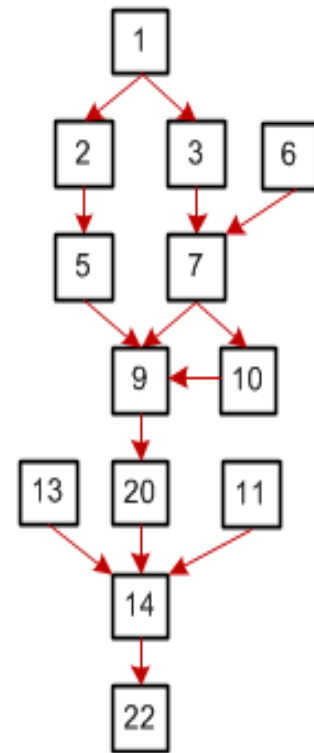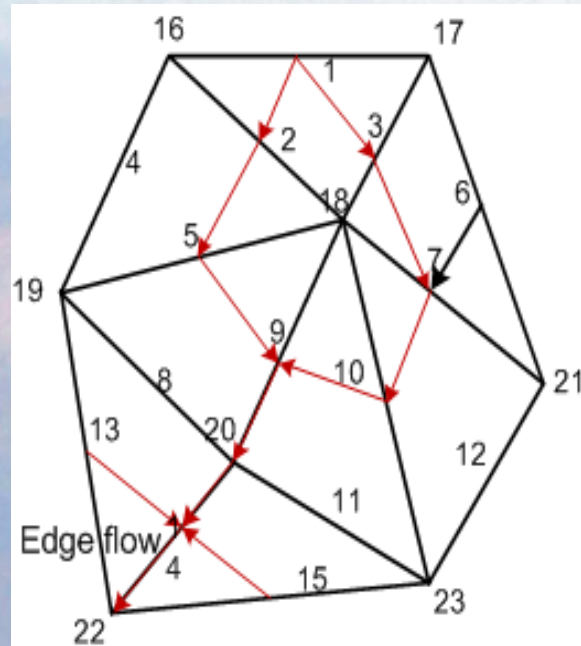
graph edge

TIN LDD to Graph

Each triangle edge
starting or ending a
flow represents a
graph node

If the flow goes along
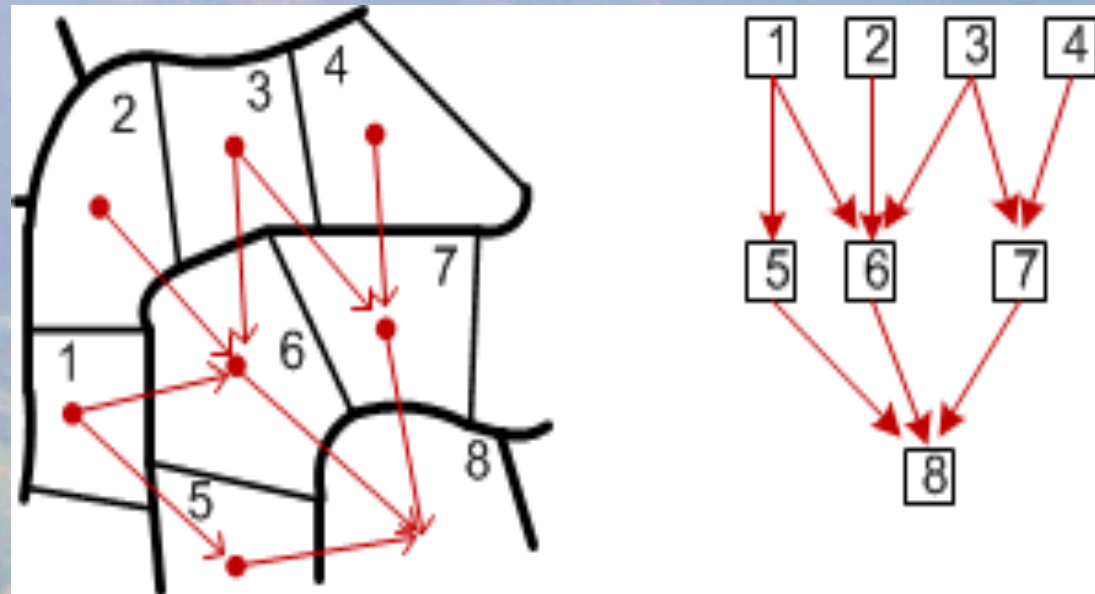a edge, the edge
vertices are graph
nodes

Contour Lines LDD to Graph

Flows from each cell to one or more neighbors,

passing through their centers
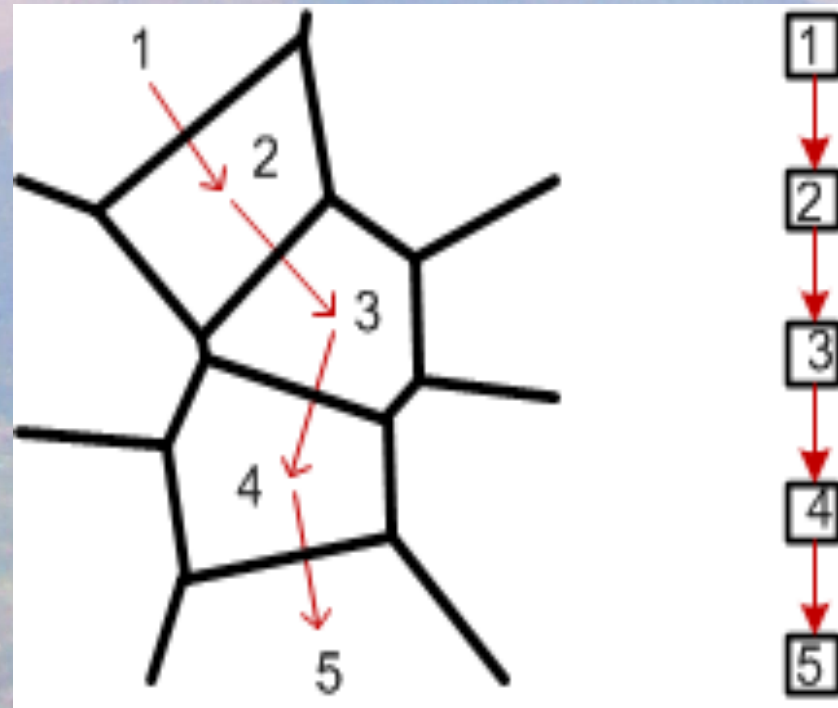
Cell numbers are graph nodes

Links are graph edges

Contour Lines LDD to Graph

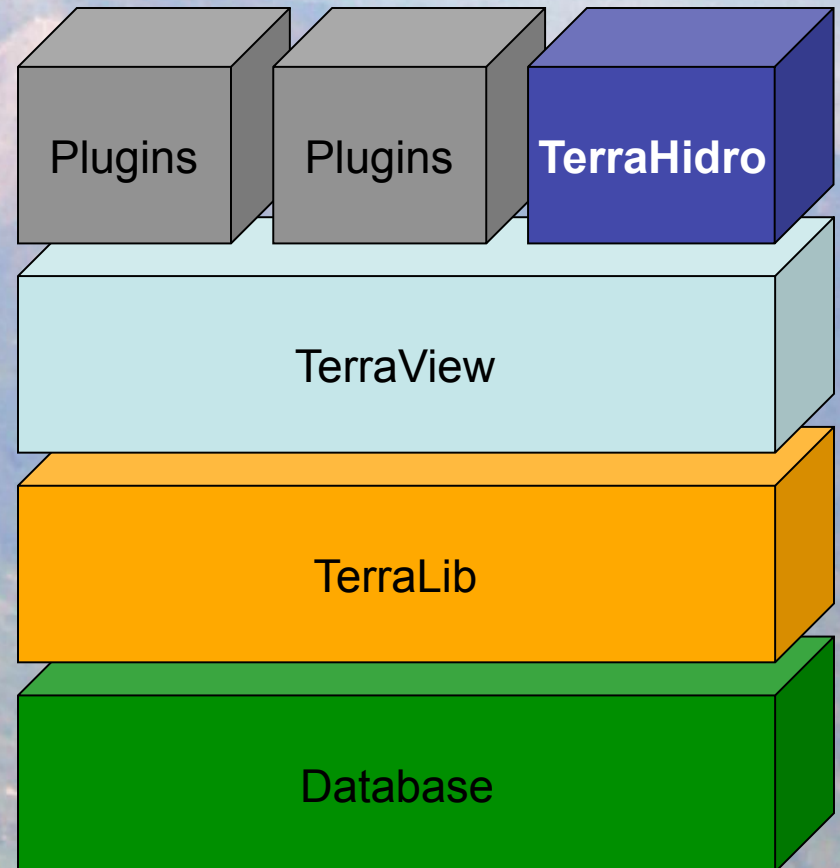Each Voronoi polygon is a graph node

Links from one polygon to other are graph edges

Development Environment

TerraHidro is a TerraView Plugin

TerraView is a GIS application built using TerraLib

Current Functionalities

LDD Extraction

Upscaling

   LDD redefinition similar to a lower resolution

Accumulation Area

   Contributing area for any location

Drainage Network Definition

   Drainage network for a given accumulation threshold

Current Functionalities

River Segments

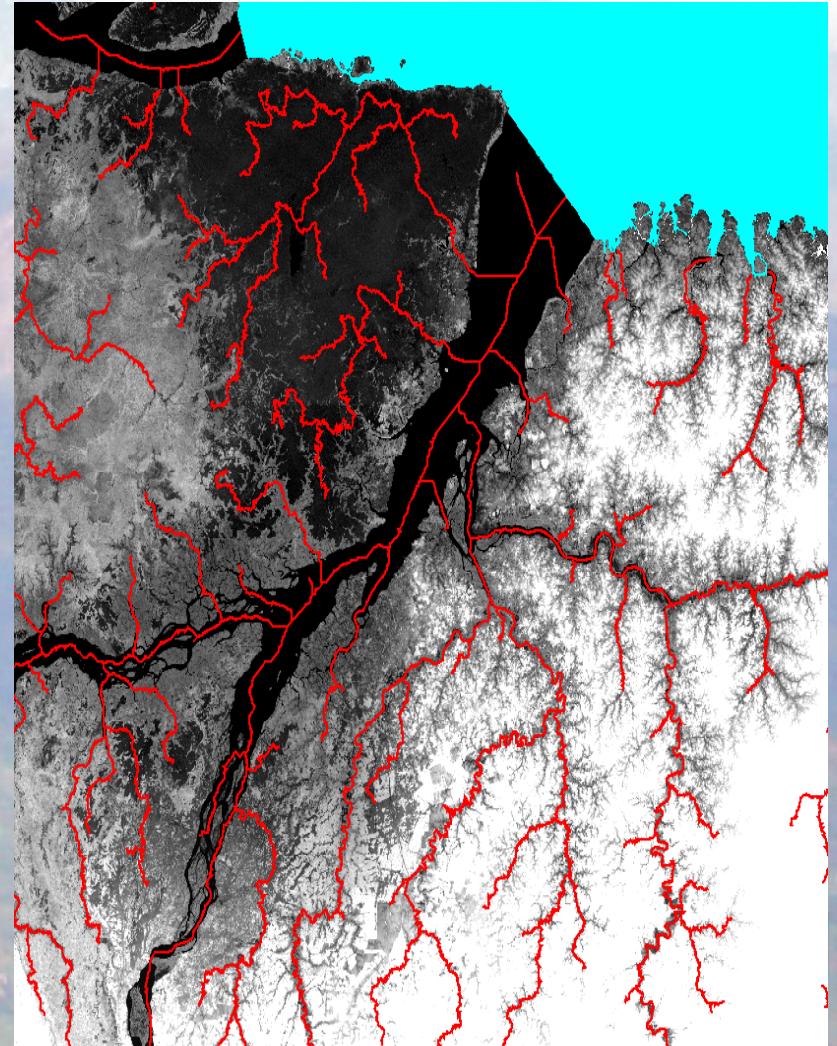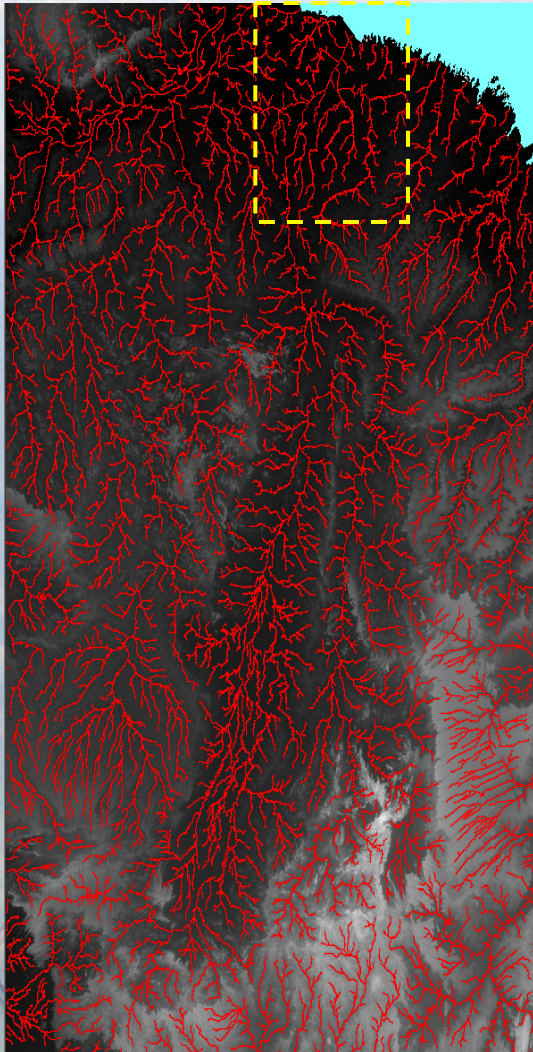Segments from springs to junctions, between junctions, a from junctions to river mouth

Watershed Delimitation
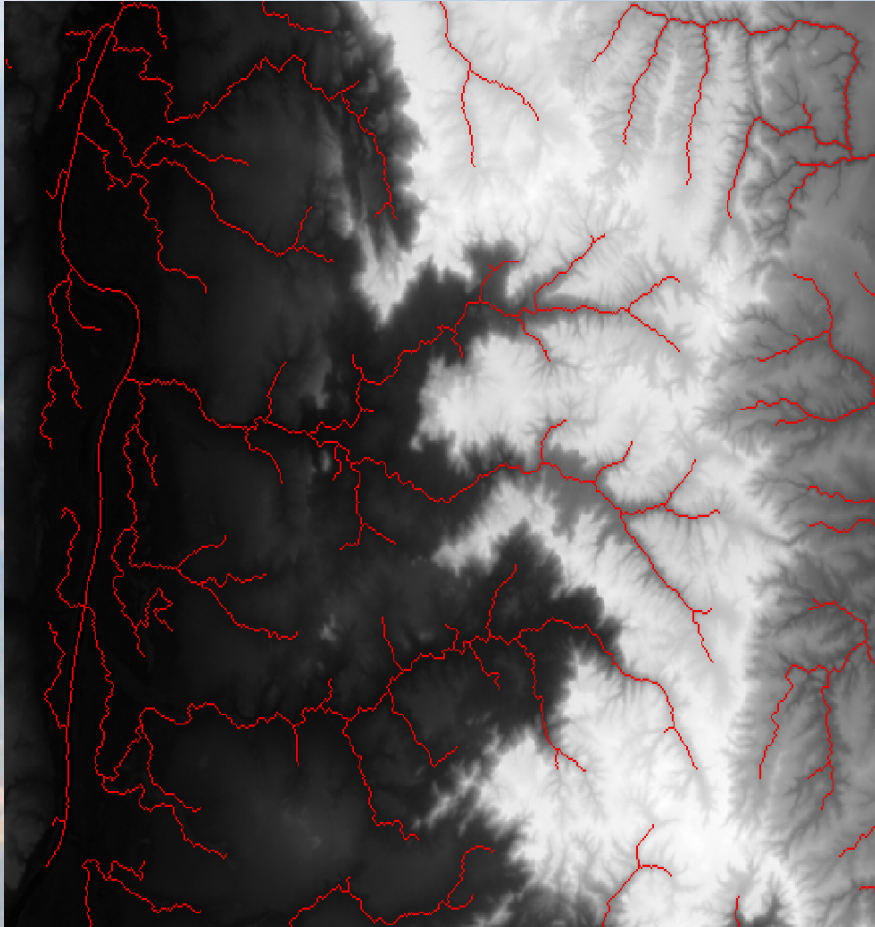
Defined for one or more points on the drainage network

Example
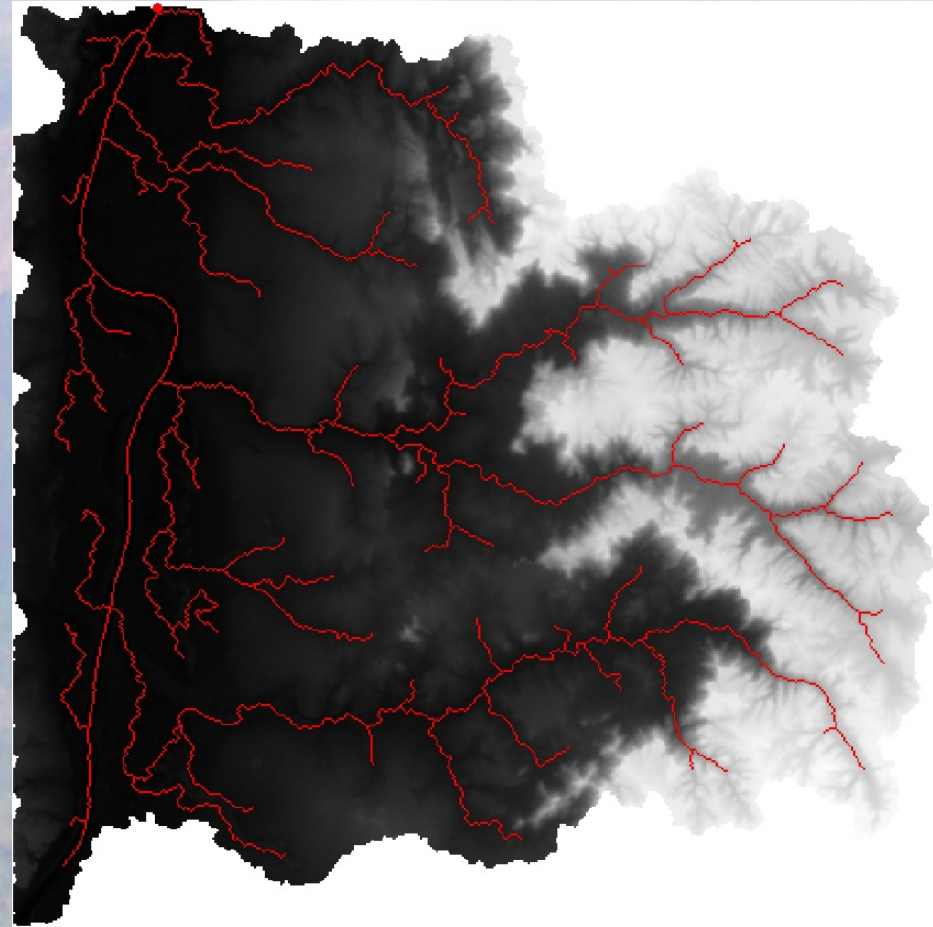## Tocantins River – Amazon Basin
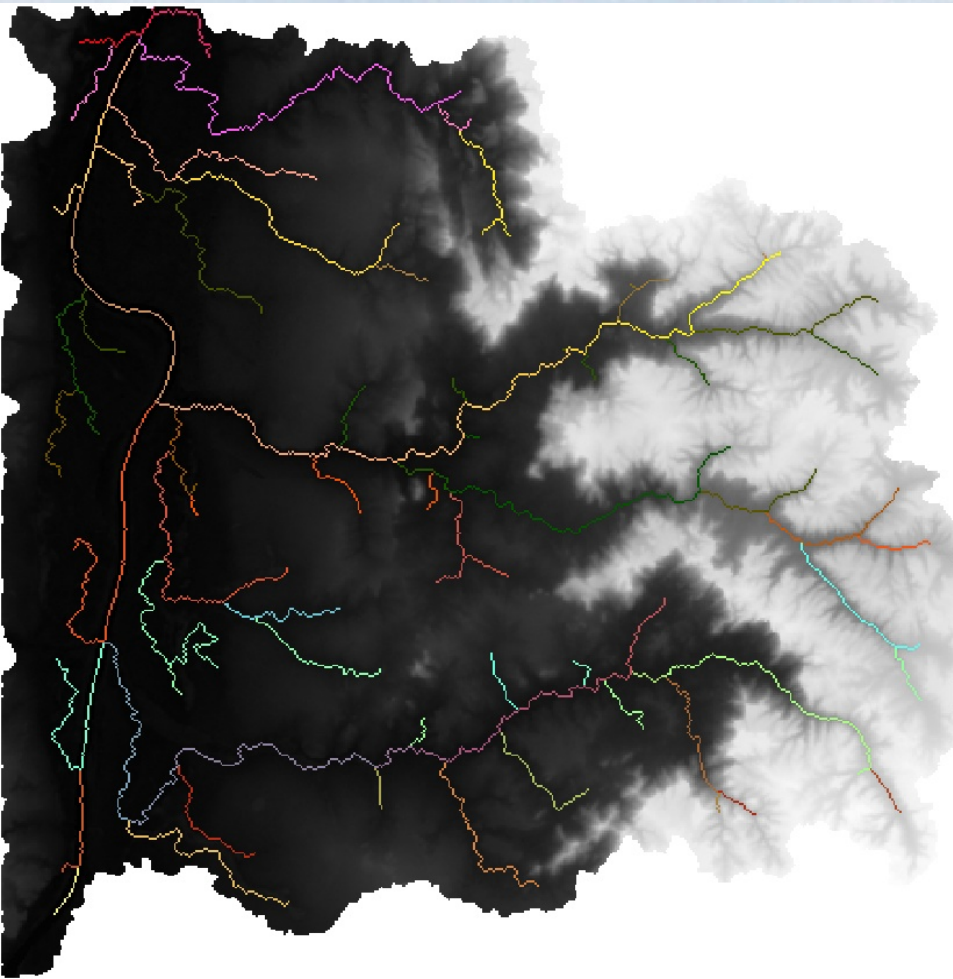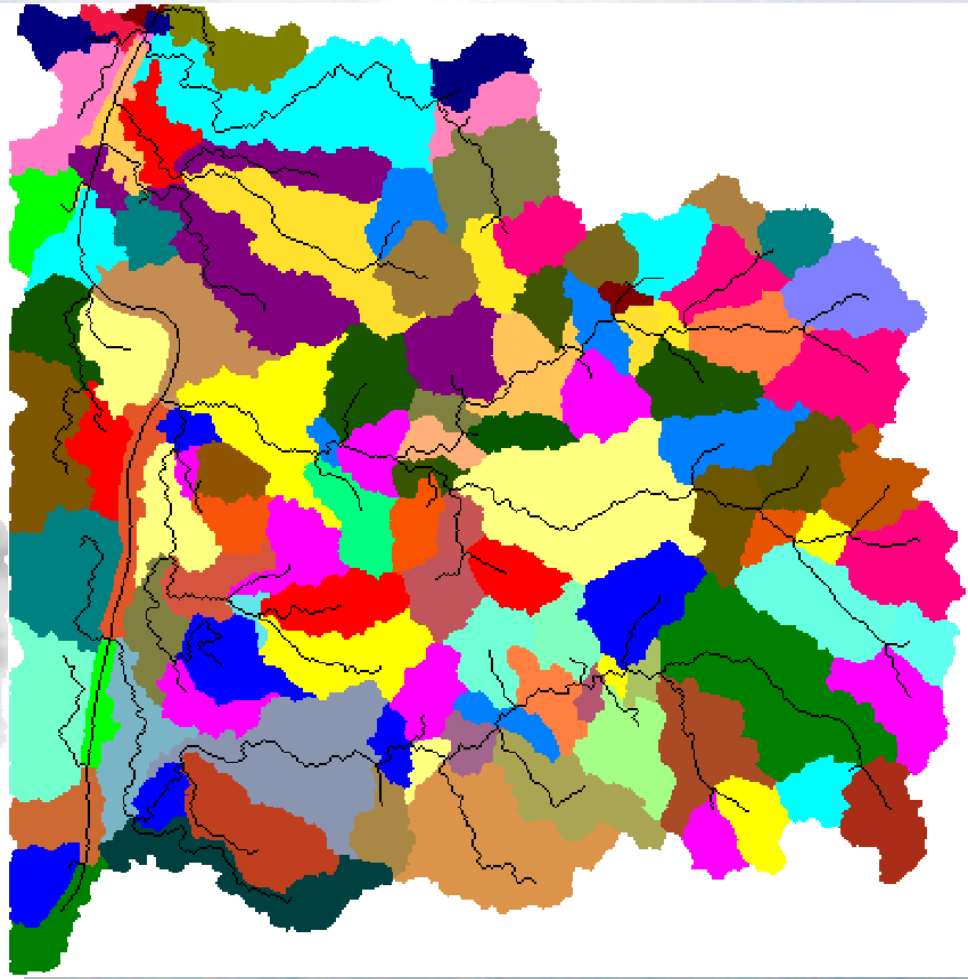
Example

Accumulation Area /
Drainage Network

Delimitation for One
Point

Example

River Segments

Watershed Delimitation

Robustness Test – Amazon Basin

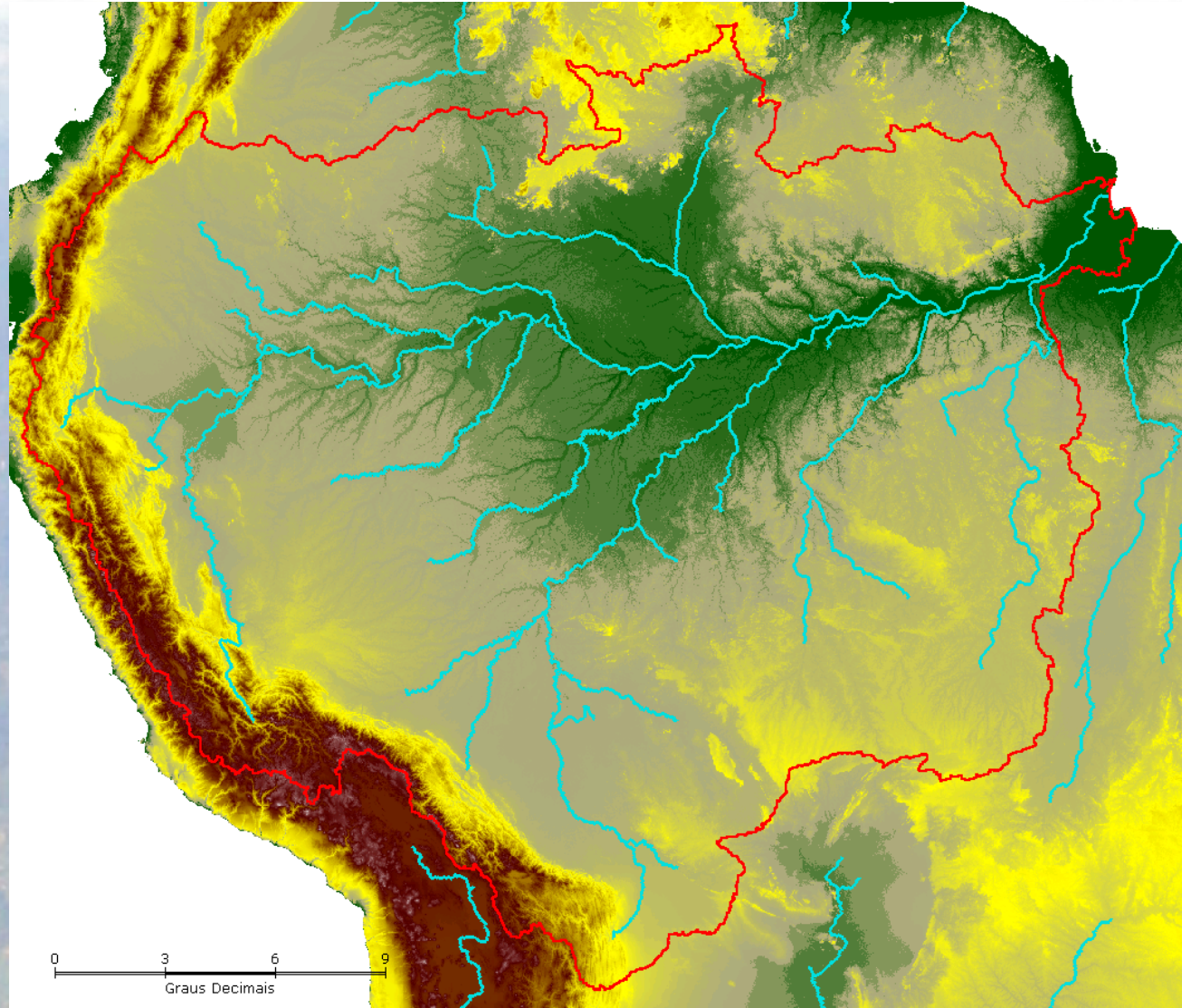**SRTM (90m) Grid size**:

1,244,160,000
Rows: 32,400
Columns: 38,400

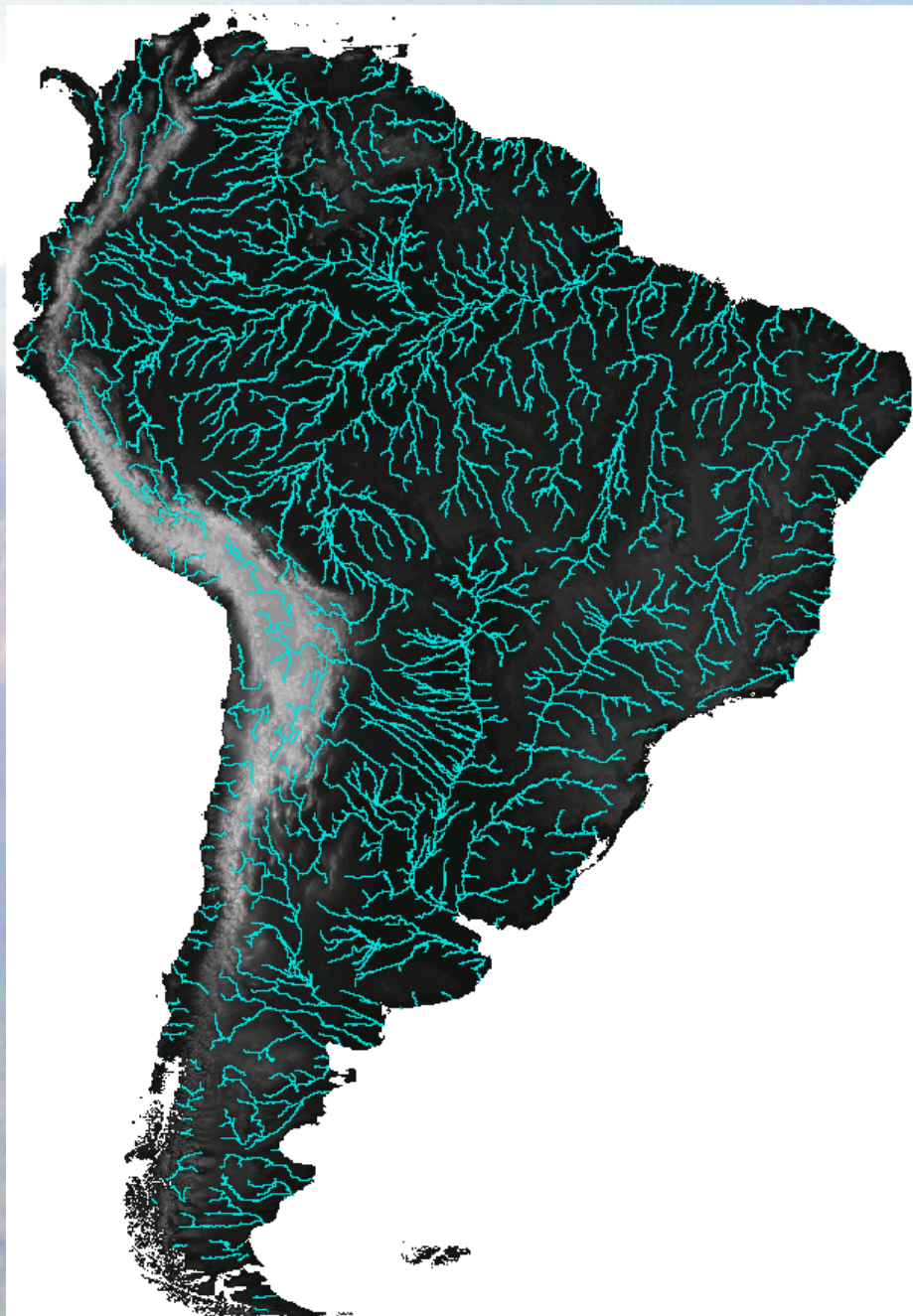**Processing time**:
360:16:25
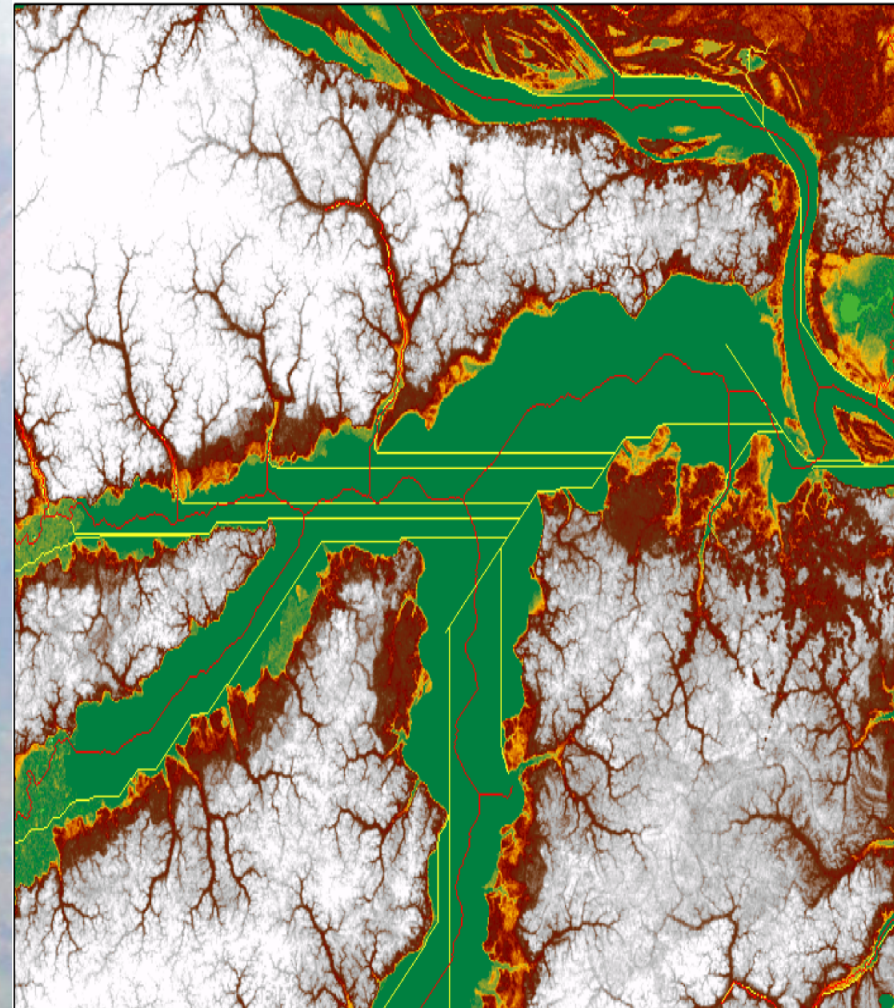**Initial number of pits** : 65,670,466
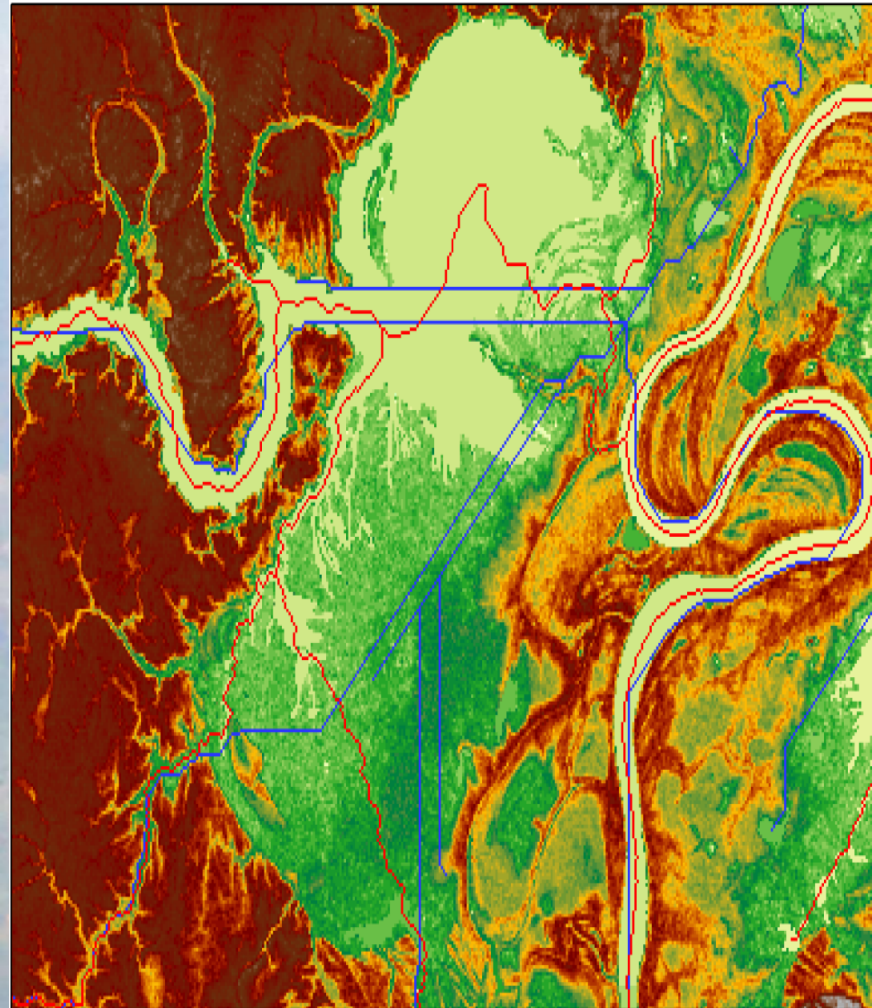
Unsolved pits: 0

South America SRTM

Quality Comparison

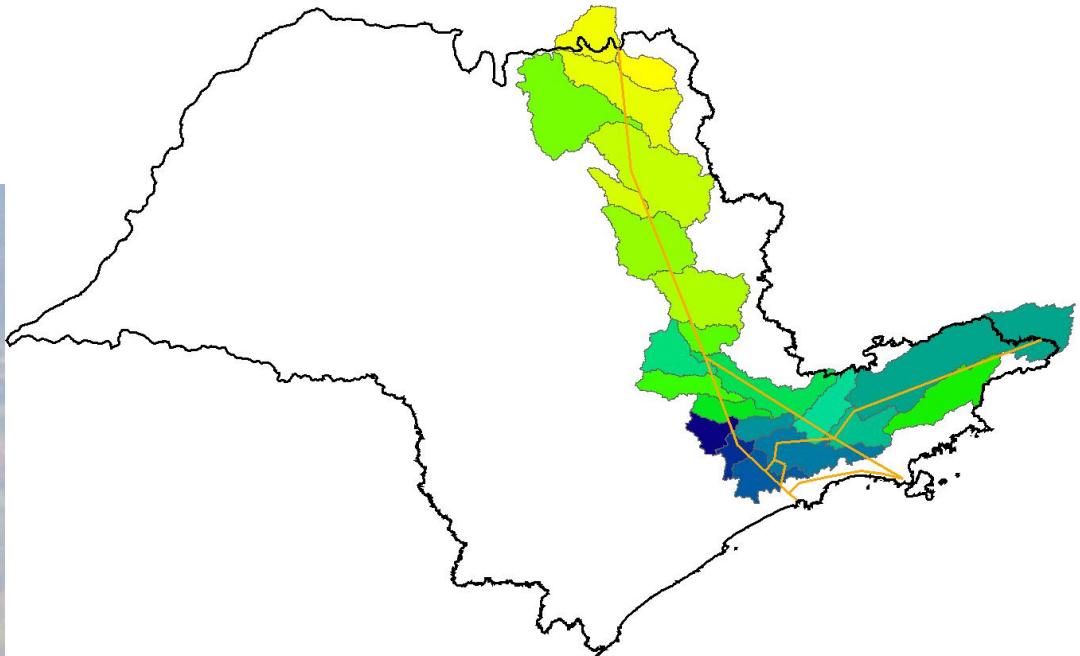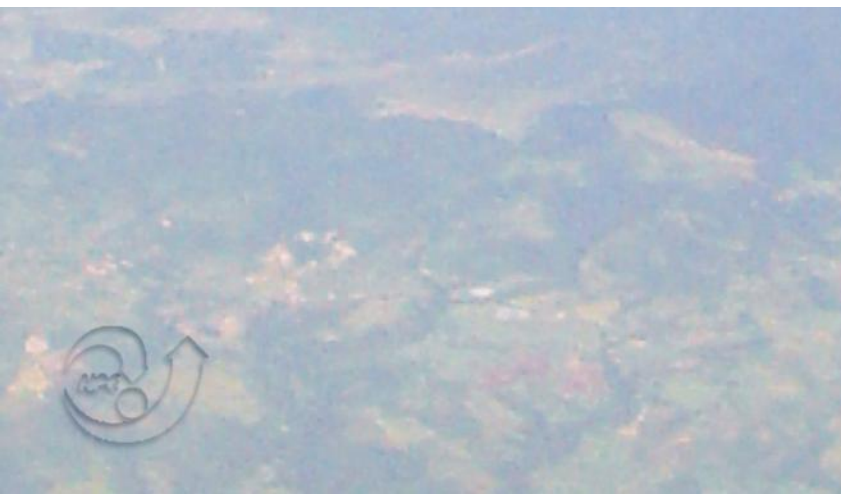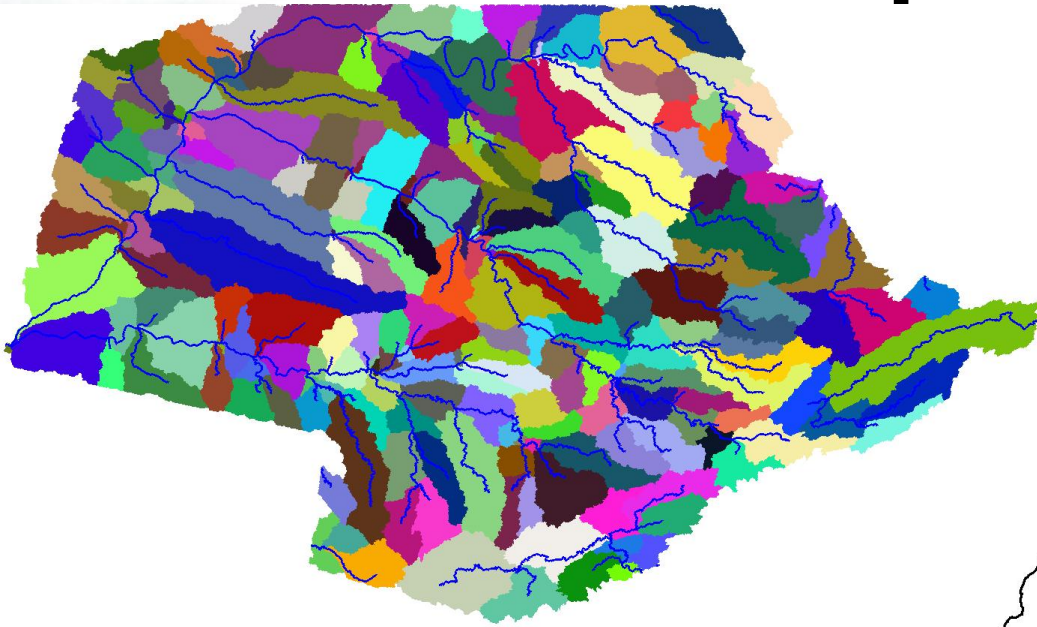ArcGis HydroTools: **Blue**

TerraHidro: **Red**

ArcGis HydroTools: **Yellow**

TerraHidro: **Red**

Application Example
Basins Intercepted by Pipelines

Thank You!

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