



Python Interface to RSIG (pyrsig)

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Python interface to RSIG Web API

RSIG server prepares the data!

The key value of *pyrsig* is to present RSIG data in pandas DataFrames and xarray Datasets. This makes it easy to do advanced analyses in a pythonic way. Example analyses are provided, but the sky is the limit.

Getting Started

The best way to get started is to install (see below) and then explore the examples gallery.

Installation

pyrsig is available through pypi.org, but is still in rapid development. You can get the latest release from pypi via the command below.

```
pip install pyrsig
```

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Get DataFrame for PurpleAir PM25



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Get DataFrame for AQS ozone



Get IOAPI formatted NetCDF TropOMI NO2

```
import pyrsig

rsigapi = pyrsig.RsigApi(bdate='2022-03-01')
df = rsigapi.to_dataframe('tropomi.offl.no2.nitrogen dioxide_tropospheric_column')
print(df.shape, *df.columns)
# (303444, 4) Timestamp(UTC) LONGITUDE(deg) LATITUDE(deg) nitrogen dioxide_tropospheric_column(molecules,
```



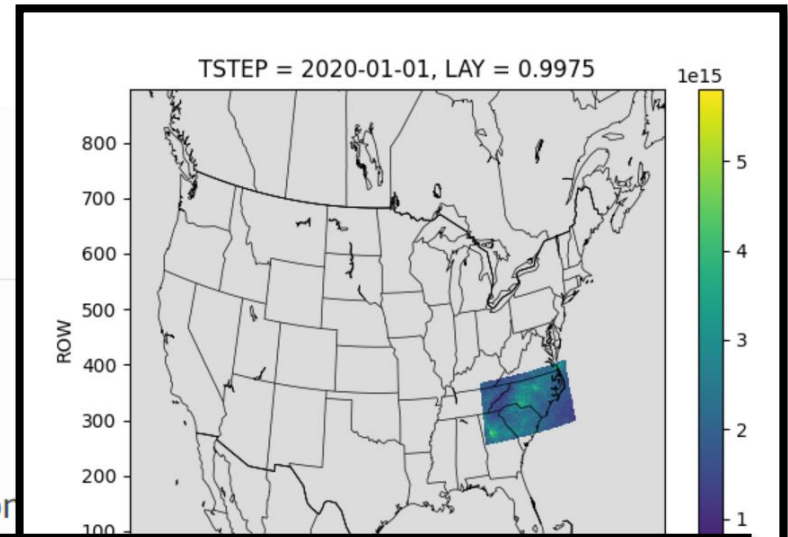
Oversample examples

Examples showing data oversampling of satellite data on



Oversample CONUS at 4k

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```
import matplotlib.pyplot as plt
import pyrsig
import pandas as pd
import xarray as xr
import pycno
import os

# Create a working directory
gdnam = '4US1'
bdate = '2021-01-01'
edate = '2021-01-15'
wdir = f'{gdnam}/{bdate[:4]}'

os.makedirs(gdnam, exist_ok=True)

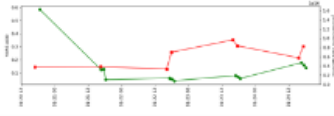
rsigapi = pyrsig.RsigApi(
    bdate=bdate, bbox=(-85, 33, -75, 37),
    encoding={"zlib": True, "complevel": 1, "_FillValue": -9.999e36},
    workdir=wdir, grid_kw='4US1'
)

# Update to download daily averages instead of hourly
rsigapi.grid_kw['REGRID_AGGREGATE'] = 'daily'

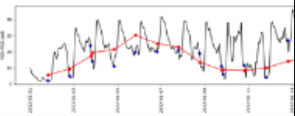
# Loop over days
dss = []
for bdate in pd.date_range('2020-01-01', '2020-01-15'):
    print(bdate)
    try:
        ds = rsigapi.to_ioapi(key='tropomi.offl.no2.nitrogendioxide_tropospheric_column', bdate=bdate)
        dss.append(ds)
    except Exception as e:
```

Timeseries examples

Examples showing timeseries analyses that illustrate the use of the pyrsig package.

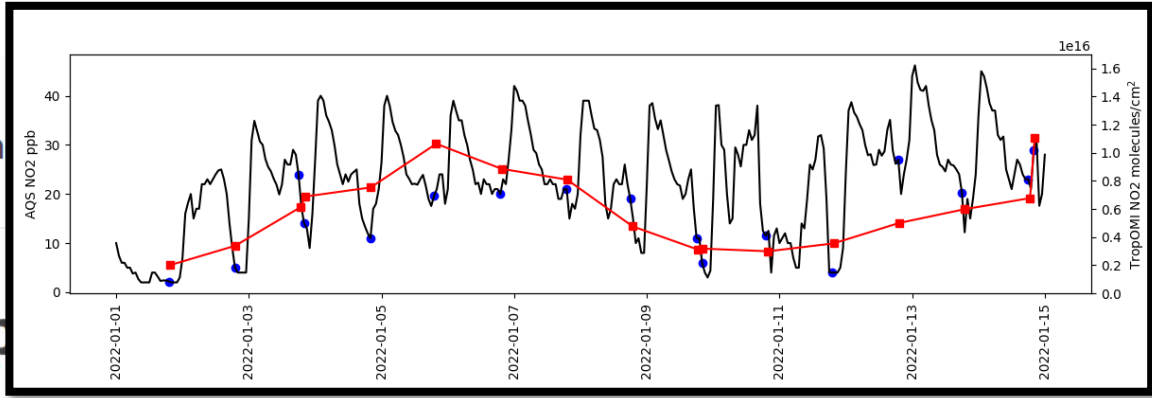


NYC VIIRS AOD vs TropOMI NO2



Phoenix AQS vs TropOMI

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```
import matplotlib.pyplot as plt
import pyrsig

# Create an RSIG api instance
# Define a Time and Space Scope: here end of February around Phoenix
rsigapi = pyrsig.RsigApi(
    bdate='2022-01-01', edate='2022-01-15',
    bbox=(-112.3, 33.25, -111.85, 33.65)
)

# Get AQS NO2 with dates parsed and units removed from column names
aqsd = rsigapi.to_dataframe('aqs.no2', parse_dates=True, unit_keys=False)

# Get TropOMI NO2
tomino2df = rsigapi.to_dataframe(
    'tropomi.offl.no2.nitrogen dioxide_tropospheric_column',
    unit_keys=False, parse_dates=True
)

# Create spatial means for TropOMI and AQS
tomids = (
    tomino2df.groupby('time').median()['nitrogen dioxide_tropospheric_column']
)
aqds = aqsd.groupby(['time']).median()['no2']

# Subset AQS to overpass times
oaqds = aqds.loc[aqds.index.isin(tomids.index.floor('1h'))] # just overpass t

# Create axes with shared x
fig, ax = plt.subplots(figsize=(12, 4),
    gridspec_kw=dict(bottom=0.25, left=0.05, right=0.95))
ax.tick_params(axis='x', labelrotation = 90)
tax = ax.twinx()
```

Run Example On Colab

- <http://colab.research.google.com/>
 - Open a new notebook
 - Add “%pip install --user netcdf4 pyproj pycno pyrsig”
 - And run it
- <https://barronh.github.io/pyrsig/>
 - Navigate to example
 - Copy code from example
 - Paste it in your colab notebook
 - Run it
- On atmos, the second part is the same.



Questions?

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