

ITC / WRS
Bas Retsios

ILWISpy

A python extension for ILWIS computational functions
A development cooperation by GIP, NRS and WRS



Recent history

- Visualisation
- Computations
- Number crunching



The screenshot shows a Notepad window with a complex mathematical formula and four satellite images. The formula is:

$$0.333*(0.5*(rwa_districts_public_transport.mpr.Share_sum_regularly_often/96.1)+0.5*(0.25*(rwa_districts_public_transport.mpr.share_0_19_minutes_walk/61.9)+0.25*(rwa_districts_public_transport.mpr.share_20_59_minutes_walk/41.7)+0.25*(1-rwa_districts_public_transport.mpr.share_60_119_minutes_walk/41.8+7.1/41.8))+0.25*(1-$$

The four satellite images are labeled with filenames:

- itc_202109040620.jpg
- itc_202109040625.jpg
- itc_202109040630.jpg
- itc_202109040635.jpg

Below the images, there is another Notepad window showing a complex mathematical formula:

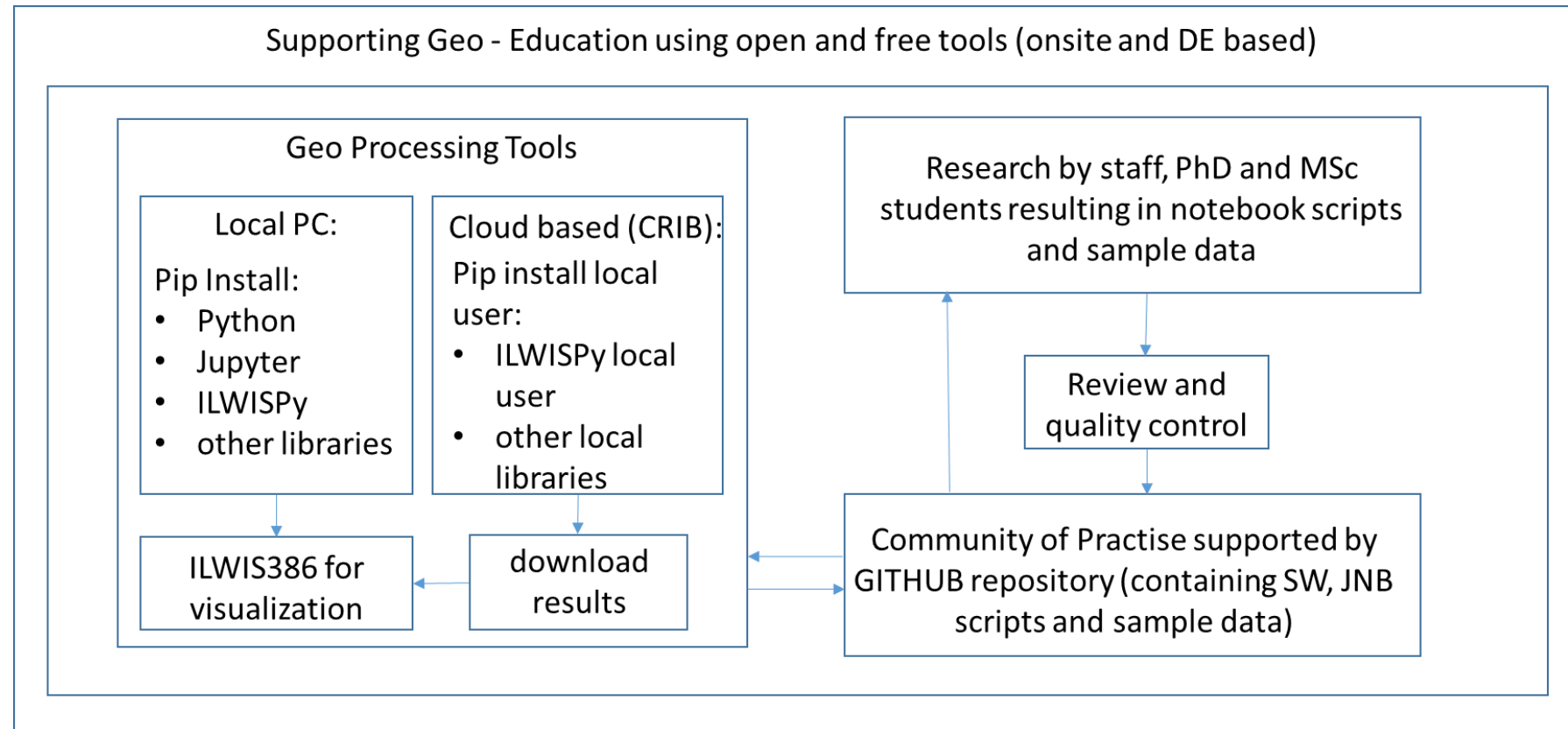
```
micro_establishments_industry +-0./>,1tt  
(rwa_sector_establishments_industry.mpr.'2014_micro_establishments_industry'<500,0.000714285714*rwa_sector_establishments_industry.mpr.'2014_micro_establishments_industry'+0.642857142857,0*rwa_sector_establishments_industry.mpr.'2014_micro_establishments_industry'+1)))))))+0.5*(min(1,max(0,iff(rwa_sector_establishments_industry.mpr.'201_SM_establishment_industry'<2,0*rwa_sector_establishments_industry.mpr.'201_SM_establishment_industry'+0,iff(rwa_sector_establishments_industry.mpr.'201_SM_establishment_industry'<5,0.083333333333*rwa_sector_establishments_industry.mpr.'201_SM_establishment_industry'+-0.166666666667,iff(rwa_sector_establishments_industry.mpr.'201_SM_establishment_industry'<7,0.25*rwa_sector_establishments_industry.mpr.'201_SM_establishment_industry'+-1,iff
```

ILWIS 3 for visualisation

ilwis python extension for computations

Motivation for ILWISpy development

- Integration with Python
- Achieve more with less coding
- Run as well on older computers
- Run on Linux



Features

- `import ilwis`
- Large # of operations
- Multiprocessing
- Raster images of unlimited size

```
Python 3.6 (64-bit)
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:54:40) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> import ilwis
gdal connector:
ilwis3 connector: Organizing data:
>>> _
```

```
Untitled.ipynb
+
Code
Python

[1]: import ilwis
gdal connector: ilwis3 connector: Organizing data:

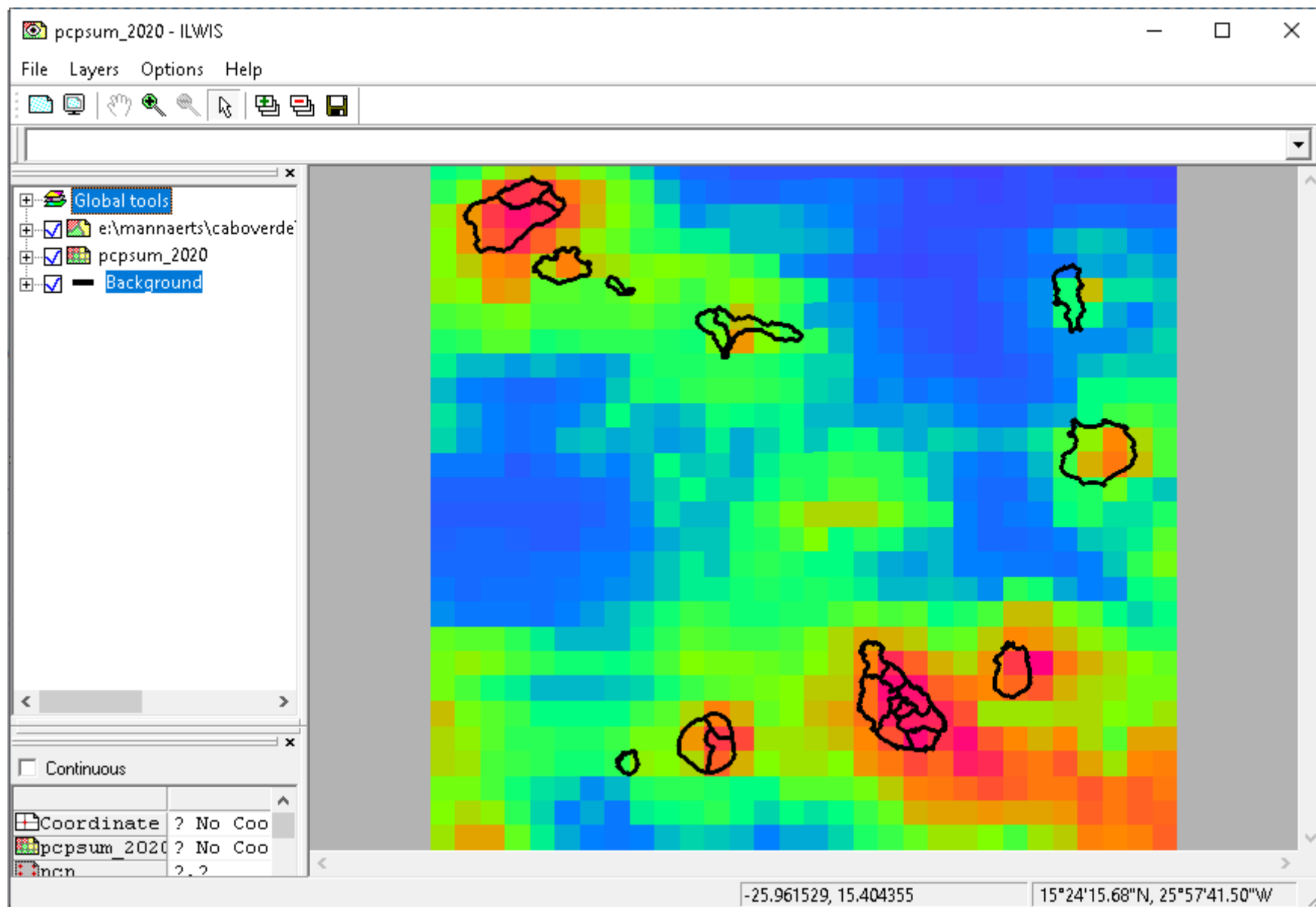
[2]: print(ilwis.operations())
('compare', 'incompatible', 'junction', 'numbercondition', 'range', 'createboundsonlycsy', 'createcombinationmatrix', 'createcornersgeoreference', 'createfeaturecoverage', 'createidentifierdomain', 'createintervaldomain', 'createitemrepresentation', 'createnumericdomain', 'createpalettedomain', 'createprojectedcoordinatesystem', 'createrrastercoverage', 'createrrastercoverage', 'createtable', 'create thematicdomain', 'createtimeddomain', 'createtimeintervaldomain', 'createvaluerepresentation', 'addcolumn', 'addrasterband', 'groupby', 'assignment', 'connect', 'convertcolumnndomain', 'copycolumn', 'iffeature', 'iffraster', 'number2string', 'property', 'rastervalue', 'saveas', 'selection', 'attributeraster', 'rasterband', 'selection', 'selection', 'serviceobject', 'setattributetable', 'setvaluerange', 'setvariable', 'property', 'tablevalue', 'tablevalue', 'coord2pixel', 'coordinate', 'pixel', 'rastersize', 'mastergeoreference', 'pixel2coord', 'resample', 'spatialrelation', 'aggregation', 'binarylogicalraster', 'binarymathfeature', 'binarymathraster', 'binarymathtable', 'joinattributes', 'columnnaryoperation', 'mapcalc', 'mapcalc', 'mapcalc', 'mapcalc', 'mapcalc', 'mapcalc', 'tabcalc', 'tabcalc', 'tabcalc', 'tabcalc', 'tabcalc', 'tabcalc', 'sin', 'cos', 'tan', 'asin', 'acos', 'atan', 'log10', 'ln', 'exp', 'abs', 'sqrt', 'ceil', 'floor', 'sgn', 'cosh', 'sinh', 'sin', 'cos', 'tan', 'asin', 'acos', 'atan', 'log10', 'ln', 'exp', 'abs', 'sqrt', 'ceil', 'floor', 'sgn', 'cosh', 'sinh', 'stringfind', 'stringsub', 'stringreplace', 'addstrings', 'testoperation', 'text2output', 'setworkingcatalog', 'buffer', 'line2polygon', 'pointrastercrossing', 'polygon2line', 'r
```

Use-cases

- Education, research and projects
- Dedicated operations
 - “timesat” temporal filter
 - Spatiotemporal tracking algorithm
- (Cloud, big) data handling, preprocessing
- Incorporation of models

Functionality

- openeo -> google earth engine
- Login with GEE account
- Fetch Cabo Verde 100m landcover
- Display in JNB
- Fetch Cabo Verde IMERG Monthly Rainfall 2020
- Display September
- Raster data to ILWISpy
- Check one pixel 12 months
- Create temporal aggregate (sum)
- Download sum image
- Display in ILWIS 3



Plans / Challenges

- Smoother installation on Linux
- Availability for windows-python 3.6, 3.7, 3.8, 3.9, 3.10, ?
- Add functions (kriging, hydroflow, sebs)
- Improve API
- Automated testing
- Documentation (JNB)