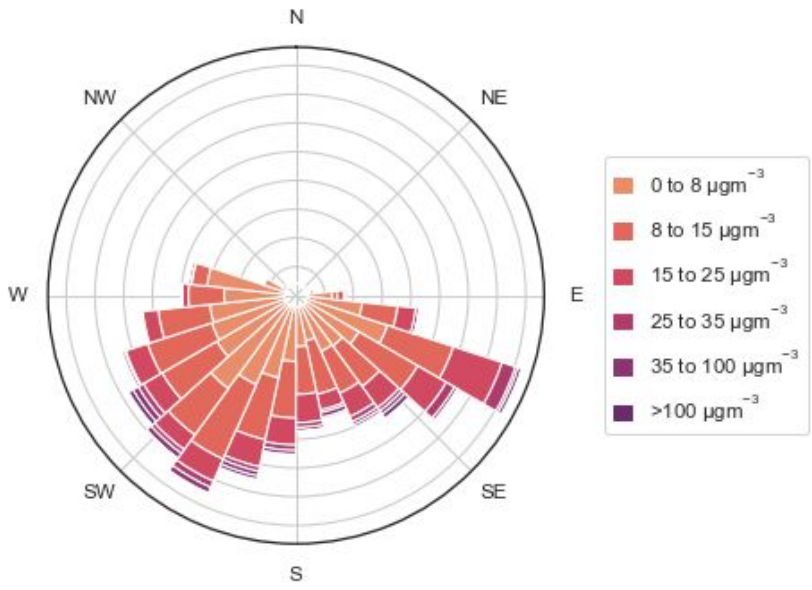


QUANTAQ

Hands-on with data

Making professional figures in Python with atmospy

Dr. David H. Hagan
CEO at QuantAQ

Agenda

Introduction why this and why now?

Tools of the Trade what are my options? Why are there so many?

Getting Ready a guided walkthrough of atmospy installation

A Guided Tour of atmospy let's see what's possible

Open Floor ask questions and make figures with your own data (or ours)

Why is data visualization important?

To communicate your insight successfully, you must present your audience with a meaningful and exciting story.

A story (in this context) is a “set of observations, facts, or events that are presented in a specific order such that they create an emotional reaction in the audience”

- Fundamentals of Data Visualization
  Claus O. Wilke

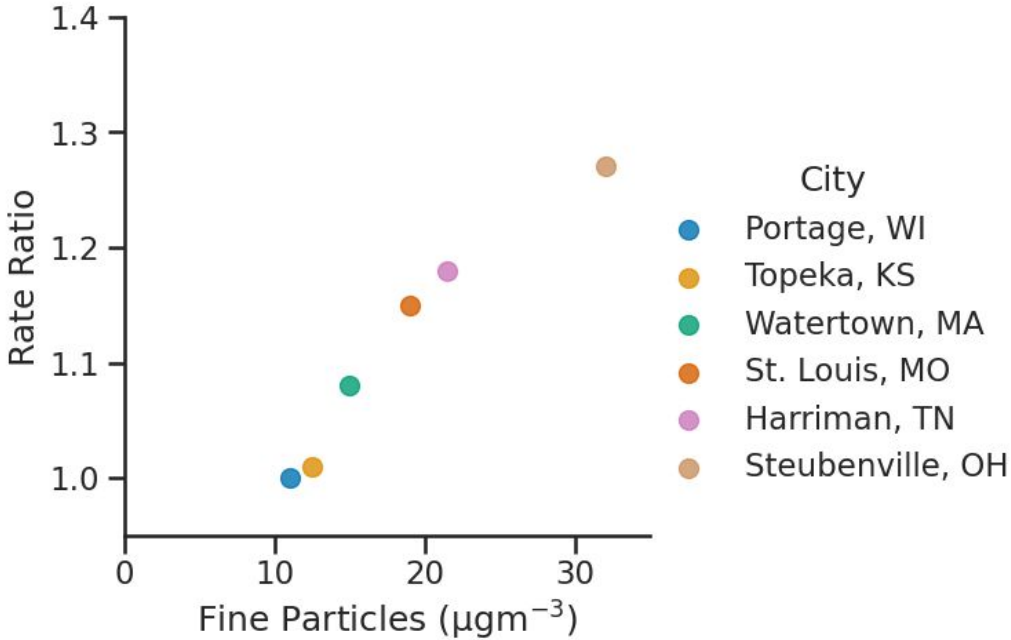
The purpose of a figure is to **tell a story** and **make a point**.

Powerful stories can change the world

In 1993, the Six Cities study was published which contains one of the most powerful individual figures in air quality science.

If you haven't read the paper, you absolutely should!

[An Association Between Air Pollution and Mortality in Six U.S. Cities. Dockery, et al., 1993. New England Journal of Medicine.]



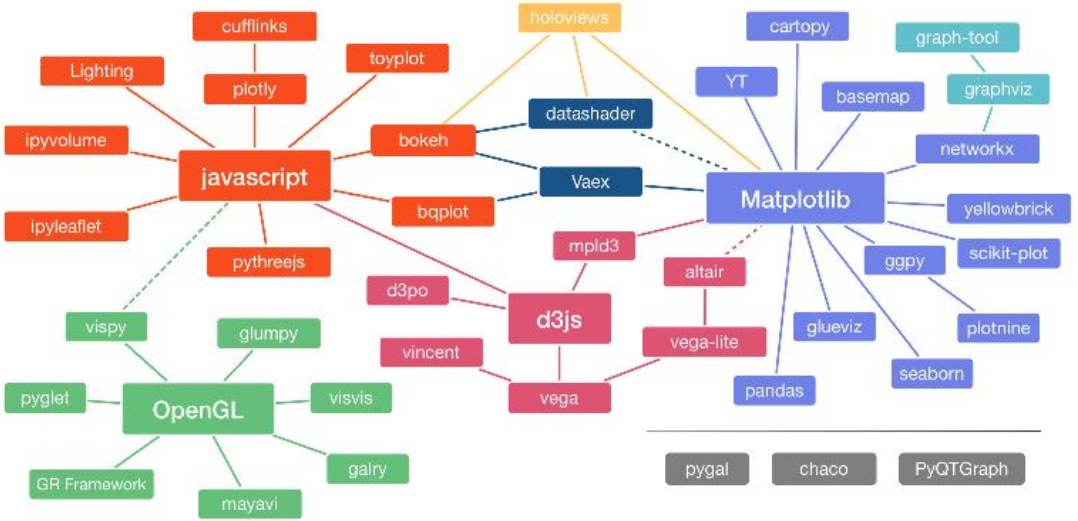
An overview of plotting in Python

There are many plotting libraries available in Python. Choosing which one to use can be a challenge. Here, we talk about some of the key differences and provide a brief overview of when to use what and why.

For reference, atmospy is built on top of **matplotlib** and **seaborn** (static, for publication and reporting).

Interactive
Exploratory

Static
Publication



Source: pyviz.org

Next, we skip to the good part…

While there are many choices, I chose to write atmospy as a **wrapper around matplotlib** (and seaborn, which is also a wrapper around matplotlib).

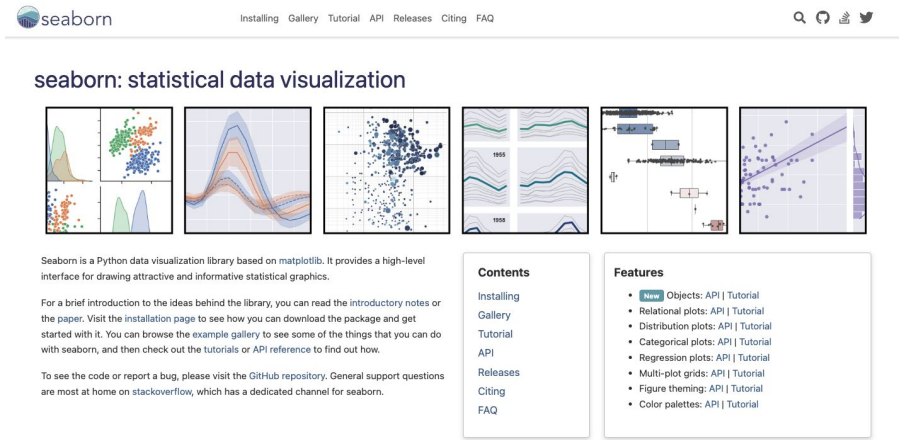
Why?

1. It is incredibly powerful and configurable
2. The user community is *huge* which means help is close by (on the internet, at least)
3. It is a low-level library - nearly anything is possible

Matplotlib: Visualization with Python

Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python.
Matplotlib makes easy things easy and hard things possible.

- Create publication quality plots.
- Make interactive figures that can zoom, pan, update.
- Customize visual style and layout.
- Export to many file formats.
- Embed in JupyterLab and Graphical User Interfaces.
- Use a rich array of third-party packages built on Matplotlib.



…before you lay ink to paper

What is the story you are trying to tell?

A few guiding principles for impactful figures

Less is more.

Too much information can *hurt*, not help.

Simplify your figure as much as possible.

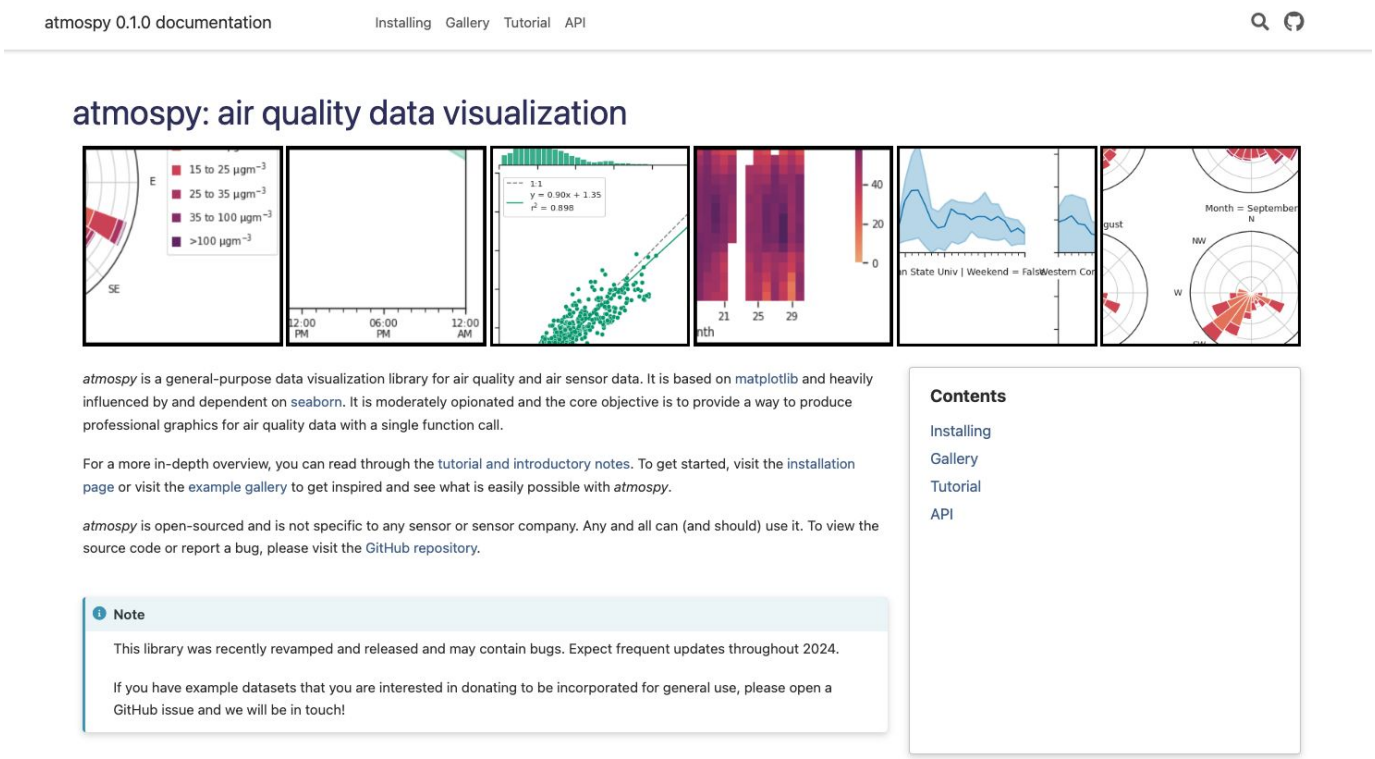
Simple and clear is better than complex and confusing.

Make your figures memorable and clear.

While making figures from scratch each time can be fun, it can also be cumbersome.

So, we made atmospy.

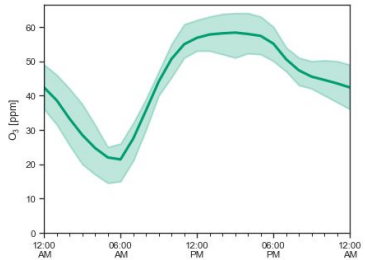
Introducing atmospy: air quality data visualization



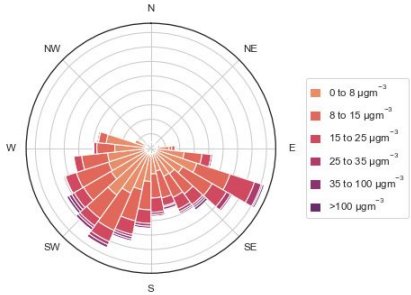
atmospy provides the foundational building blocks…

Calendar Plots

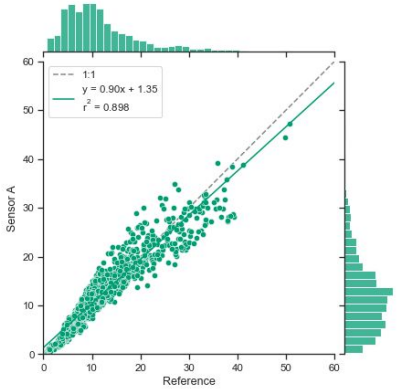
Diel Plots



Pollution Rose Plots



Regression Plots



Let’s install atmospy and its dependencies

Let’s take a few minutes and make sure everyone can get atmospy installed if they haven’t already.

Full installation instructions are available here.

Dependencies
You must have a version Python 3.8-3.11 installed.

Mandatory Library Dependencies

1. Numpy
2. Pandas
3. Seaborn
4. Matplotlib
5. Scipy

```
# install directly from PyPi
pip install atmospy

# upgrade, if you already have a version installed
pip install -U atmospy

# install a pre-release if you'd like
pip install -U atmospy --pre
```

To the code…