



NLS
FINNISH GEOSPATIAL
RESEARCH INSTITUTE
FGI

Cloudless Sentinel-2 mosaics in Puhti

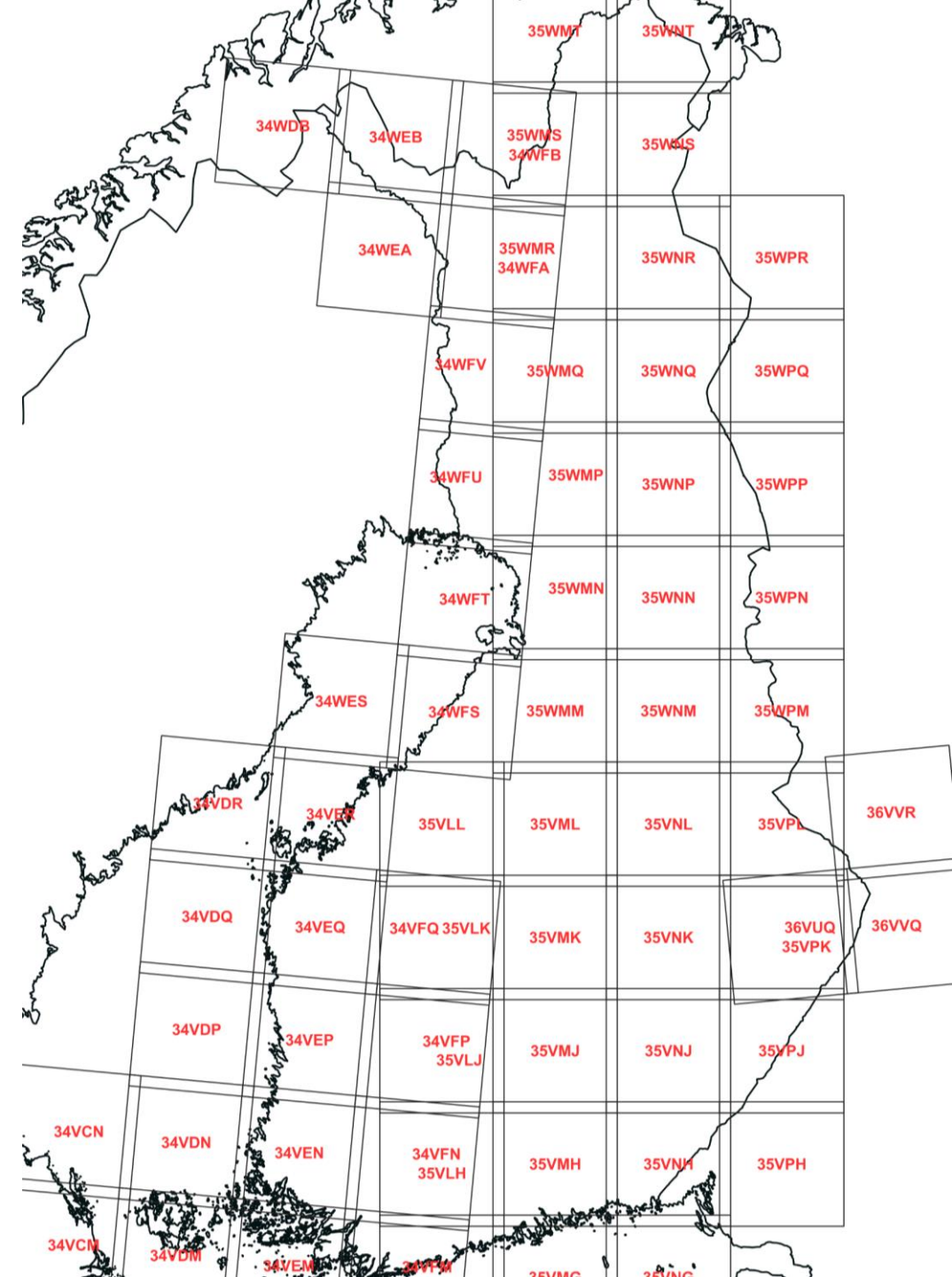
Using sen2mosaic

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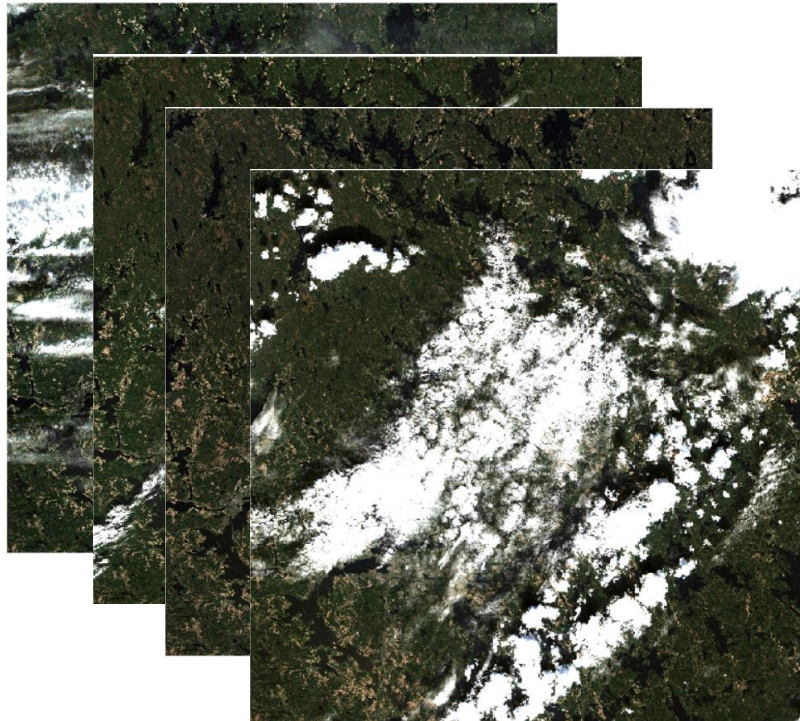
Requirements

- sen2mosaic module in Puhti
 - Downloading from SciHub (sentinelsat)
 - L1C -> L2A processing (sen2cor)
 - **Mosaicking**
- L2A Sentinel-2 data
 - Available in Allas: growing season covering most of Finland, years 2016-2021
 - Different combinations

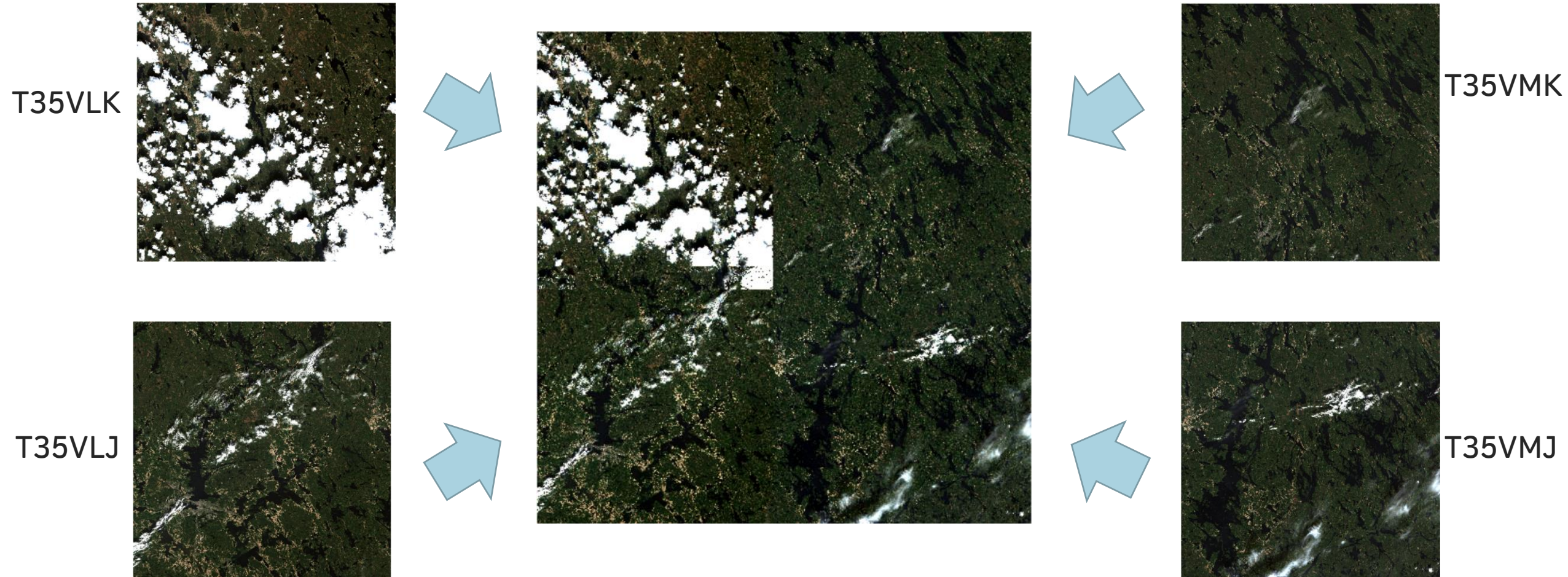


S2 data: one tile, several images

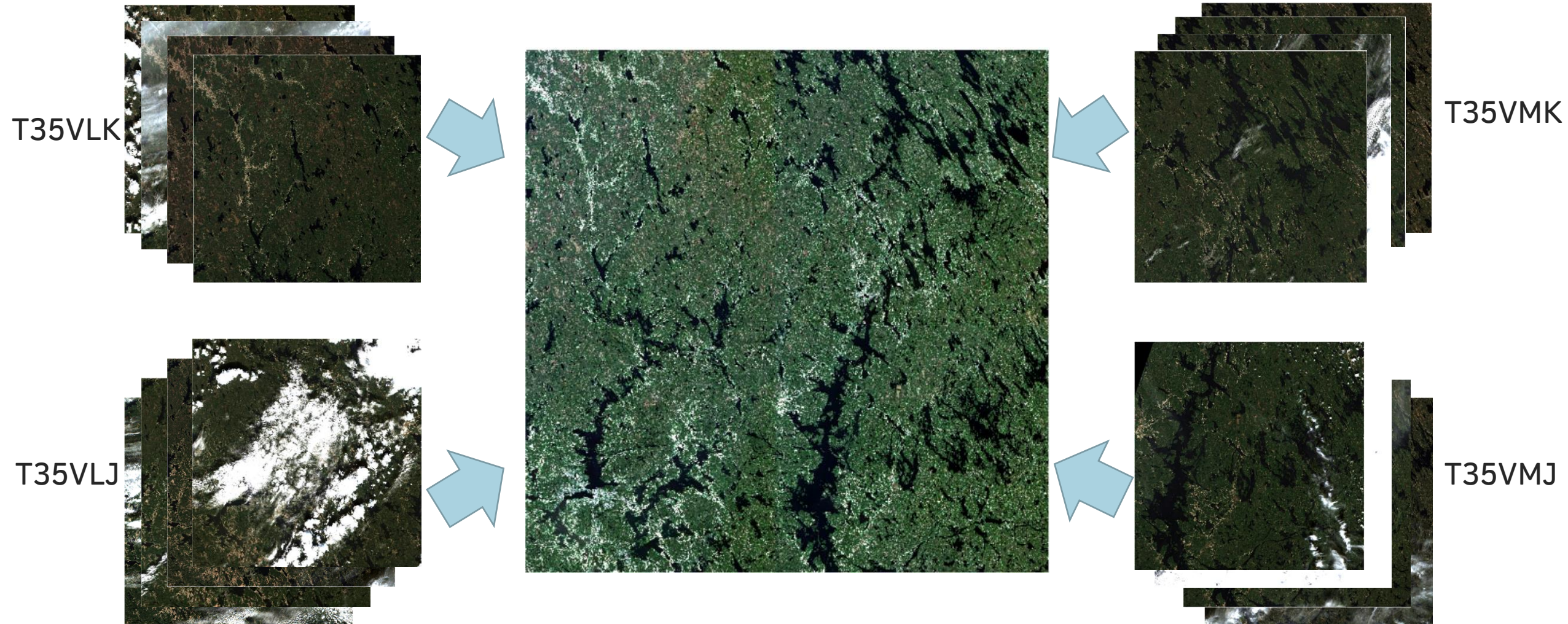
T35VLJ



S2 data: one image per tile, several tiles



S2 data: several tiles, several images



Running

- Command in Puhti: `s2m_mosaic <arguments>`
- Key arguments
 - Path to .SAFE files
 - Output extent `<xmin ymin xmax ymax>`
 - EPSG-code (UTM)
 - Resolution
- Several optional arguments
 - Timeframe, L1C/L2A, colour balancing, cloud mask enhancing...
 - Parallelization
 - Output name & directory

```
s2m_mosaic --target_extent 300000 6790200 509760 7000020 --epsg 32635 --resolution 10 --output_dir  
/scratch/project_2000290/Mosaic/Output/ --start 20180510 --end 20180527 --verbose /scratch/project_2000290/Mosaic/SAFE/35*/
```

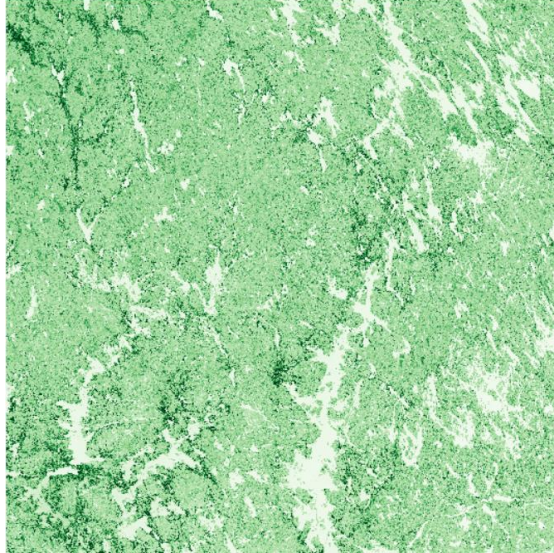

Outputs

- Mosaicked image per band per resolution as TIFFs
 - Only bands with user-given resolution are mosaicked
 - All bands with 60 m

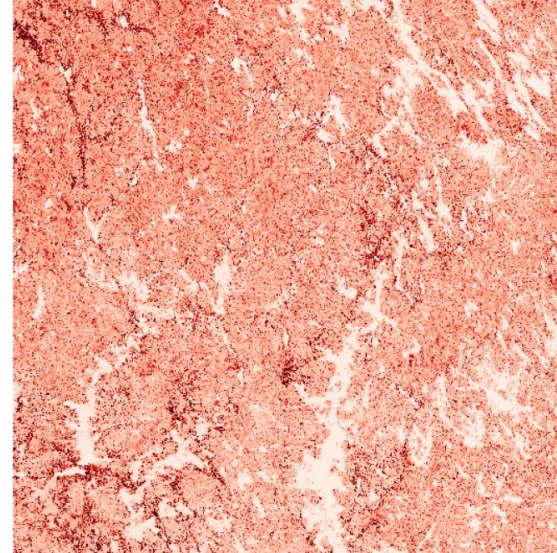
B02 - Blue



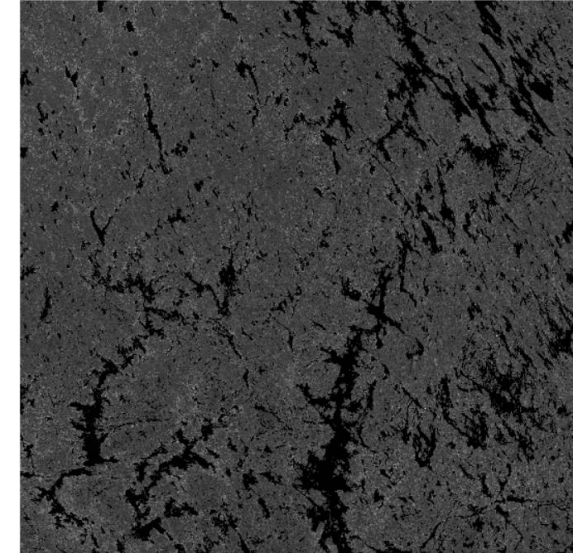
B03 - Green



B04 - Red



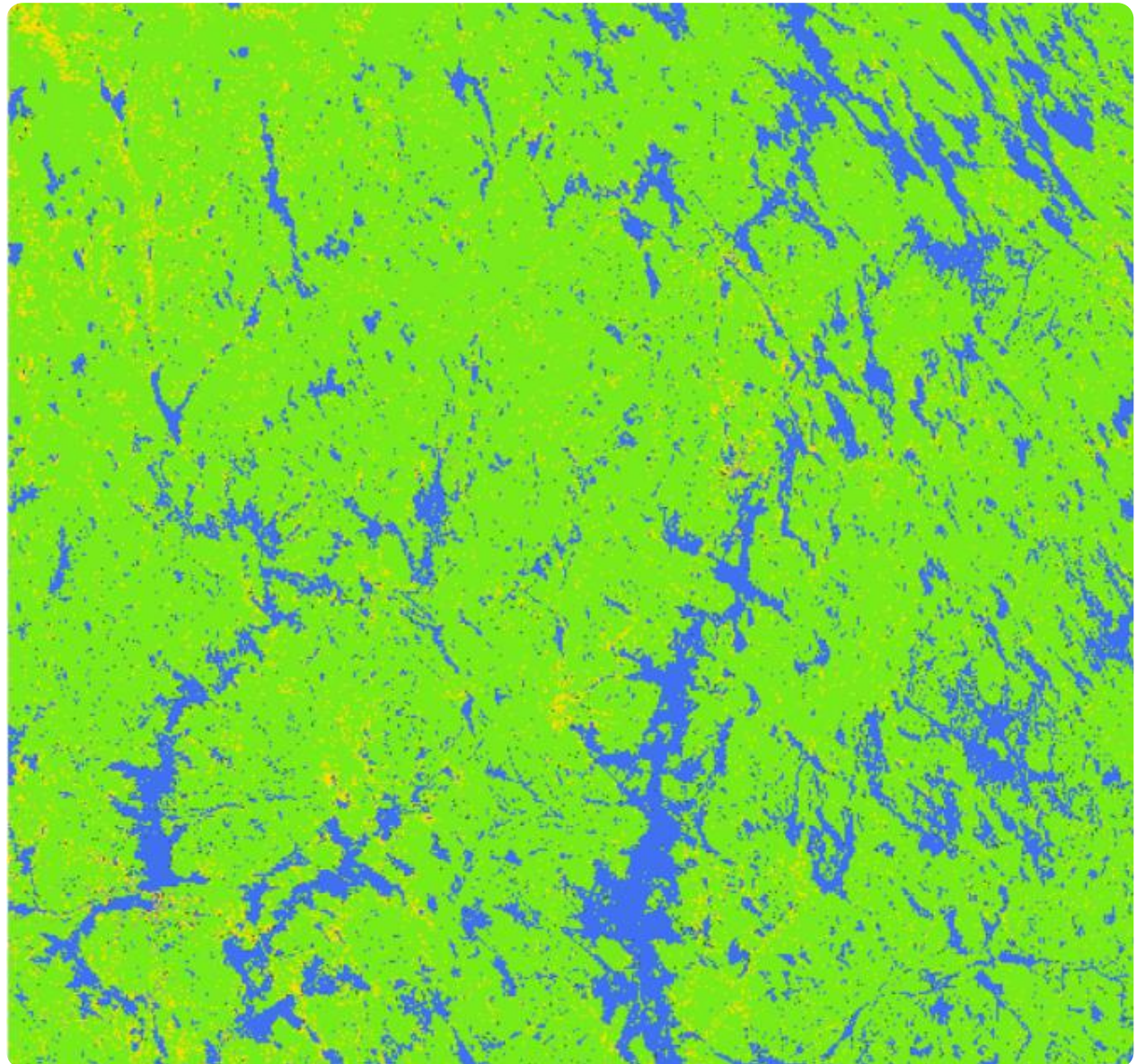
B08 - NIR



Outputs

- Scene classification layer

Label	Classification
0	NO_DATA
1	SATURATED_OR_DEFECTIVE
2	DARK_AREA_PIXELS
3	CLOUD_SHADOWS
4	VEGETATION
5	NOT_VEGETATED
6	WATER
7	UNCLASSIFIED
8	CLOUD_MEDIUM_PROBABILITY
9	CLOUD_HIGH_PROBABILITY
10	THIN_CIRRUS
11	SNOW



<https://sentinels.copernicus.eu/web/sentinel/technical-guides/sentinel-2-msi/level-2a/algorithm>

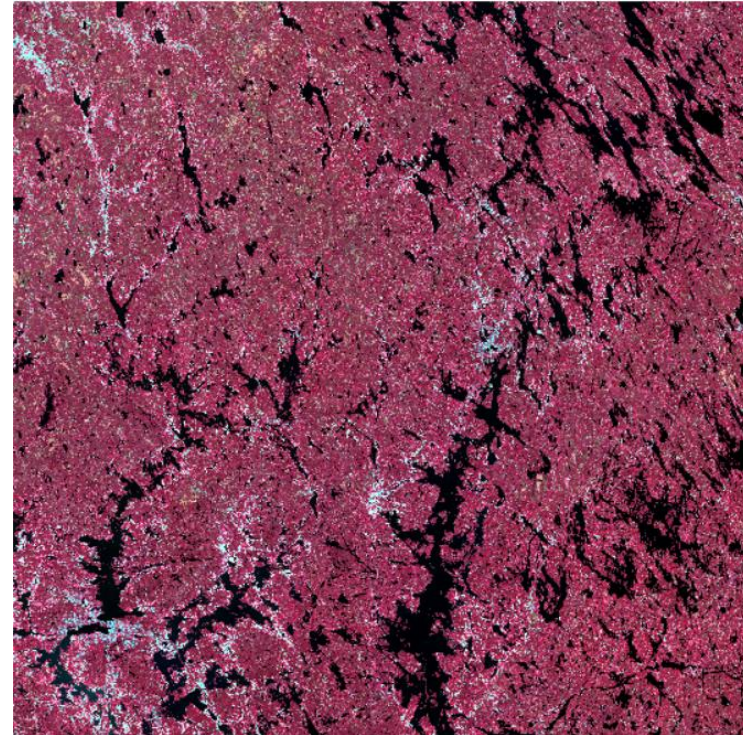
Outputs

- Two virtual rasters (.vrt)

True color RGB



False color NRT



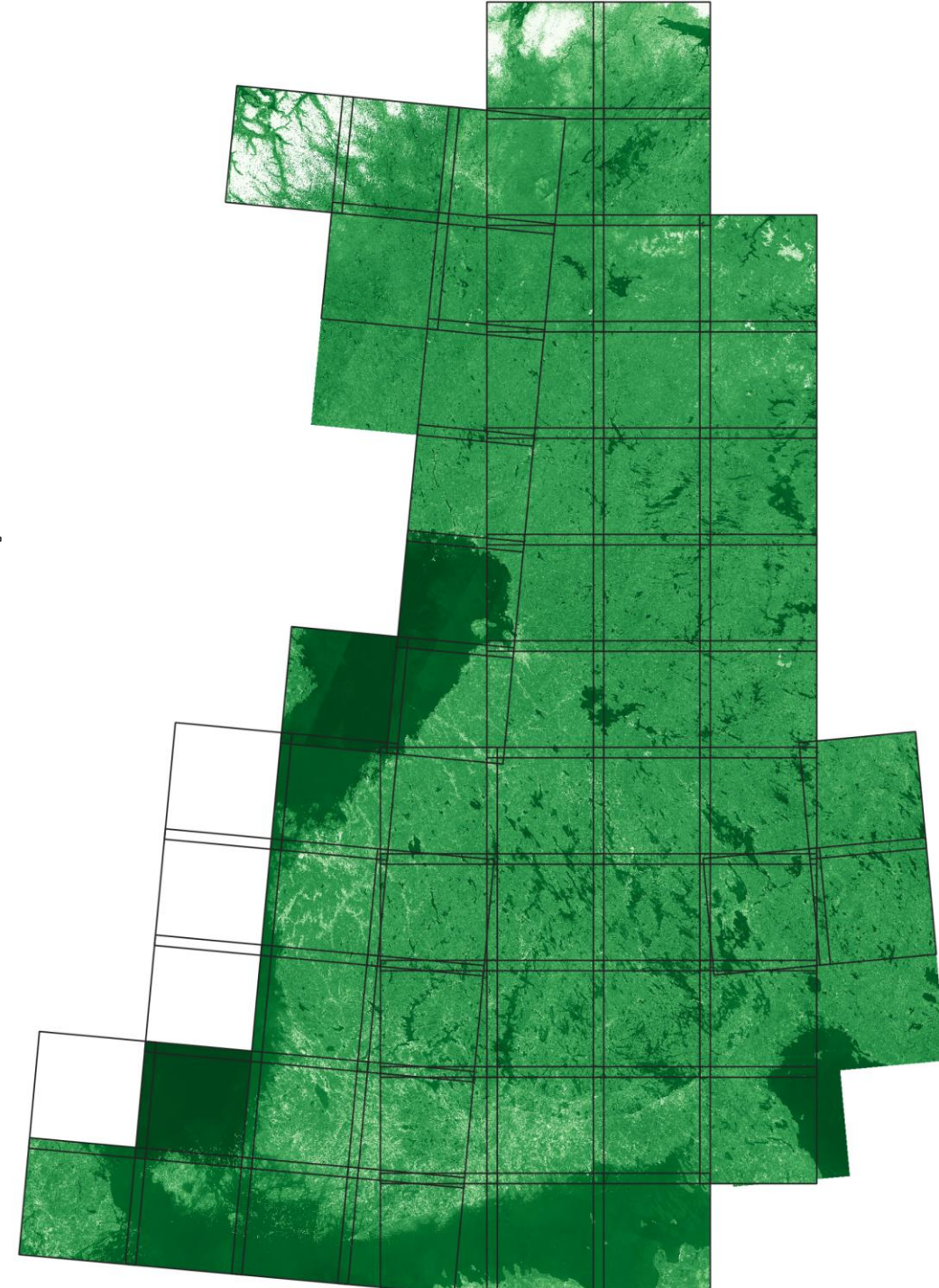
Challenge: file size

- Limited output file size
 - BigTIFF not supported
 - Outputs > 4 GB cannot be directly produced



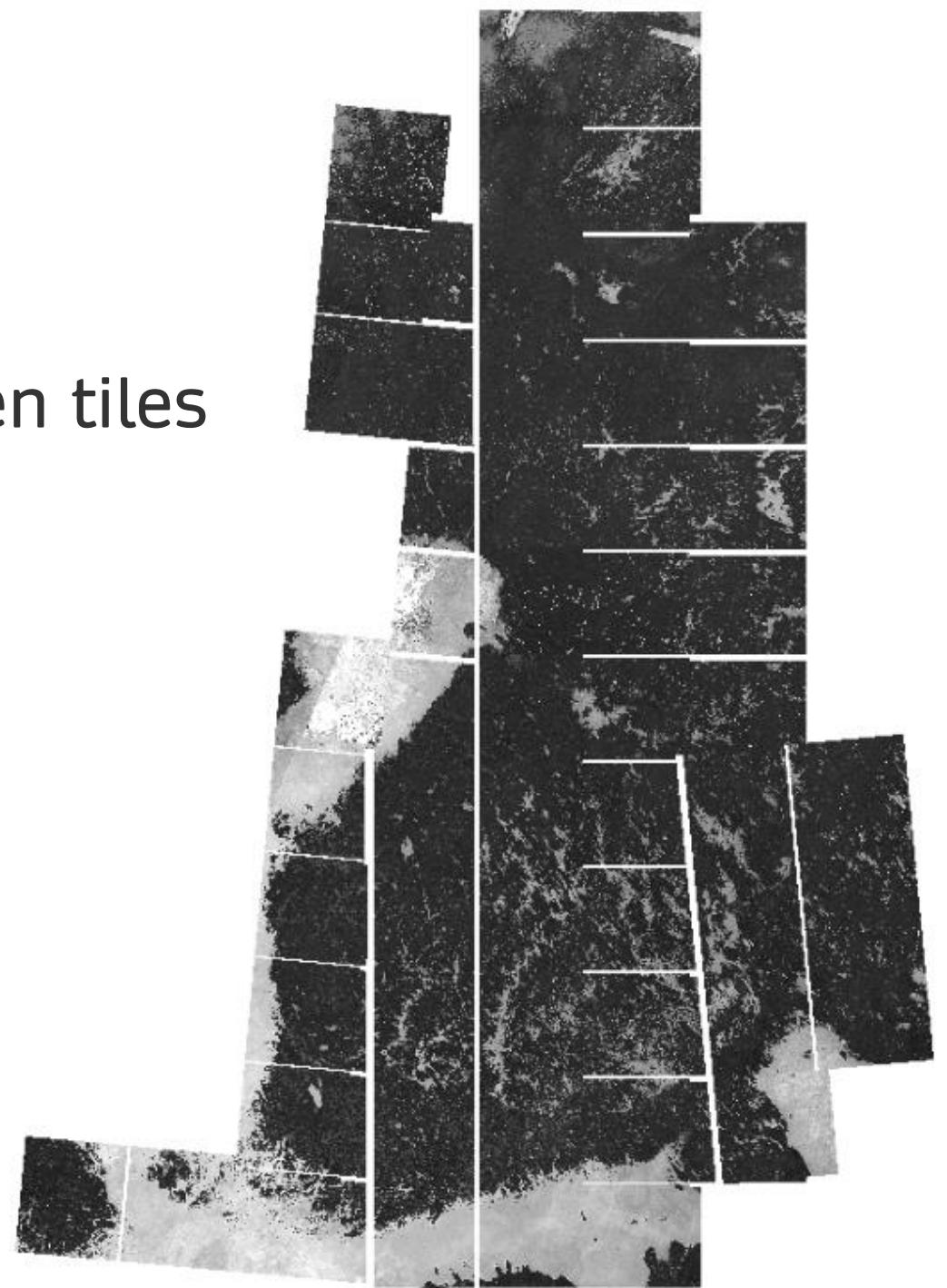
Solution: file size

- Mosaic one tile at a time
- Create virtual raster of outputs
- Translate virtual raster into GeoTIFF



Challenge: weird gaps

- Weird data gaps in seams between tiles
 - Example: NDWI of Finland



Solution: weird gaps

- Function *trim* in *raster* package of R
 - Removes NoData values from raster edges



Conclusions

- Easy-to-use mosaicking tool for Sentinel-2 data
- If existing mosaics do not meet your interests/needs, you can make your own
- Some technical limitations, most importantly file size
- No development recently
 - Main features do work
 - Downloading data with the module from the SciHub Long-term archive is not possible

Thank you!

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Advancing together

