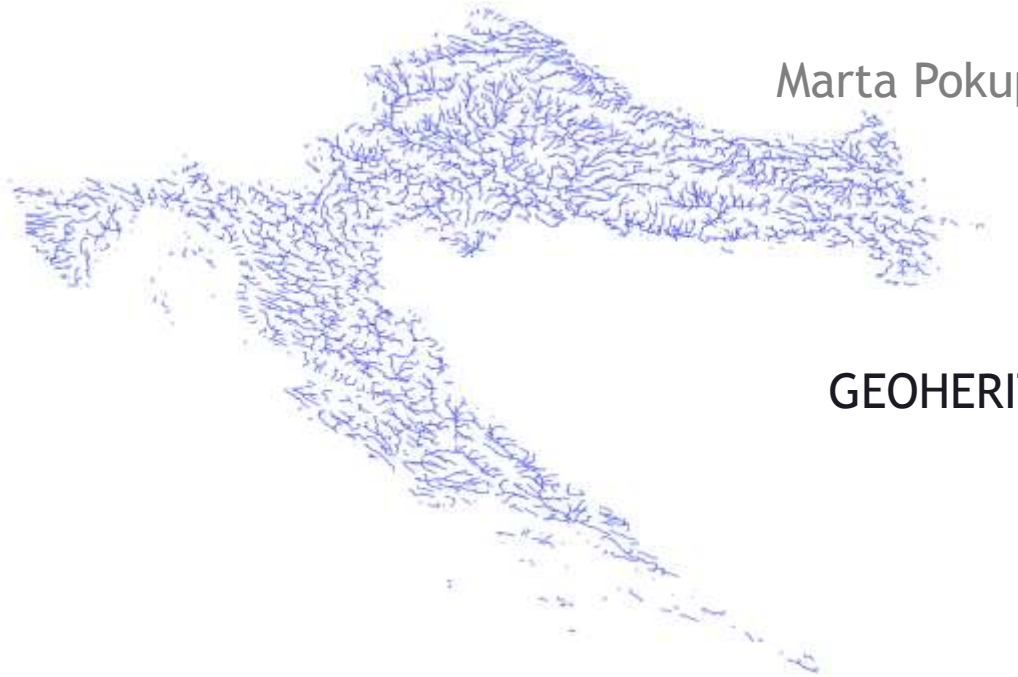
Geomorphometric analysis and drainage network for the territory of Republic of Croatia



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GEOHERITAGE, GEOINFORMATION AND CARTOGRAPHY
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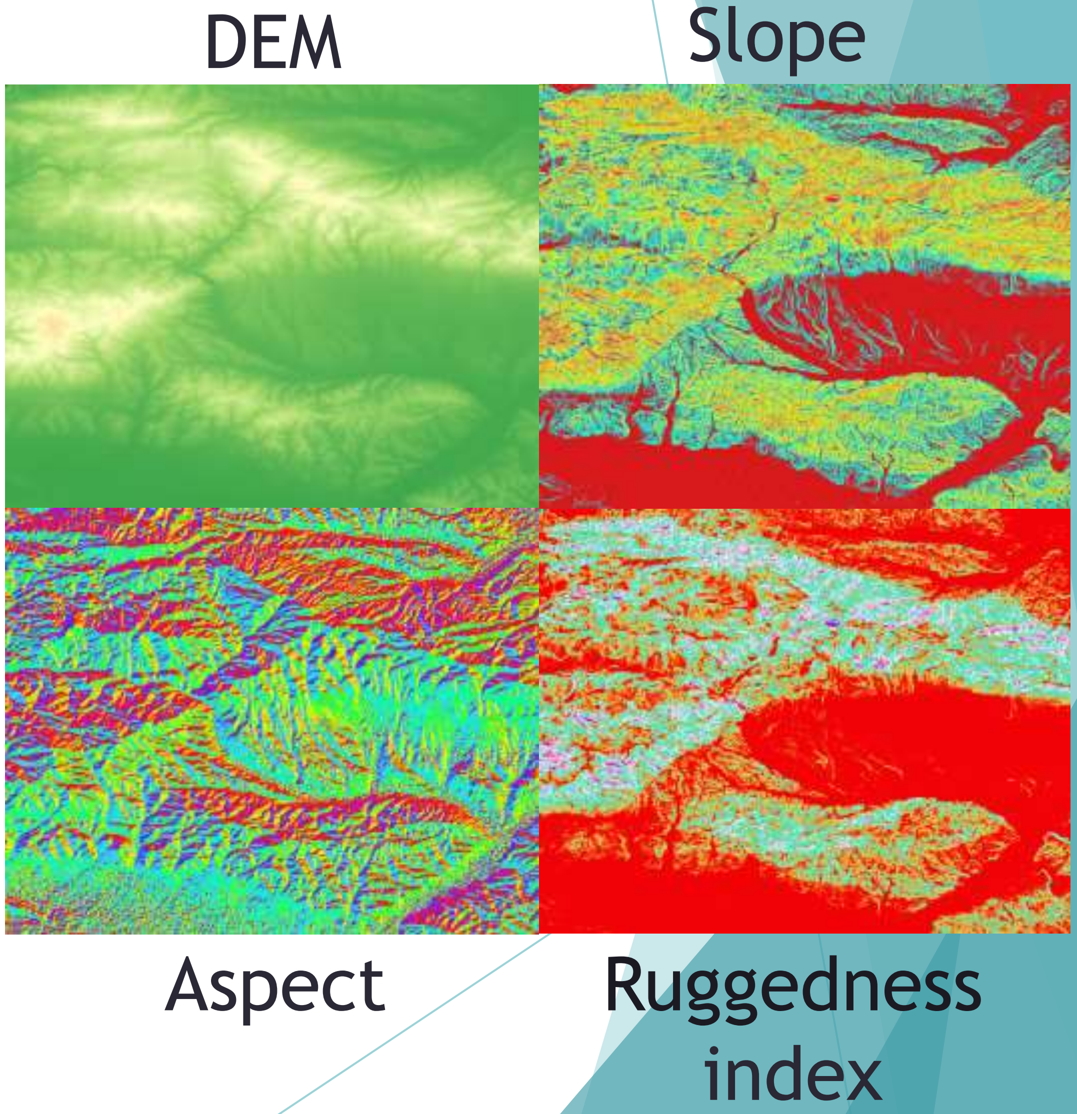
Summary

- Basic terms and importances of models
- Analysis
  - **Geomorphometric parameters**
    - Slope, Aspect, Ruggedness index
  - **Drainage network**
    - Outputs
    - Algorithm comparison
    - DEMs comparison
- Conclusions

Geomorphometry: introduction

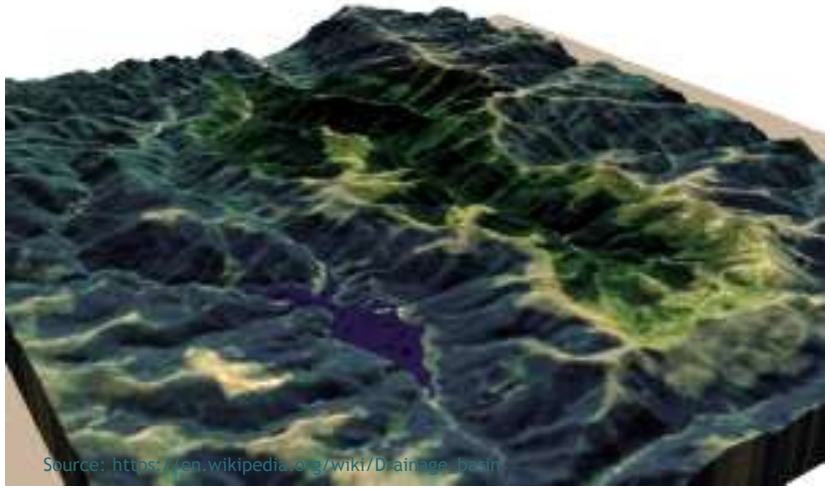
- science of quantitative land surface analysis
- it collects various mathematical, statistical and image processing techniques

Source: http://www.fenixdtours.hr/hrvatska/pp-papuk-i-eko-imanje-mavrovic

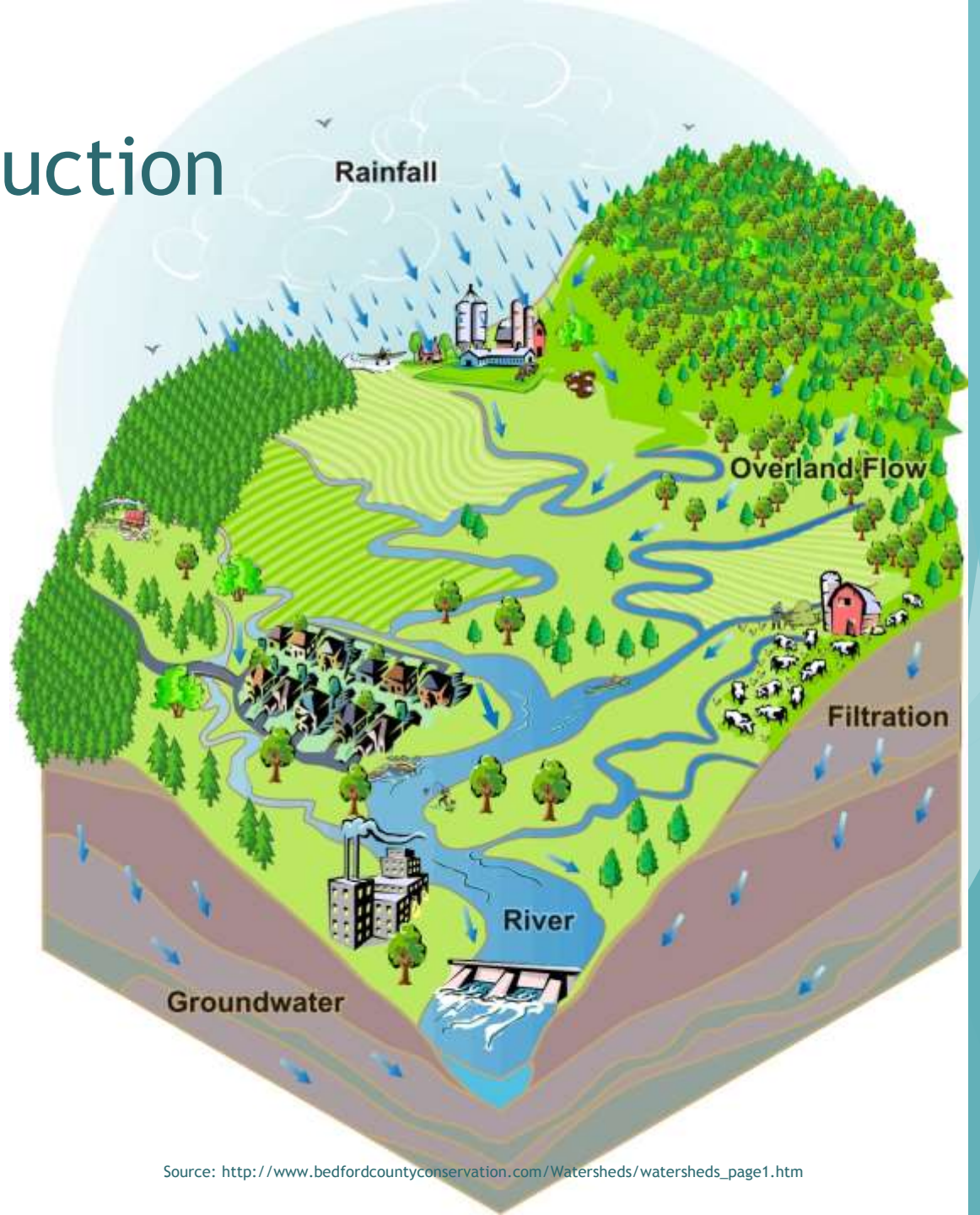


Drainage network: introduction

- **Drainage network -** network of channels and drains of all drainage basins of an area
  - Channels = stream segments
- **Drainage basin -** any area of land where rainfall collects and drains off into a common outlet



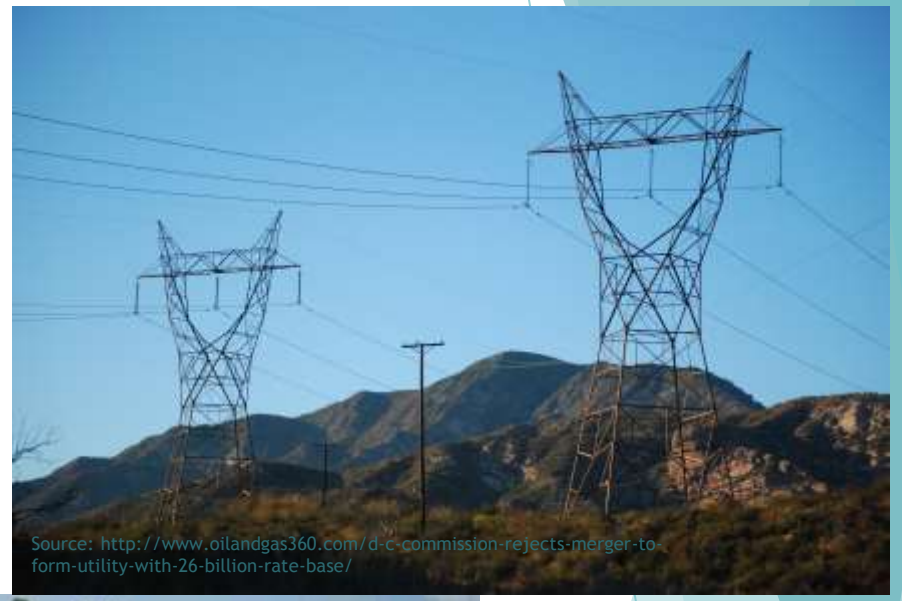
Source: https://en.wikipedia.org/wiki/Drainage_basin



Source: http://www.bedfordcountyconservation.com/Watersheds/watersheds_page1.htm

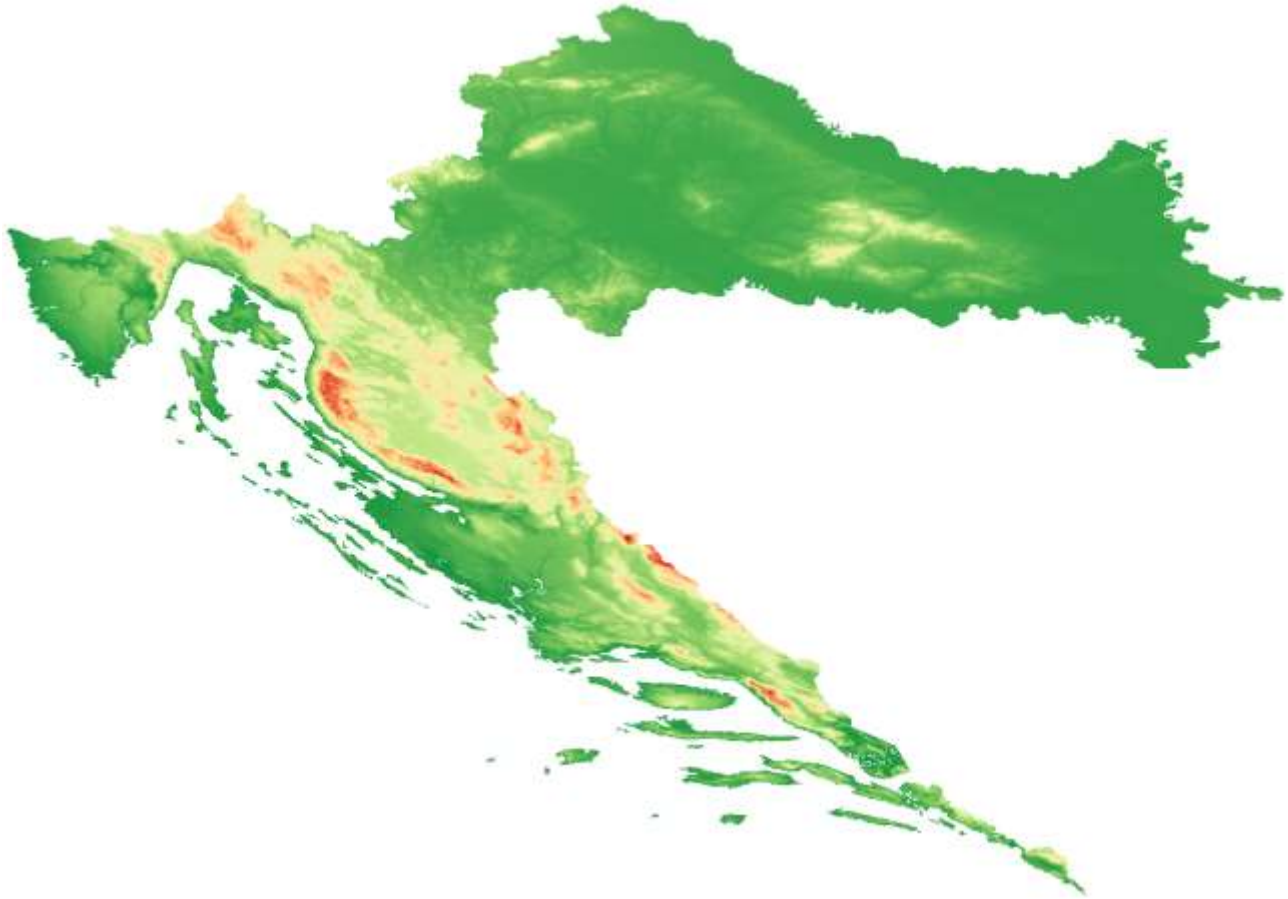
Importance of geomorphometric analysis and drainage network

- hazard assessment - landslide prediction and mitigation
- coastal protection
- planning the installations of lines of renewable and non-renewable energy sources
- space planning
- in civil engineering
- needs of the military and tourism
- ecological problems
- **design of a stable system**


Source: http://www.oilandgas360.com/d-c-commission-rejects-merger-to-form-utility-with-26-billion-rate-base/


Source: http://istinomprotivlazi.com/novosti/obnove-kuca-u-gunji

Study area – Republic of Croatia



- variety of reliefs
- Source data: digital elevation model (**DEM**)
- Used DEMs: **SRTM30, SRTM15, SRTM3, SRTM1, GTOPO30, ETOPO1**

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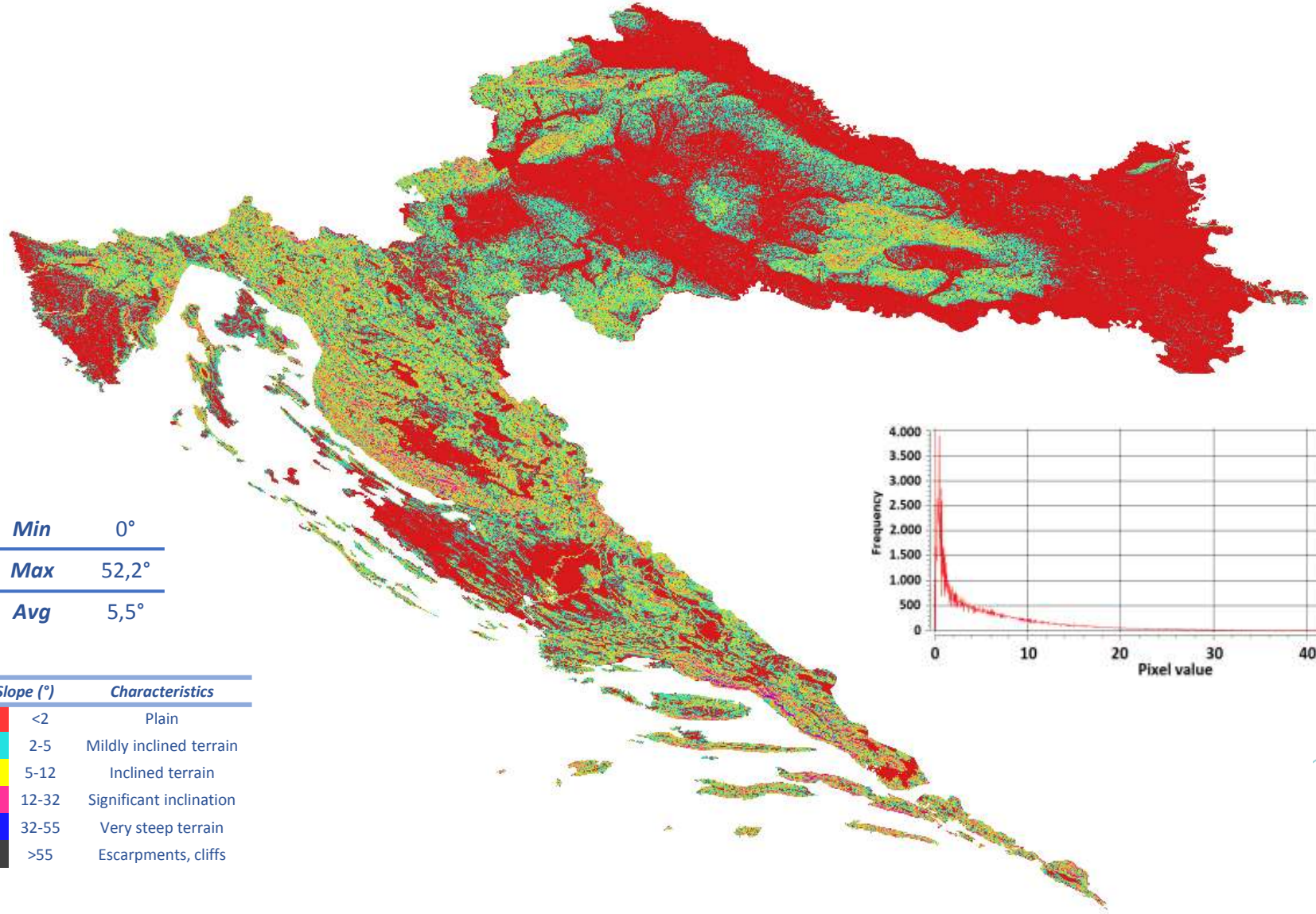
Slope map of Croatia

- the steepness or the degree of incline of a surface

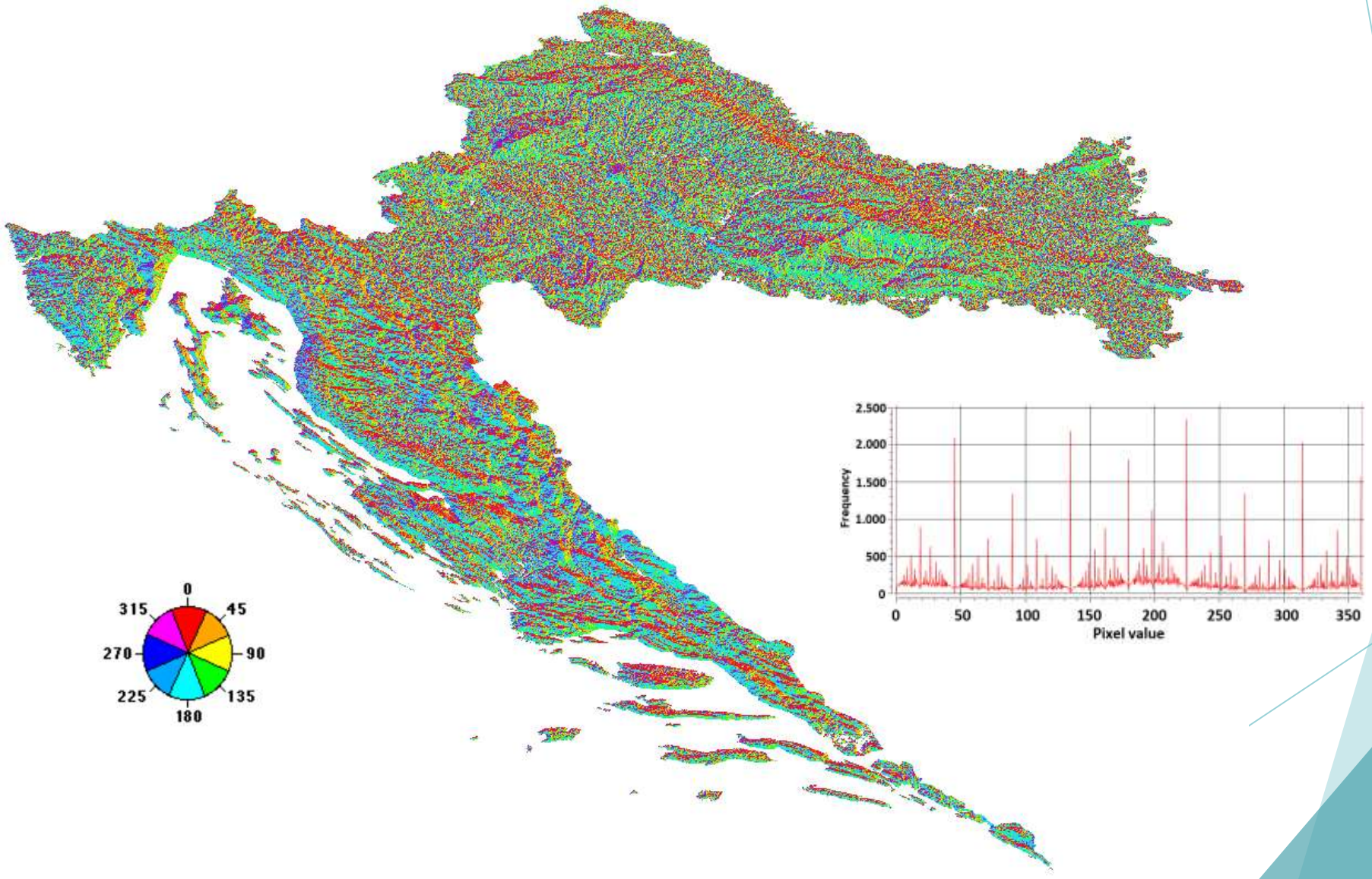


Min	0°
Max	52,2°
Avg	5,5°

Slope (°)	*Characteristics*
<2	Plain
2-5	Mildly inclined terrain
5-12	Inclined terrain
12-32	Significant inclination
32-55	Very steep terrain
>55	Escarpments, cliffs

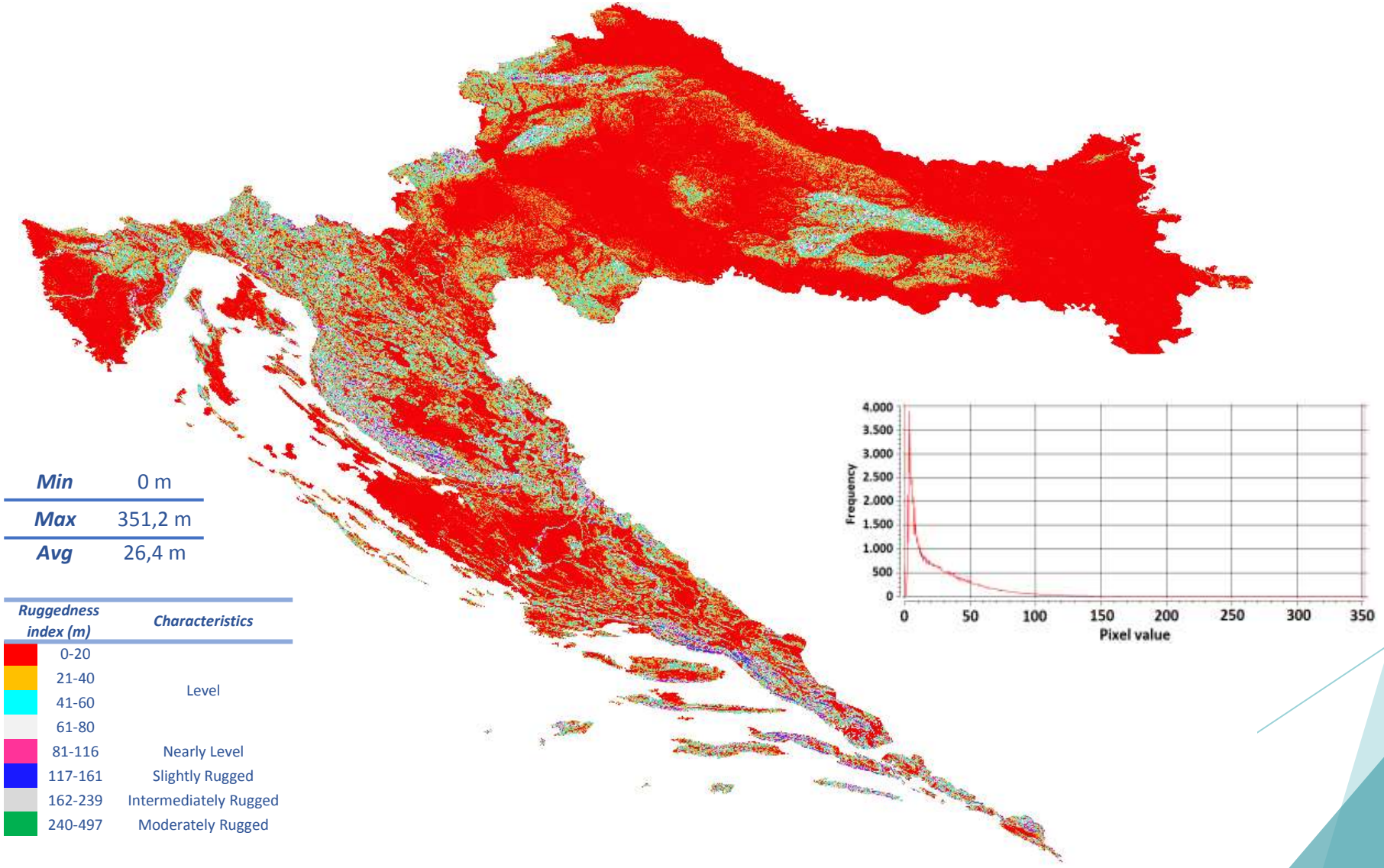
Aspect map of Croatia

- can be thought of as the slope direction



Ruggedness index map of Croatia

- the difference between the value of a cell and the mean of its 8 neighboring cells.

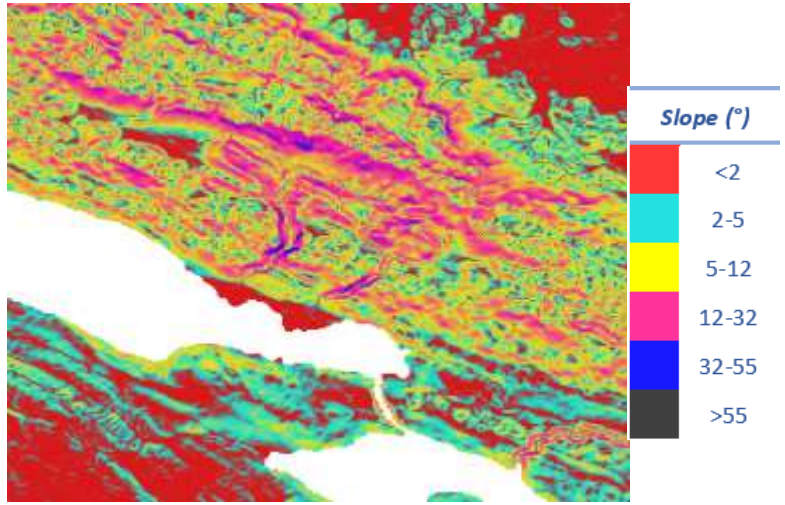


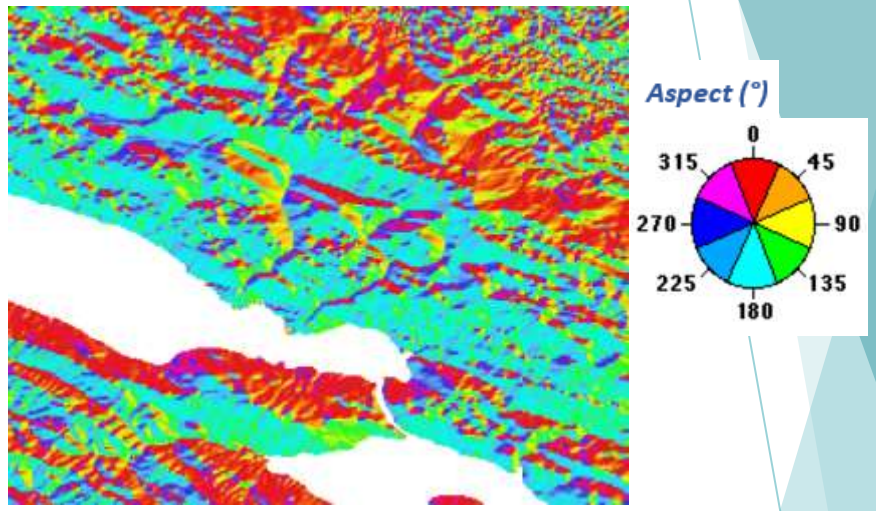
Min	0 m
Max	351,2 m
Avg	26,4 m

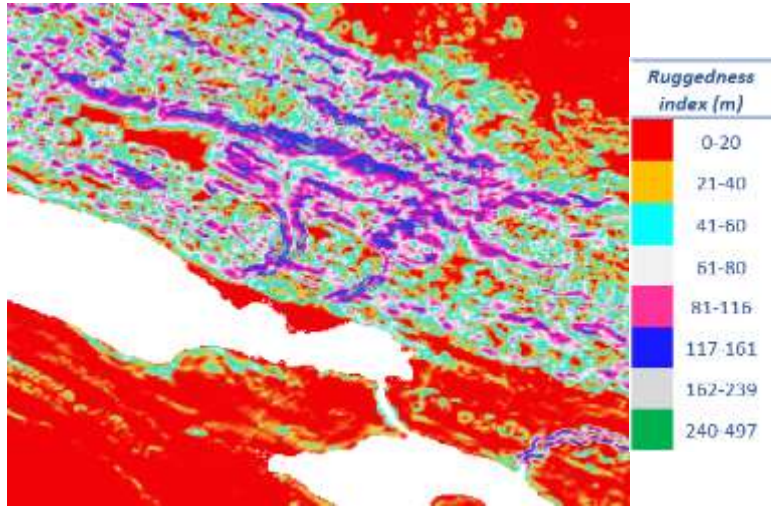
Ruggedness index (m)	*Characteristics*
0-20	Level
21-40	
41-60	
61-80	
81-116	Nearly Level
117-161	Slightly Rugged
162-239	Intermediately Rugged
240-497	Moderately Rugged

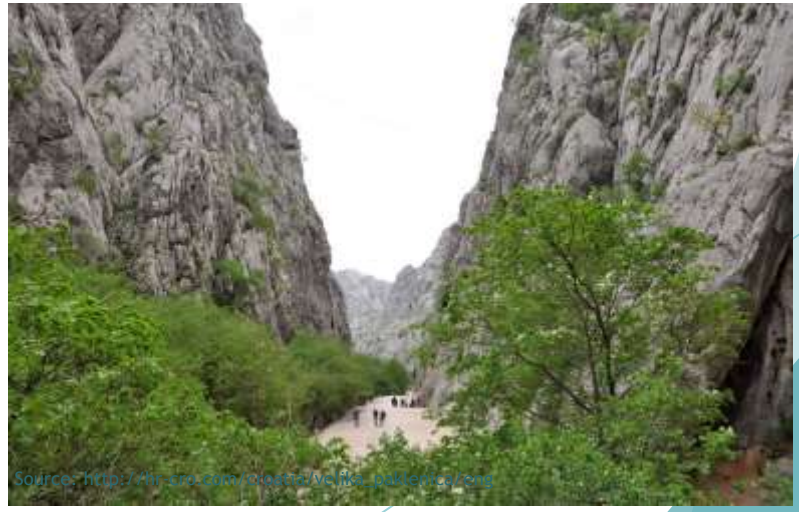
Geomorphometric analysis: extreme values

Paklenica national park

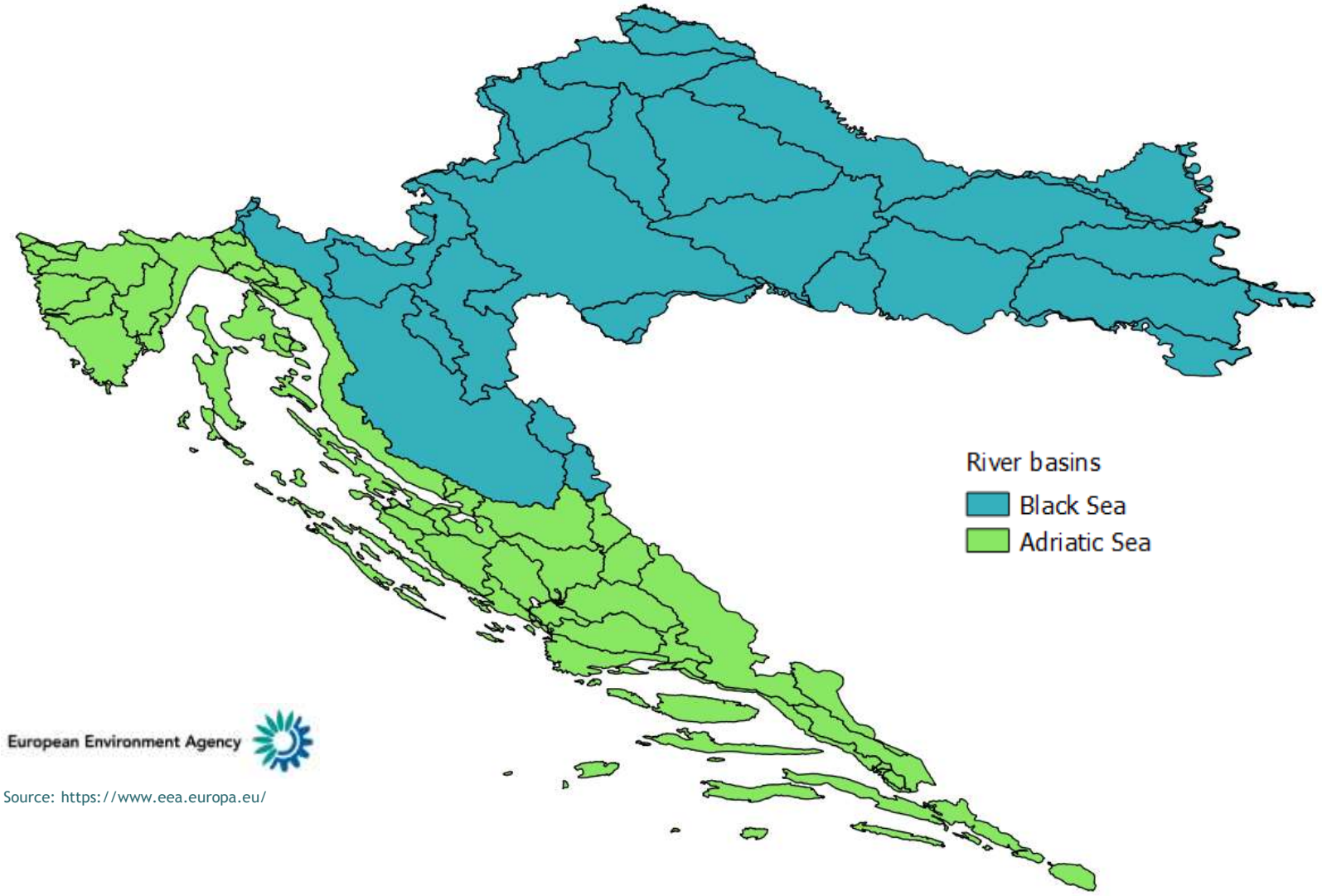








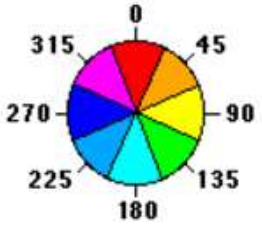
Geomorphometric analysis

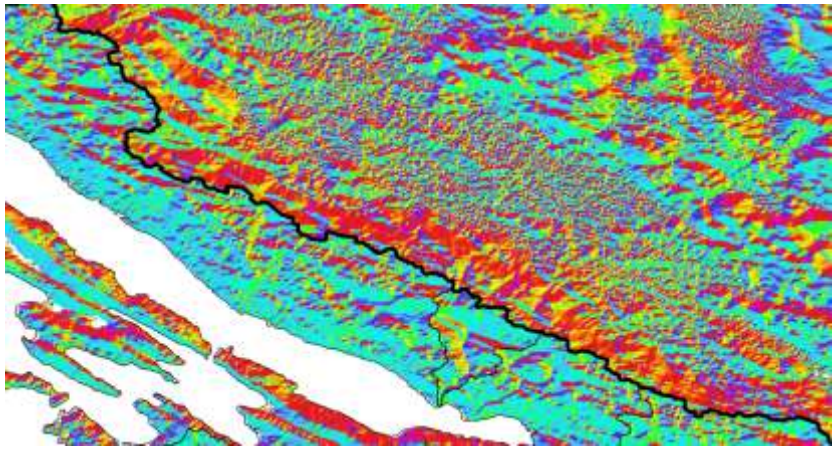


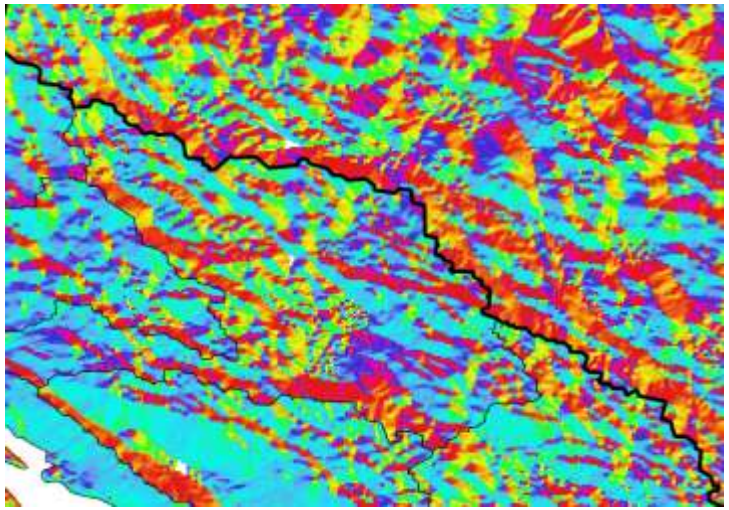
Source: https://www.eea.europa.eu/

Geomorphometric analysis

Aspect

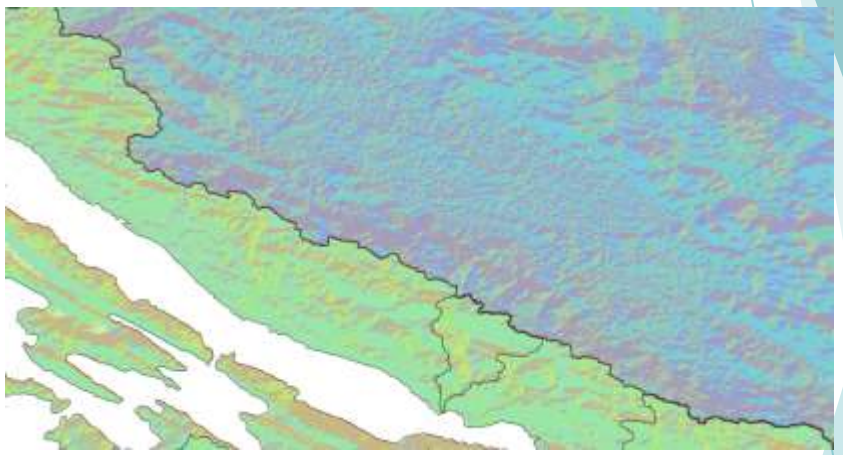


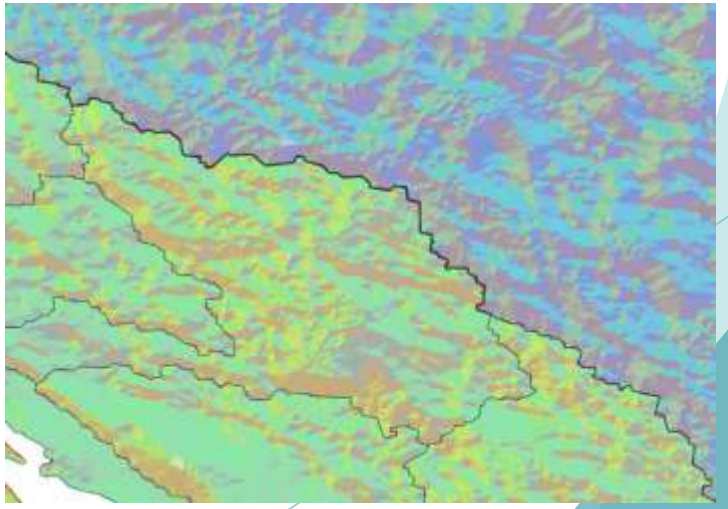




River basins

according to EEA





River basins
Black Sea
Adriatic Sea

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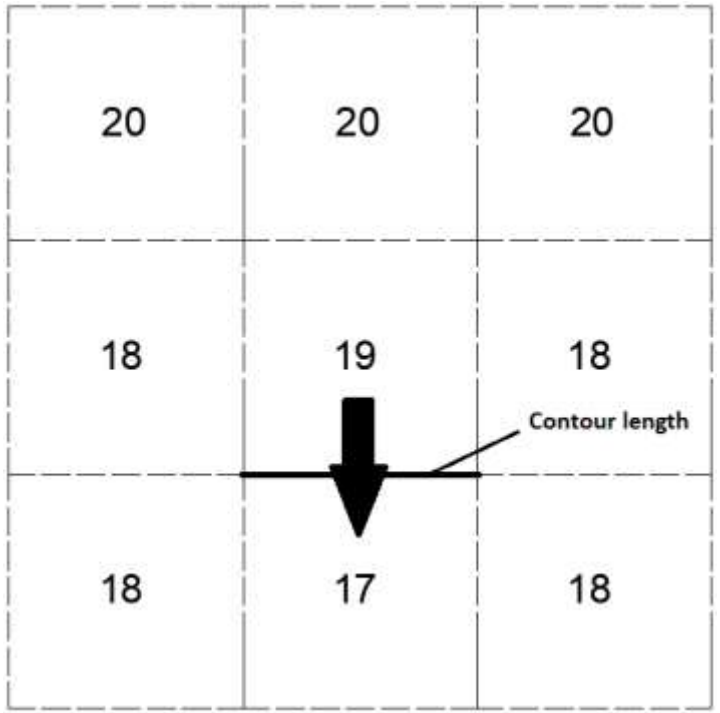
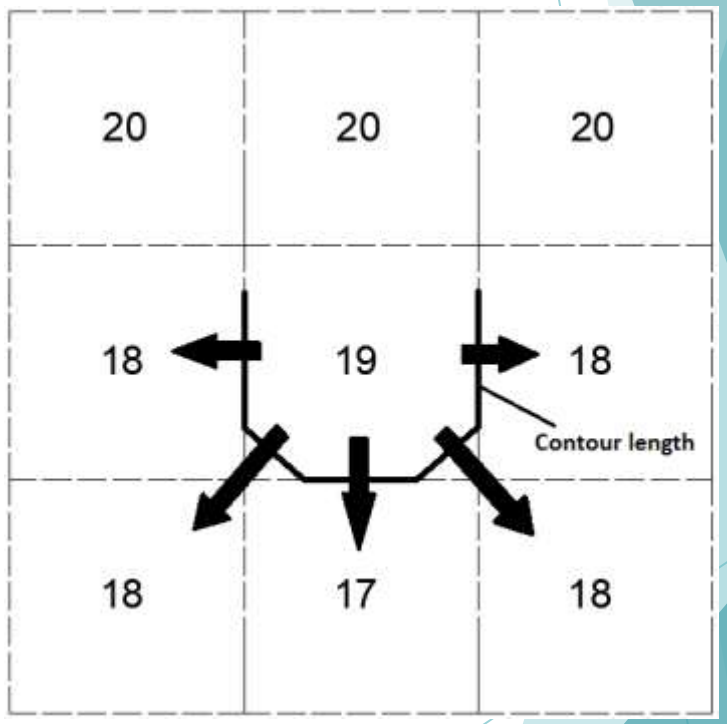
Drainage networks: algorithms

Single flow direction algorithm (D8)
SFD



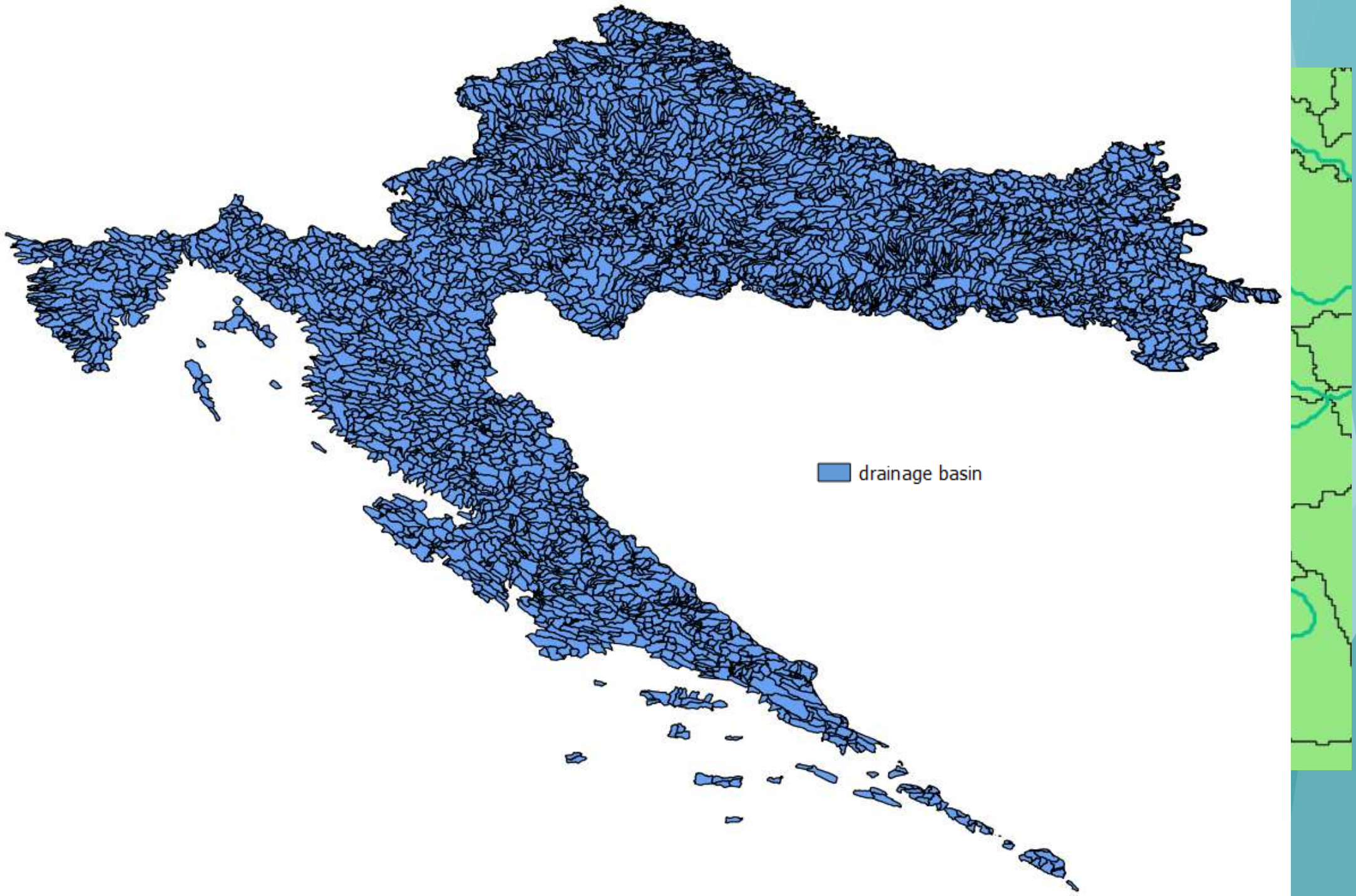
In steepest downslope direction

Multiple flow direction algorithm
MFD



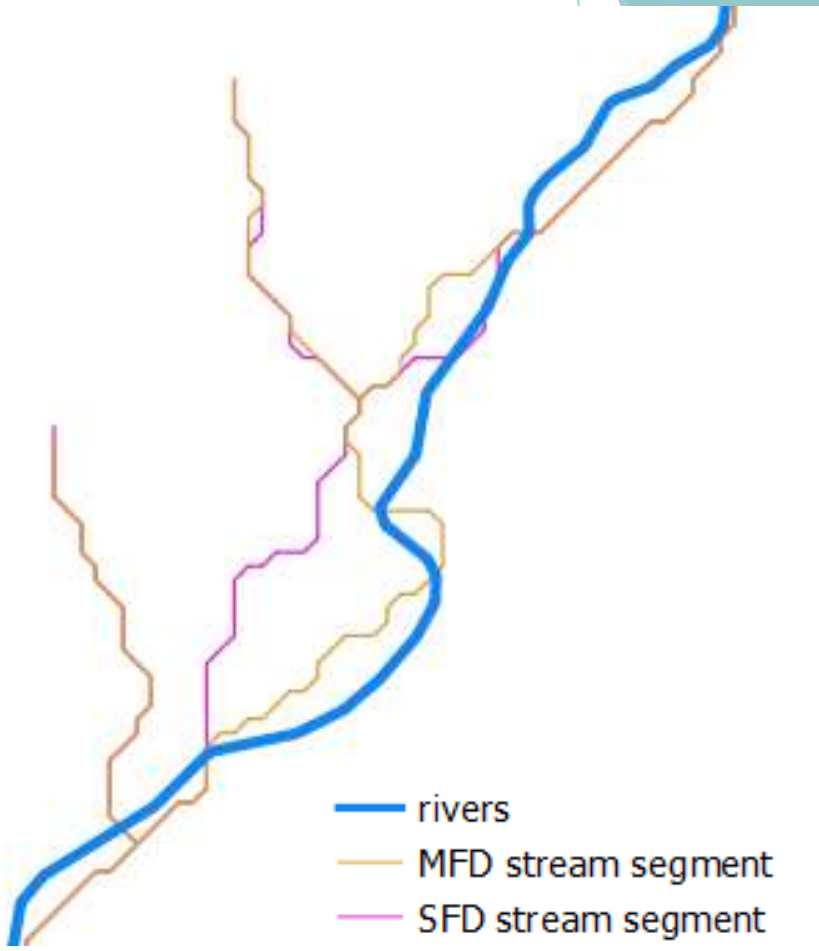
In all downslope directions

Dr
ou



Algorithm comparison

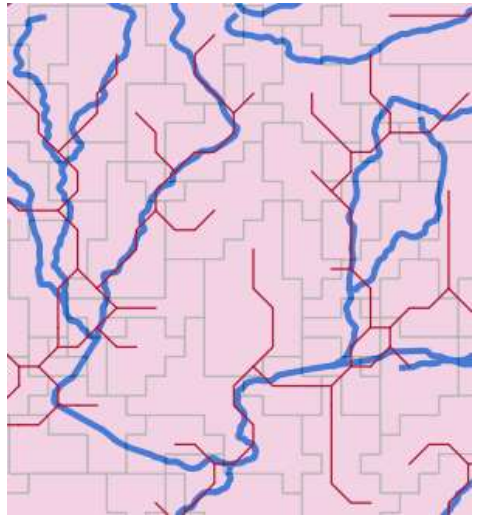
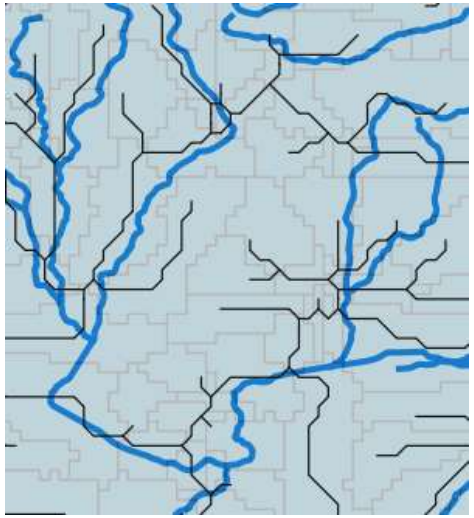
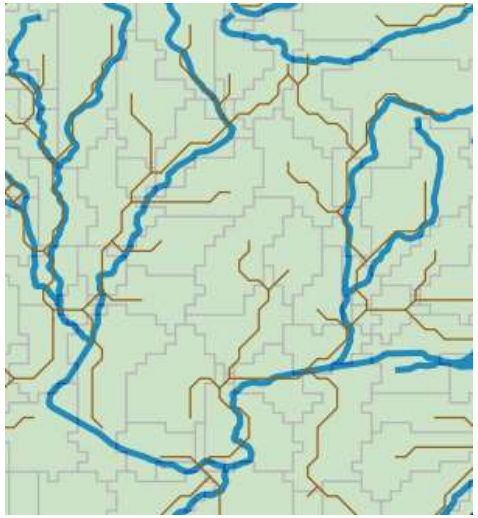
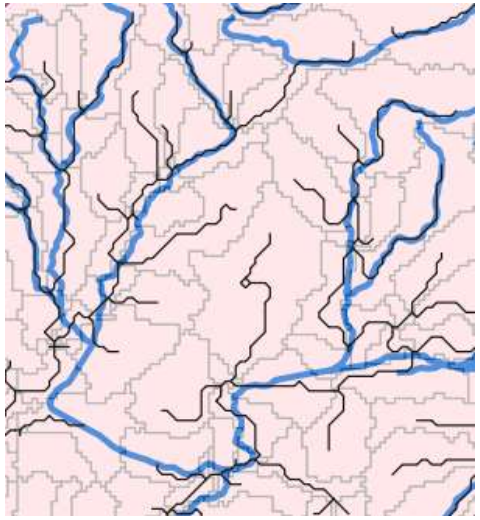
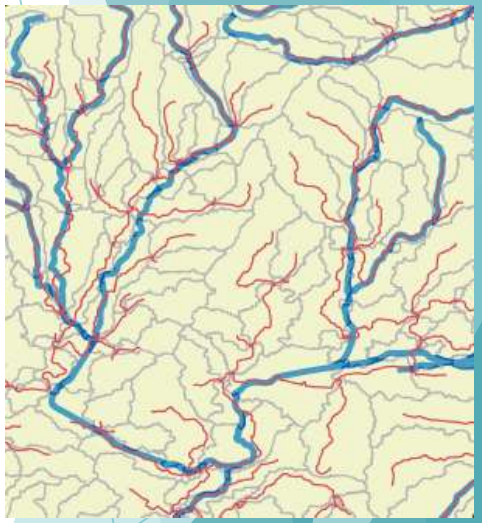
- Both vector layers of stream were overlapped with the vector layer of the Croatian rivers
- MFD algorithm produced more accurate and denser drainage pattern
- MFD algorithm produced more basins



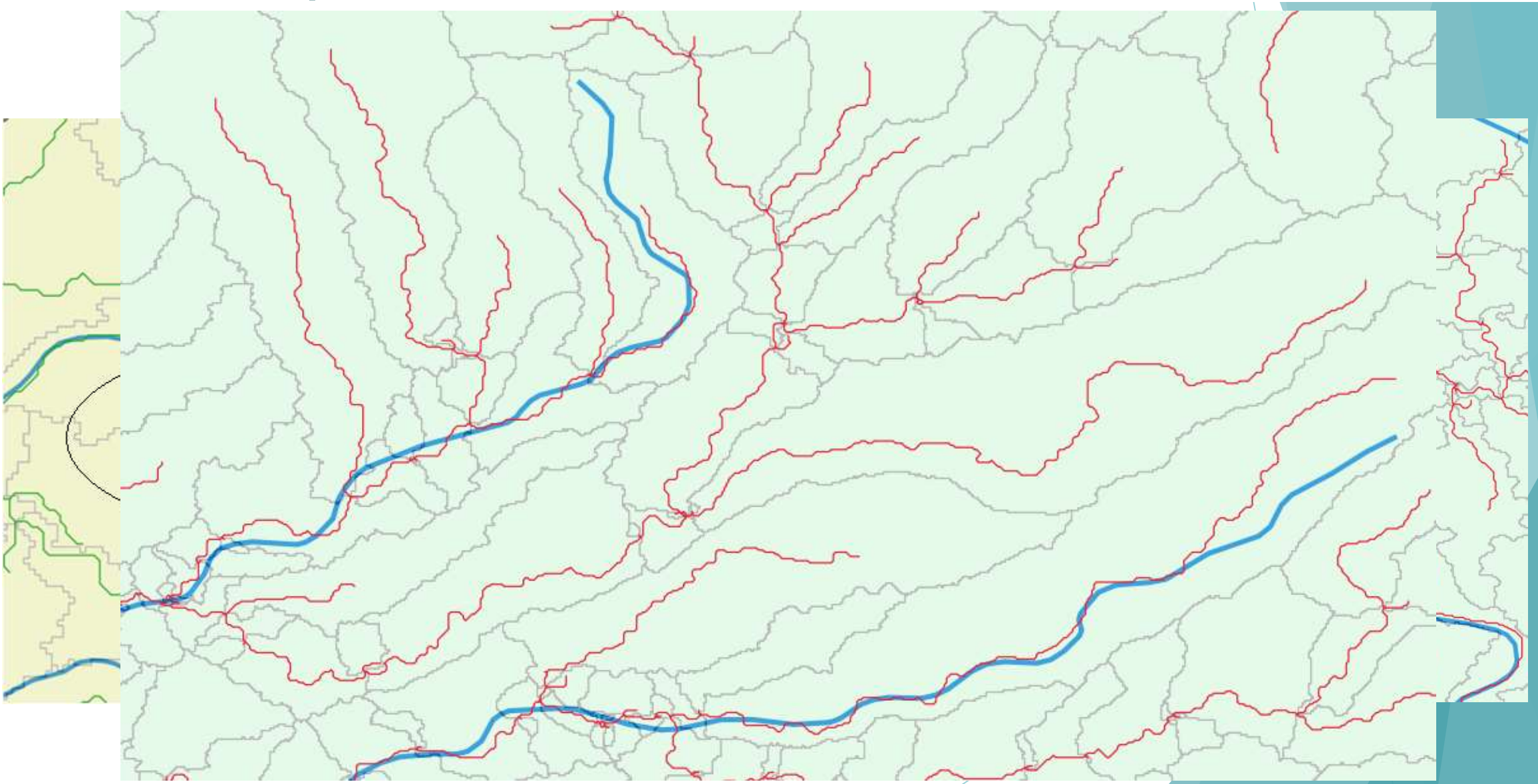
Source: http://www.eurogeographics.org/products-and-services/euroglobalmap

DEMs comparison

rivers

ETOPO1	GTOPO30	SRTM30	SRTM15	SRTM3
				
1075 basins	1597 basins	1566 basins	2355 basins	4863 basins

DEMs comparison



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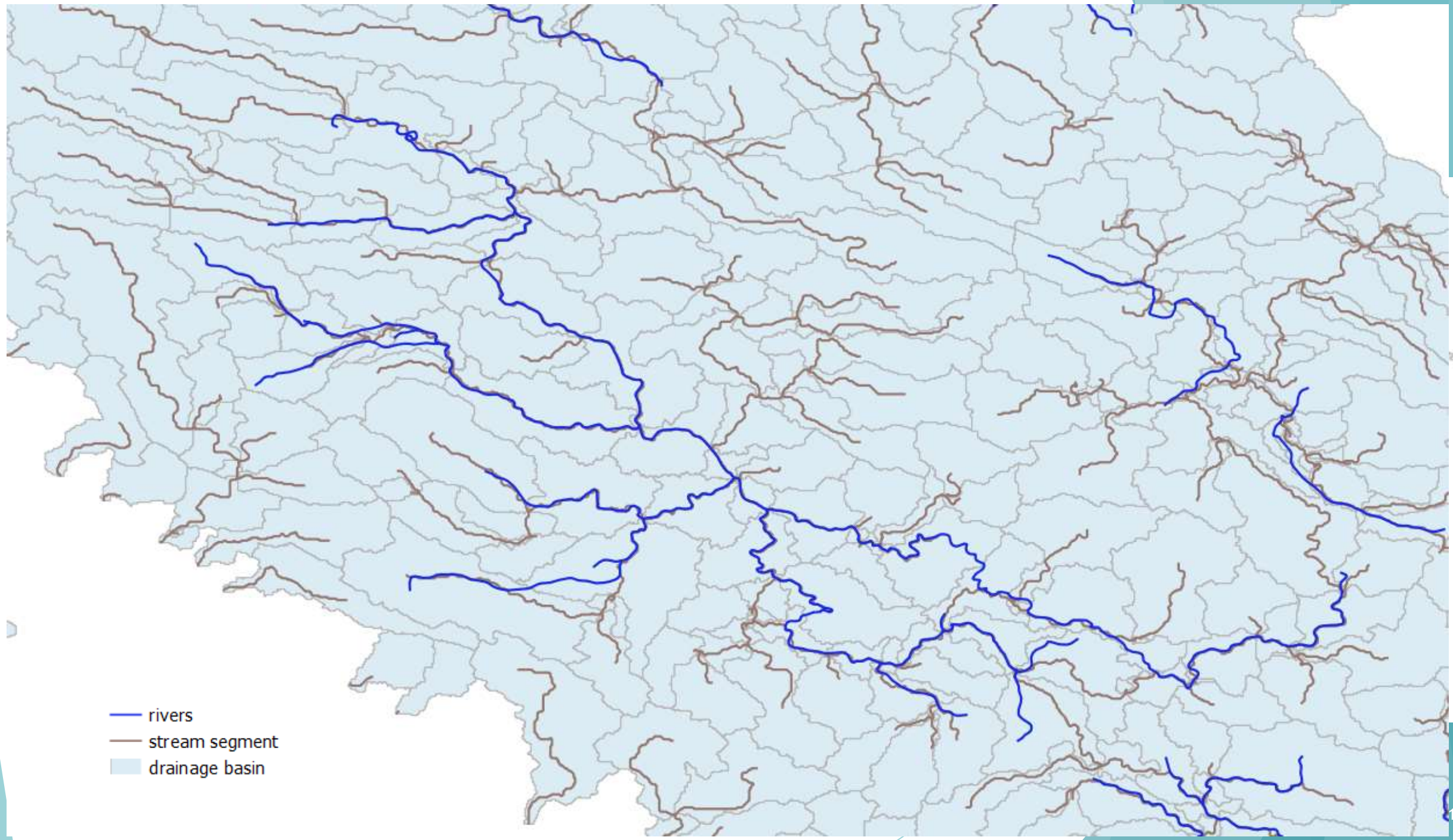
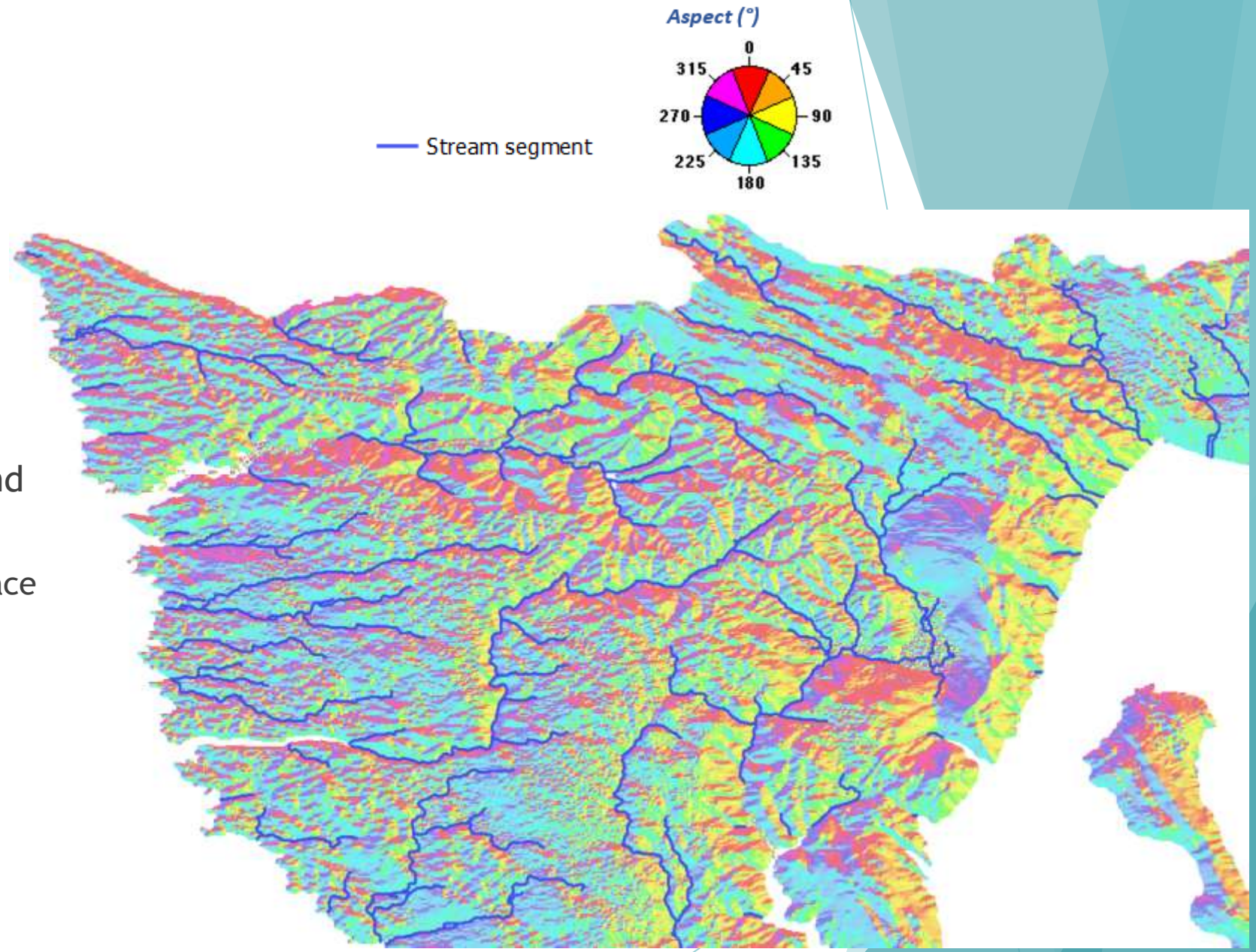

rivers
stream segment
drainage basin

Conclusions

Drainage network + geomorphometric parameters =

- preserving and planning space
- Identifying and planning the groundwater potential zones and watershed management
  - irrigation and drainage of surface
- Geomorphometric analyzes determine the variety of life in each site



Thanks for attention!

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