State of GRASS GIS Project: 35 years is nothing!

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grass.osgeo.org

FOSS4G 2019 – Bucharest, Romania

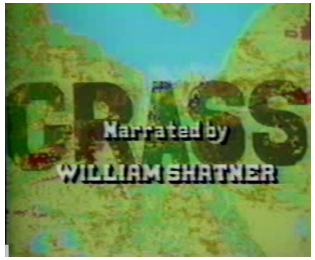
35+ years of GRASS GIS: from mainframe to desktop and cloud

GRASS GIS 101

- GRASS = Geographic Resources Analysis Support System
- **modular and flexible** GIS and image processing software
- freedom: GNU General Public License 2+
    - 2D raster and 3D raster voxel processing
    - topological vector data functionality
    - image processing, time series analysis
    - visualization options

- **portable** software ("all" operating systems)
- graphical user interface and command line
- **cloud** ready: docker images available

1982: Vax 11/780 minicomputer



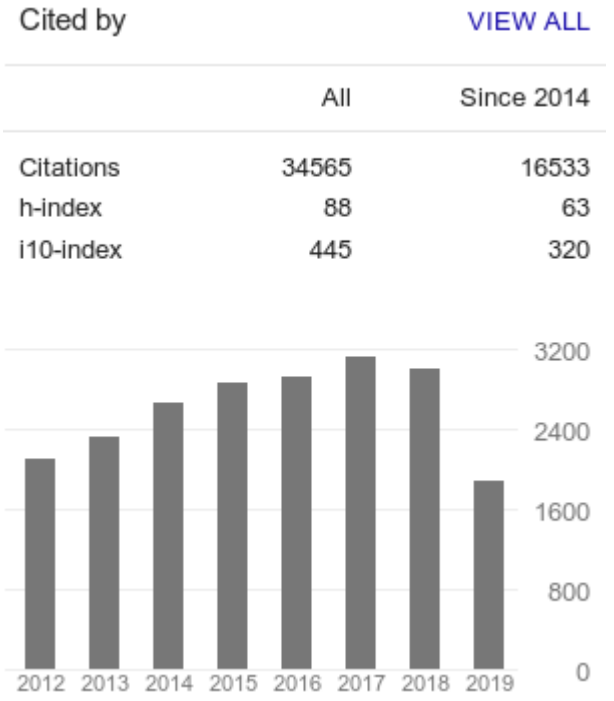
OSGeo community sprint

Data center (Source: Wikipedia)

GRASS GIS and the scientific community

GRASS GIS scientific reputation:

- 34528 citations
- H-index: 88
- i10-index: 444



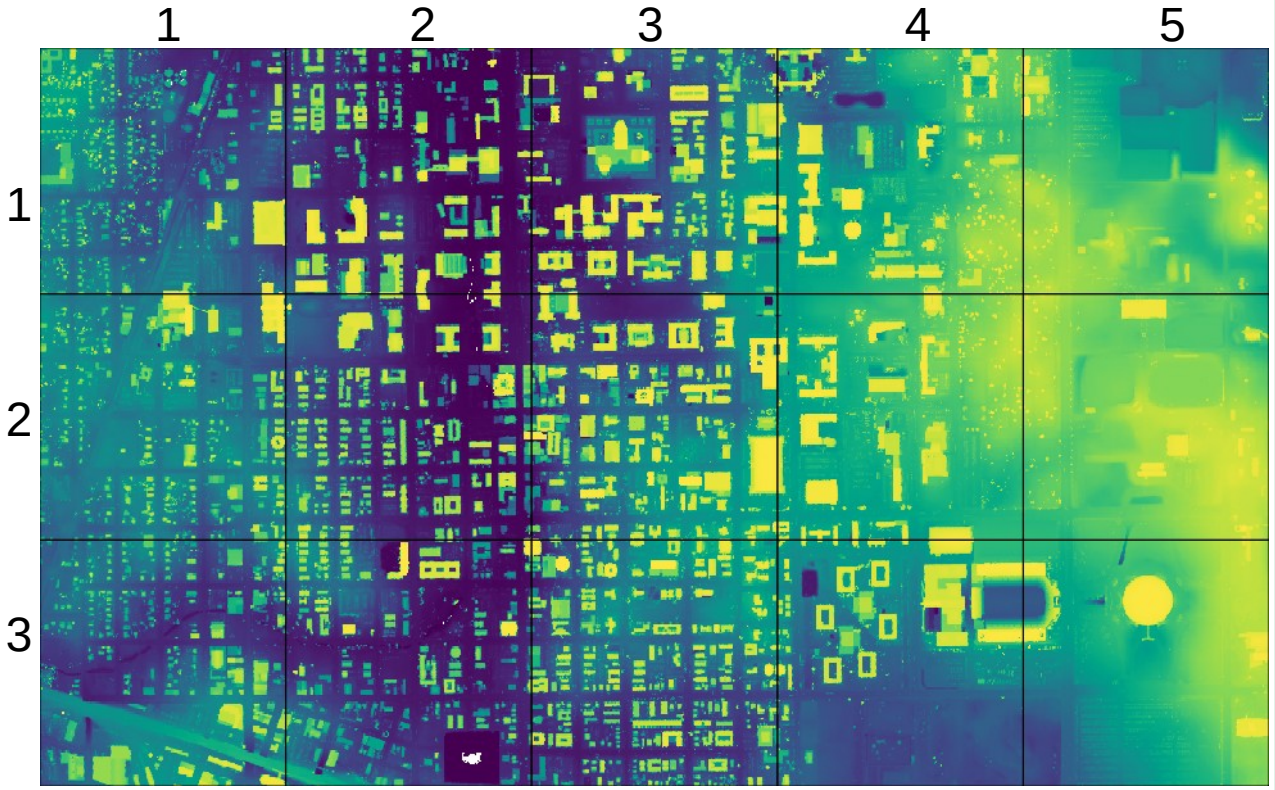
https://scholar.google.com/citations?user=gJ0ZB0cAAAAJ

GRASS GIS is Big Data ready

Virtual raster tiles (VRT)

r.buildvrt - creates VRT layer from a list of input raster maps

Useful for tile based (cloud) computing or better management of mosaics

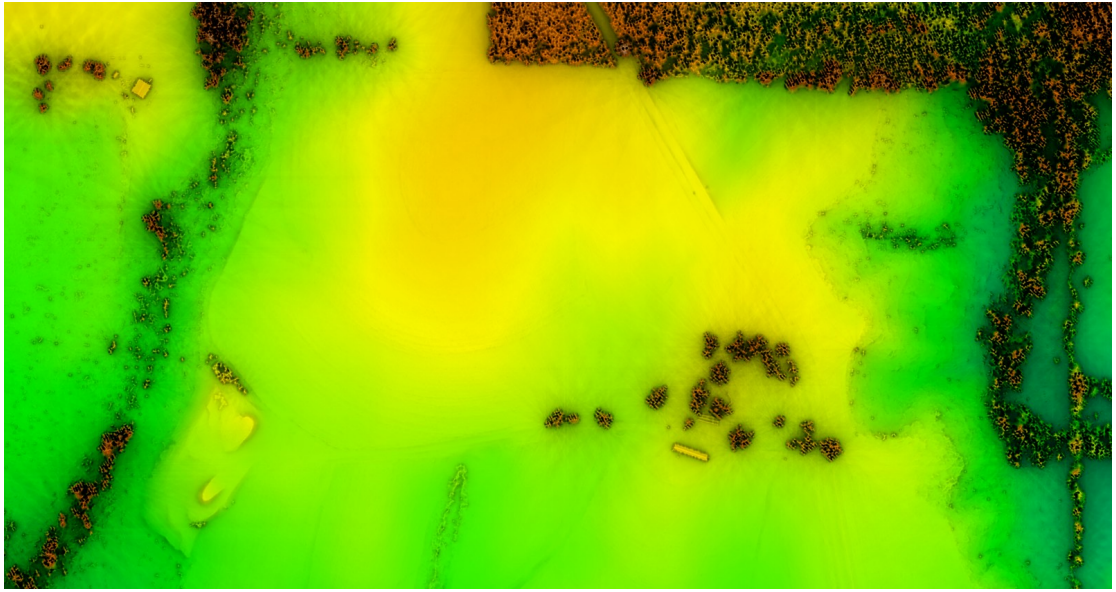


Screenshot source:
https://wenzeslaus.github.io/grass-gis-talks/ncgis2019_whats_new.html#/26

GRASS GIS is Big Data ready

New raster compression

ZSTD - an improvement over ZLIB (Deflate) method, providing both faster and higher rate of compression



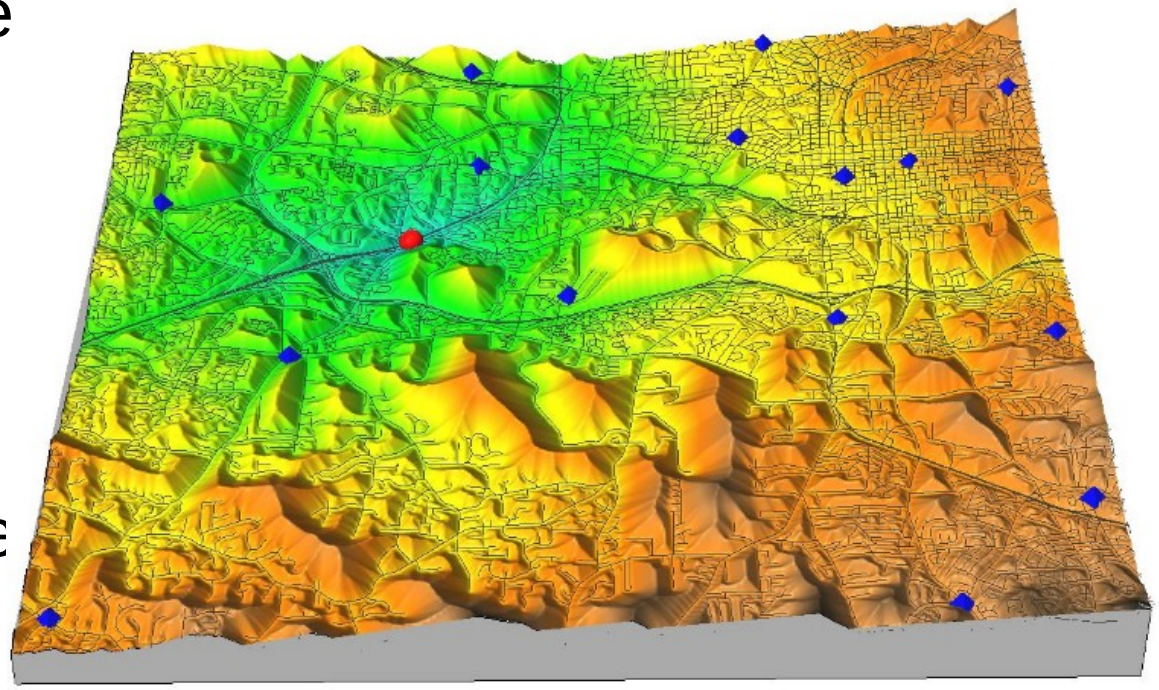
Screenshot source:
https://wenzeslaus.github.io/grass-gis-talks/ncgis2019_whats_new.html#/27

GRASS GIS is Big Data ready

Flexible memory handling:

- **all-in-memory** mode
- **disk cache** mode

The new all-in-memory cache offers faster cost path, point cloud binning, stream and flow computation, image segmentation, b-spline interpolation



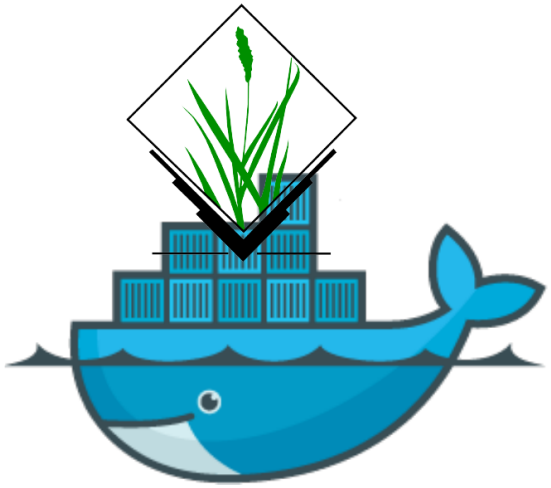
Screenshot source:
https://wenzeslaus.github.io/grass-gis-talks/ncgis2019_whats_new.html#/28

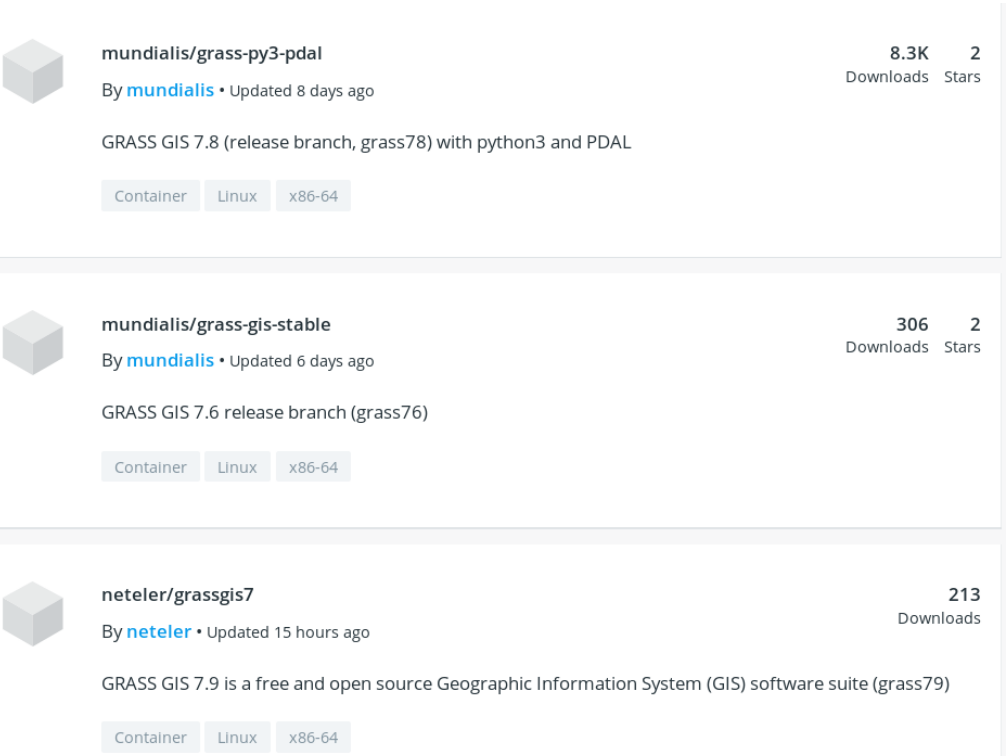
GRASS GIS is Big Data ready

Up-to-date docker images are available from

https://grass.osgeo.org/download/software/docker-images/

→ https://hub.docker.com/



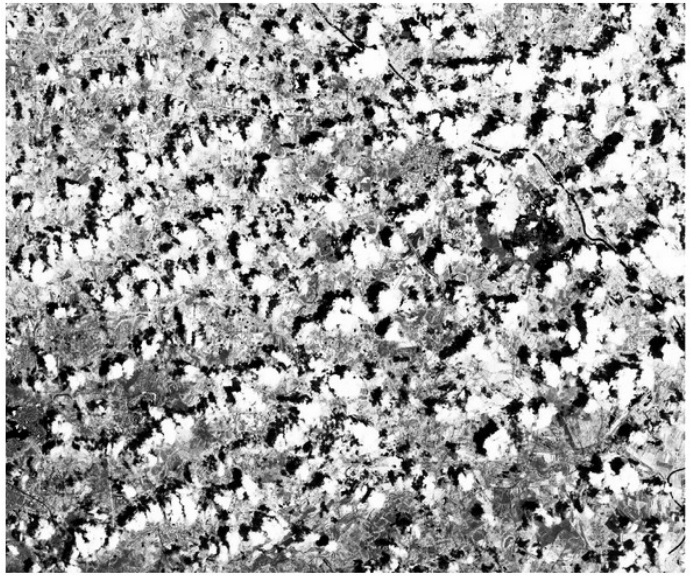


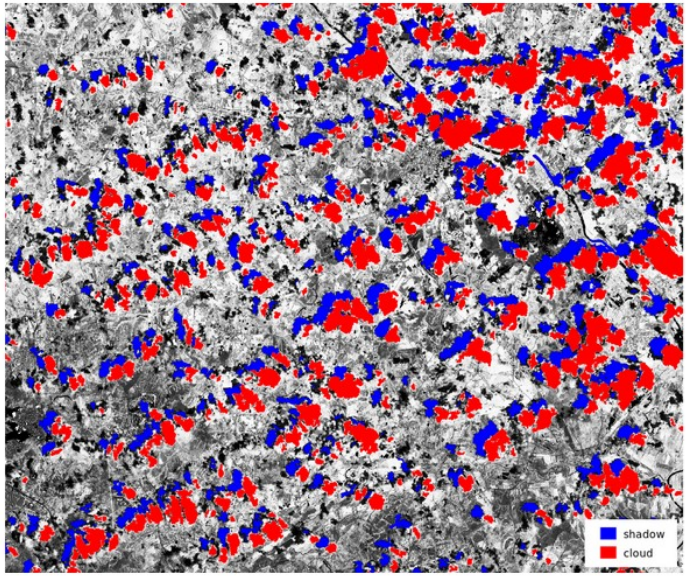
GRASS GIS is Copernicus-ready

New toolset for processing Sentinel-2 data

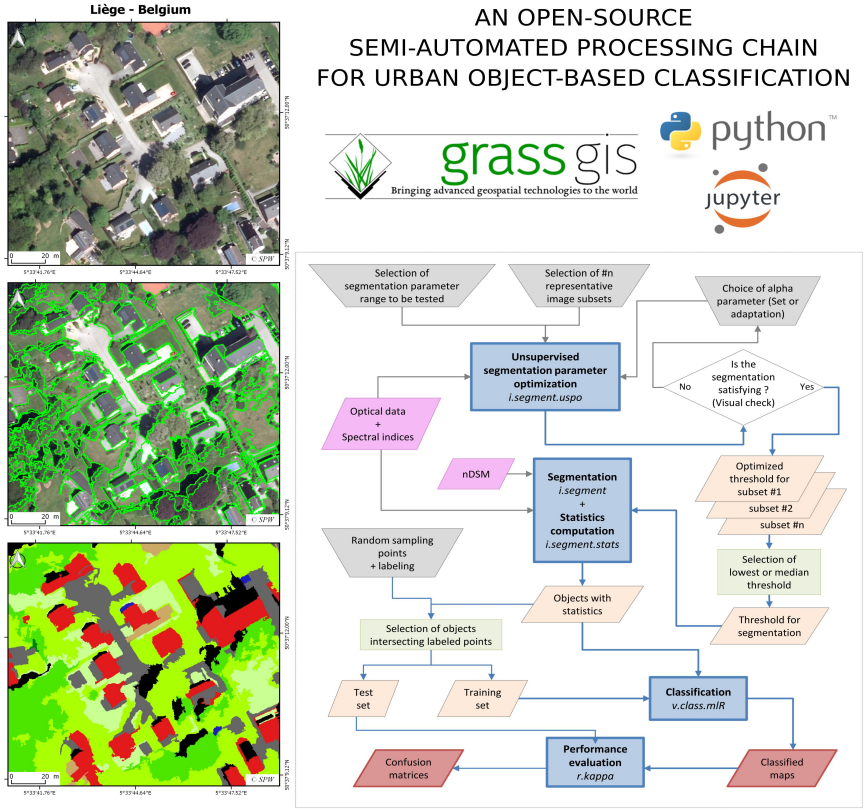
https://grass.osgeo.org/grass7/manuals/addons/i.sentinel.html

S-2 download, import, atmospheric and topographic correction, cloud detection, and masking





Remote sensing in GRASS GIS: object-based image analysis (OBIA)



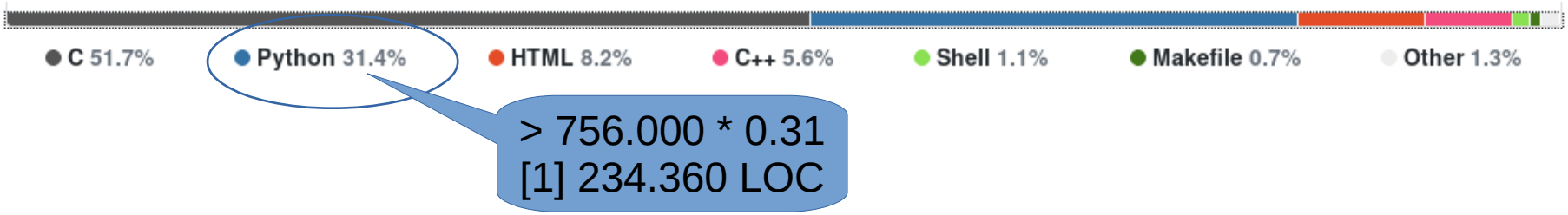
Source : http://dx.doi.org/10.3390/rs9040358

- Complete toolchain from segmentation to classification
- including
  - SLIC superpixel creation
  - image segmentation and parameter optimization
  - Machine Learning (r.learn.ml, v.class.mlR)
  - Deep learning (i.ann.*)

GRASS GIS and Python: a long-lasting love story

Python 3 support is available!

- started in 2018 as a Google Summer of Code project
- a notable amount of code needed to be revisited:



First release candidate (7.8.0 RC1) in August 2019

https://github.com/OSGeo/grass/releases/tag/7.8.0RC1

Try GRASS GIS online!

Try GRASS GIS in Jupyter Notebook with Python

launch binder

https://github.com/wenzeslaus/try-grass-in-jupyter

Jupyter Notebook for trying GRASS GIS in *Binder*.

Try GRASS GIS in Jupyter Notebook with Bash

launch binder

https://github.com/wenzeslaus/try-grass-in-jupyter-with-bash

Jupyter Notebook for trying GRASS GIS in *Binder*.

Try GRASS GIS online!

https://hub.gke.mybinder.org/user/wenzeslaus-grass-zonal-of-solar-jteqp543/

jupyter zonal-of-watersheds (autosaved)

File Edit View Insert Cell Kernel Widgets Help Not Trusted Python 2

Run Code

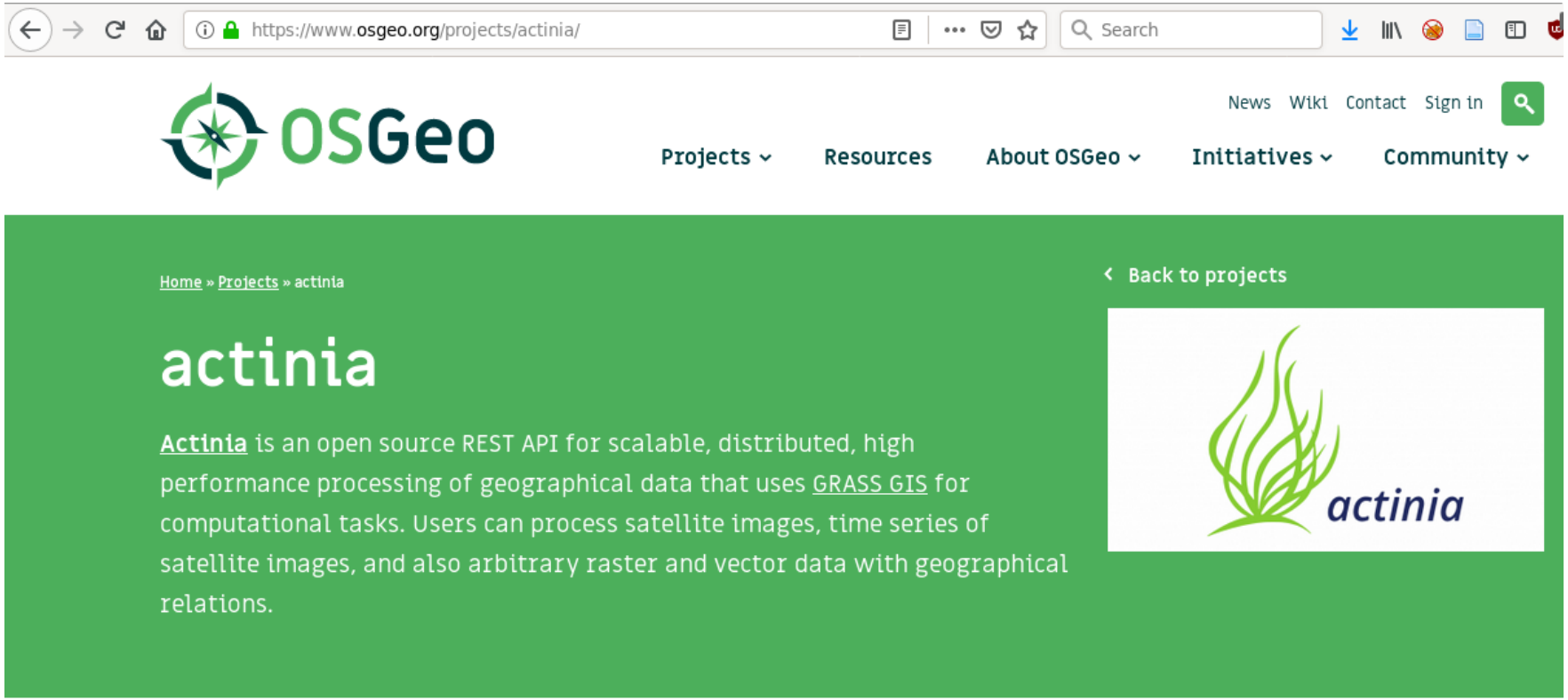
Watersheds

Set computational region and create...

In [4]:
```
gs.parse_command('g.region', raster="elevation", flags='pg')
gs.parse_command('r.relief', input="elevation", output='shade')

gs.run_command('d.erase')
gs.run_command('d.rast', map="elevation")
#gs.run_command('d.legend', raster="lakes_buff", range=(2, 5), at=(80, 100, 2, 10))
Image(filename="map.png")

gs.run_command("r.watershed", elevation="elevation", basin="watersheds", threshold=80000)

#gs.run_command("r.colors", map="watersheds", color="haxby")

gs.run_command('d.erase')
gs.run_command('d.shade', color="watersheds", shade="shade")
Image(filename="map.png")
```

Out[4]:

actinia: GRASS GIS with REST API



https://github.com/mundialis/actinia_core/

Actinia is a REST service to process geographical data that can be managed by the GRASS GIS software system. The software is designed to expose a GRASS GIS database and many GRASS GIS [1] processing tool as REST service [2]. This REST interface allows to access, manage and manipulate the GRASS GIS database

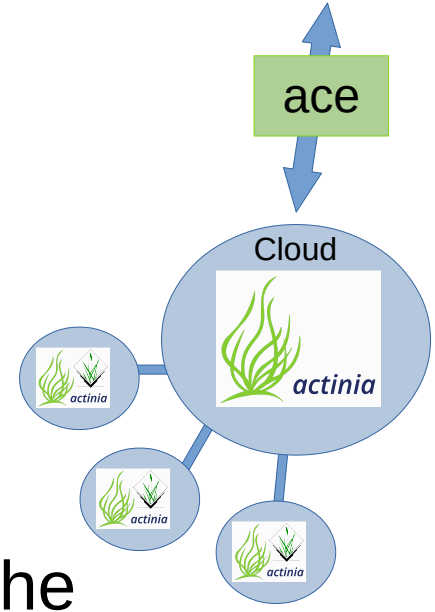
actinia: GRASS GIS with REST API

```
GRASS 7.8.dev (nc_spm_08):~ >
v.buffer input=mypoint output=mybuffer distance=42 --json
{
  "module": "v.buffer",
  "id": "v.buffer_1804289383",
  "inputs":[
     {"param": "input", "value": "mypoint"},
     {"param": "layer", "value": "-1"},
     {"param": "type", "value": "point,line,area"},
     {"param": "distance", "value": "42"},
     {"param": "angle", "value": "0"},
     {"param": "scale", "value": "1.0"}
   ],
  "outputs":[
     {"param": "output", "value": "mybuffer"}
   ]
}
```

https://github.com/mundialis/actinia_core/

actinia: GRASS GIS with REST API

“ace” tool – actinia command execution



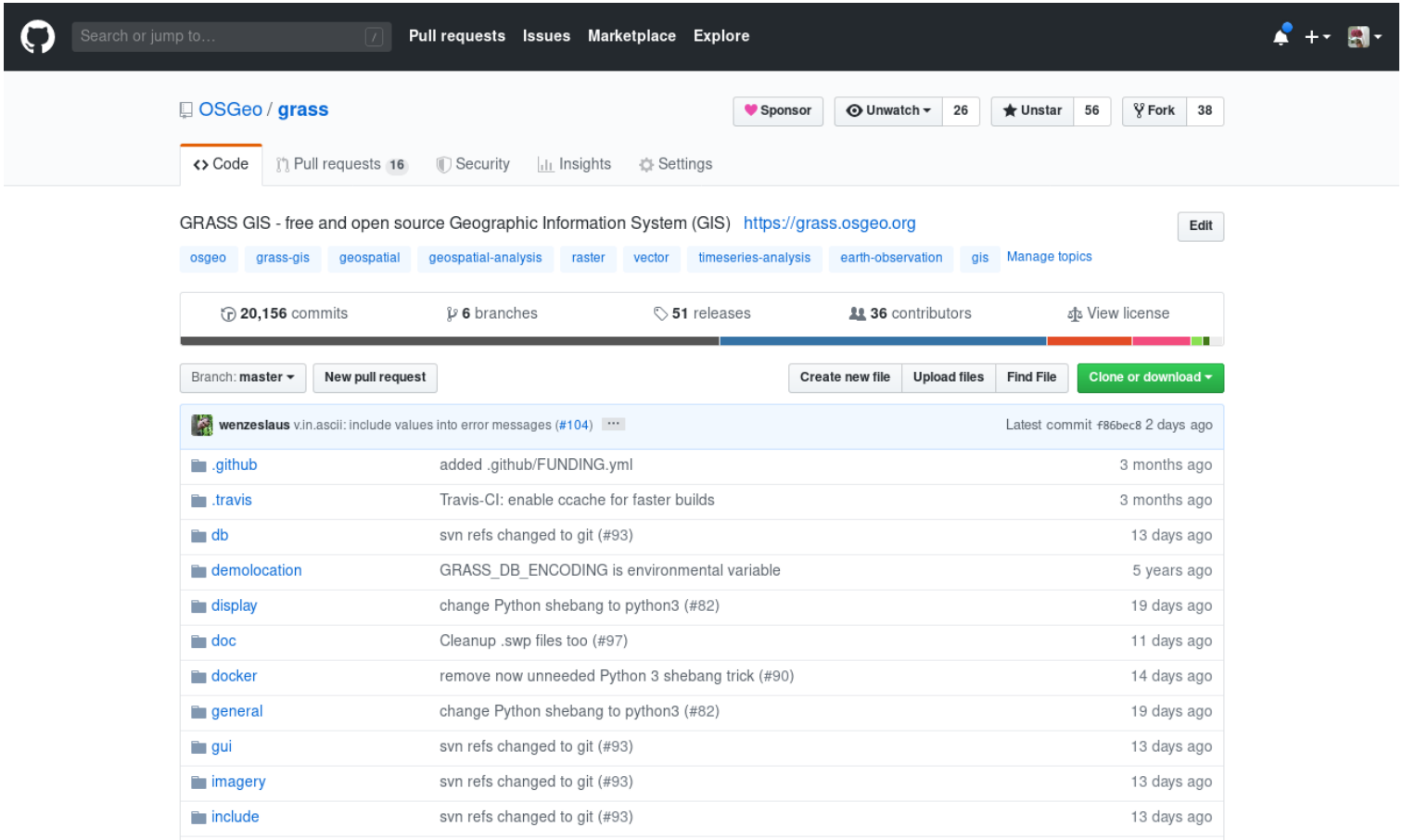
ace allows to work with actinia REST services:

- execution of **single** or **lists** of GRASS GIS commands (i.e., process chains)
- ... the actinia job management will distribute the requests to multiple compute nodes in the cloud

Tutorial incl. download of “ace” tool:
https://github.com/mundialis/actinia_core/tree/master/scripts

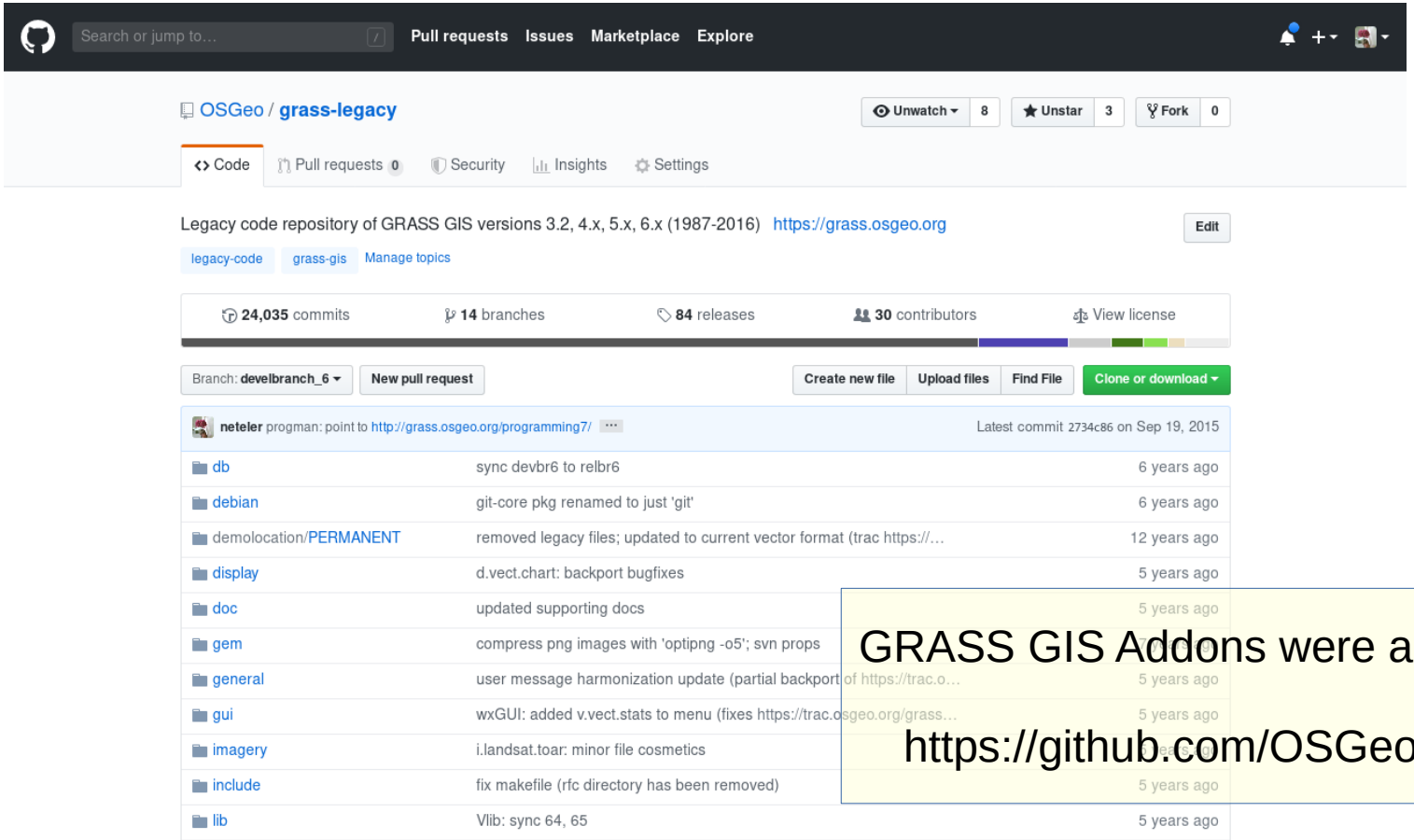
SVN to git migration: GRASS GIS 7.x

https://github.com/OSGeo/grass



SVN to git migration: 1987 – 2016
v3.2 … v6.x

https://github.com/OSGeo/grass-legacy

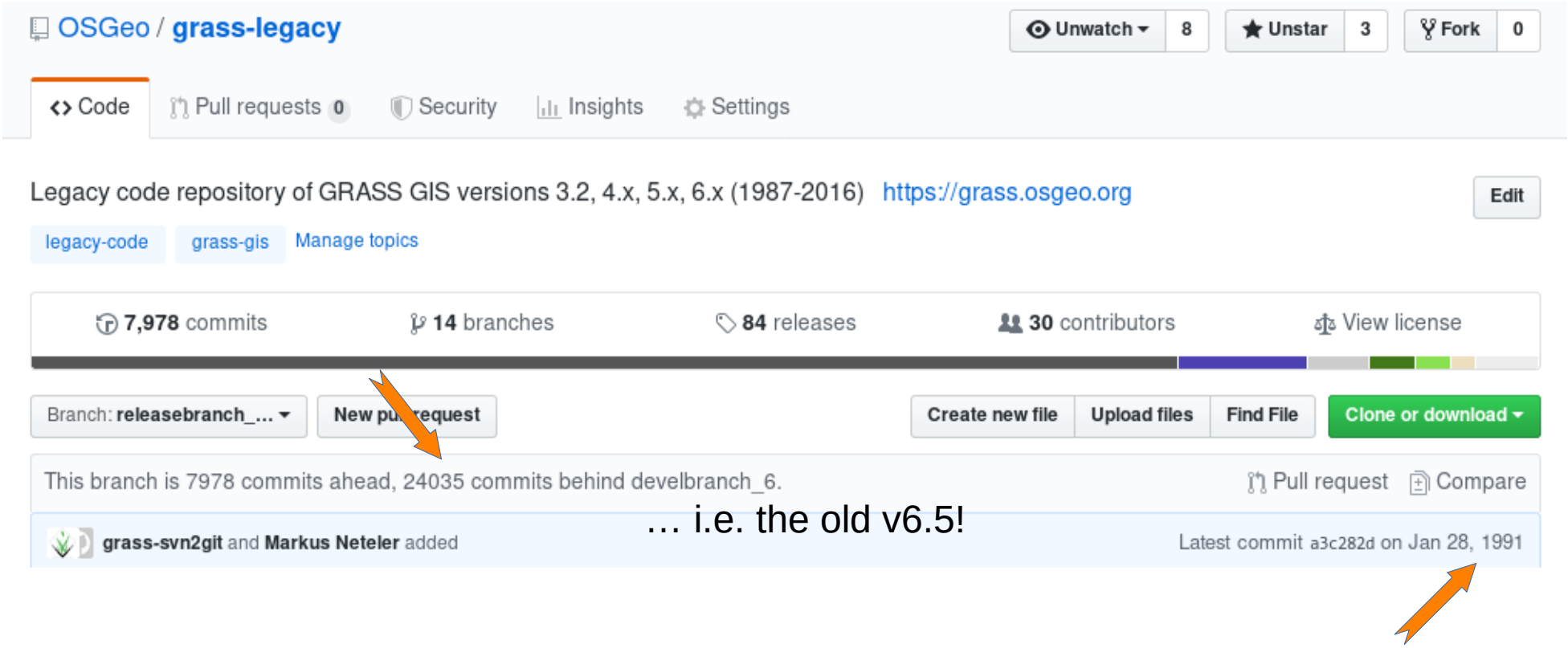


GRASS GIS Addons were also moved to GH:

https://github.com/OSGeo/grass-addons/

A true software archive: back to GRASS GIS v 3.2 from 1987

https://github.com/OSGeo/grass-legacy



… i.e. the old v6.5!

Community activities: Code Sprint 2019 in Berlin

May 2019

- Focus on SVN to GitHub migration
- Discussions on “image collections” (now available as pull request for discussion)
- WIP: support for PROJ 6

New Web site upcoming!

Thanks for your attention – and join us!

grass.osgeo.org

https://github.com/OSGeo/grass