Integrated Practical: Python in Geosciences

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Objectives

- Enable you to write python code for your own needs
- Use own laptop (become independent of pre-set environment)
- Write quality code (clean and re-usable, for you and others)
- Handle and visualize geoscience data (wide spread data formats, geographical maps)
- Collaborate in teams (team work, version control, commenting)
- Scripting (for efficient, robust, and transparent work-flow)

Contents & Schedule

- Install python on your laptop
- Python basics
- Project work
  - 3 real-world projects
  - teams of 2-3 for 6 half-days
  - select by end of Tuesday

date	half-day	topic
Mo 11.3.	**HD1**	**Welcome, project presentation & set up**
Tu 12.3.	**HD2**	**python intro (+ select project)**
We 13.3.	**HD3**	**python intro + questions**
	HD4	work on project
Mo 18.3.	HD5	work on project
Tu 19.3.	**HD6**	**mid-term status and questions** + work on project
We 20.3**.**	HD7	work on project
	HD8	work on project
Mo 25.3.	HD9	work on project
Tu 26.3.	**HD10**	**Presentations**

Bold = attendance required

Course requirements

- To get the 2 ECTS:
  1. participate in introduction and mid-term question round
  2. hand in working and commented python code
  3. present your work (~10 min) on the last half-day
  4. be present in CHN E46 on 5 half-days:
     Mo 11.3. / Tu 12.3. / We 13.3. (morning) / Tu 19.3. / Tu 26.3.

Presentation

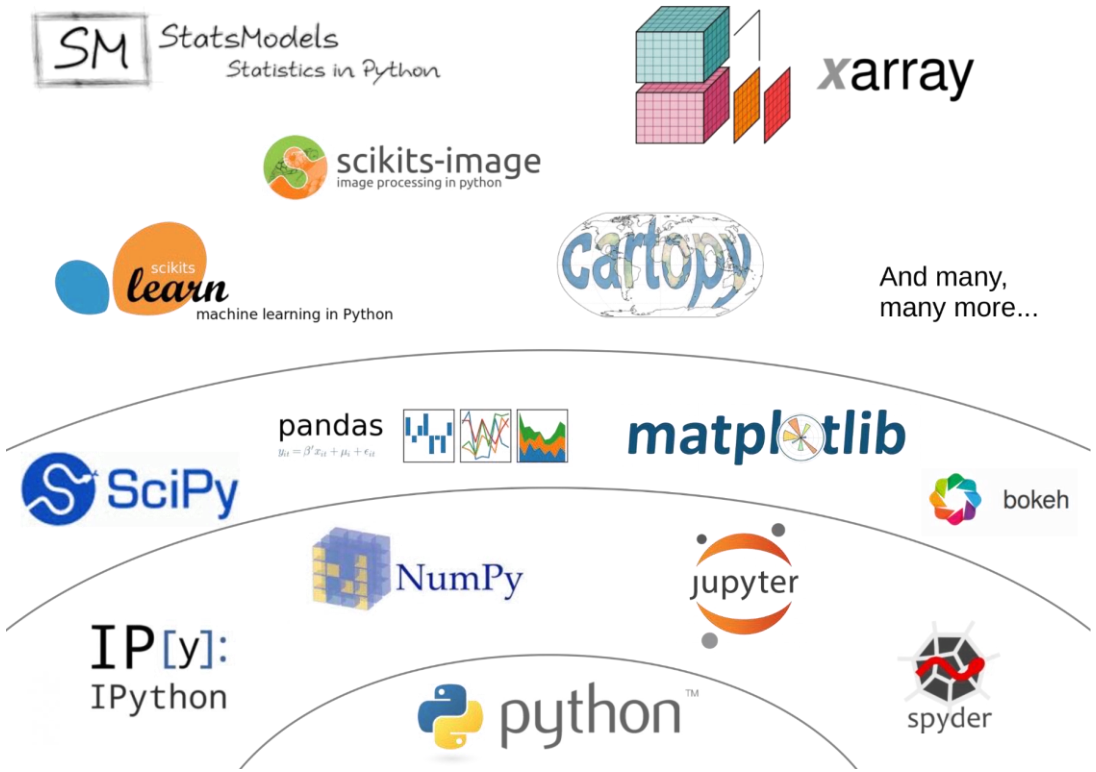
- On the last half day
- > 10 min overview of the project
  - What did work? Interesting parts? What did you learn?
  - What did not work? Challenges?

Projects

- **Climate Risk:** estimate damage costs of storms hitting settlements
- **CMIP Data:** look at simulation data behind the IPCC reports
- **Climate in Climate Economics:** simple climate models for carbon taxes

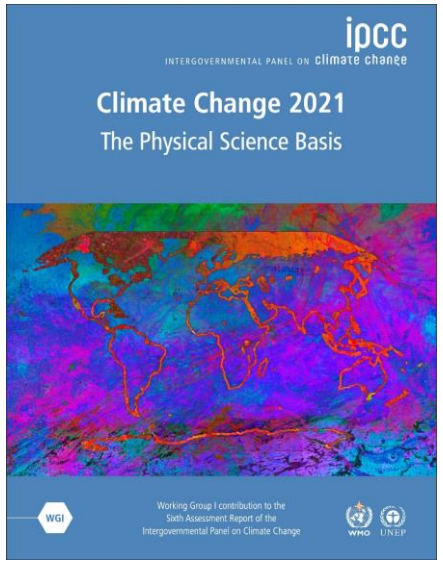
Python

- a high level programming language, similar to matlab or R
- popular, wide spread, has a large and growing user community
- behind many open source projects – a universe of modules for different purposes



Python applications

- analyze and plot existing data
- write numerical simulations (e.g. a computer code to calculate pi) and produce data
- front-end code (what PhD student sees / edits) of large simulation codes (e.g. climate model, 106 lines of Fortran or C code for ‘number crunching’)



CLIMADA
Economics of Climate Adaptation

Using python

- **jupyter**: ‘web interface’, integrates code and results (text, images)
- **ipython:** command line interface, run (develop, test) python code
- **python:** command line interface like ipython, but even more basic

```
(base) mathause@poisson:~$ python
Python 3.10.13 | packaged by conda
Type "help", "copyright", "credits
>>> a = 5
>>> b = 7
>>> a
5
>>> print(b)
7
>>>
```

```
(base) mathause@poisson:~$ ipython
Python 3.10.13 | packaged by conda-forge | (main, Dec 23 2023, 15:36:39) [GCC 12.3.0]
Type 'copyright', 'credits' or 'license' for more information
IPython 8.22.2 -- An enhanced Interactive Python. Type '?' for help.

In [1]: a = 5

In [2]: b = 7

In [3]: b
Out[3]: 7

In [4]: print(a + b)
12

In [5]:
```