**Possible topics for winter quarter**

Mondays 3pm

**Plotting (2 sessions?)**

              - Making nice xy-plots (matplotlib)

              - More complex plots; scatter plots with another dimension of data represented by color/size (3D plots)

              - Making nice maps (cartopy)

              - Animated plots

**Data (2+ sessions?)**

              - pandas and spreadsheet/csv/txt data; .mat

              - xarray (netcdf files)

              - satellite/remote sensing data (hdf, geotiff)

              - GRIB files

              - shapefiles (shapely, geopandas)

              - Government data – chem world; commercial product vs. active ingredient (two lists to compare); .txt files

**Techniques**

              - EOFs/principal component analysis (Zack? Chris?)

              - Other objective analyses (Fourier transforms, etc.)

              - Wavelet analyses/power spectra for time series

              - Fitting extreme value distributions, calculating return intervals (Meg!)

              - Parallel loops/computations

              - Machine learning (Shane? Yara? Eventually Tom?)

**General**

              - More on github?  Create your own webpage?

              - Using color maps wisely, data visualization tips (Zack)

**1.5 hours each**

**28 Jan - no preinstalls except Anaconda - BAIRD**

Some python basics (introduce concepts like numpy/libraries, etc.)

Plotting xy basics, maybe 3D plots

Add time to discuss plans, future

**4 Feb - pandas - CHRIS**

Pandas, spreadsheet data, txt/csv/etc.

Learn more plotting xy (work through themselves in cell; give “one way” of doing it)

*REVISIT FEB. 25 PLANS?*

**11 Feb - xarray, cartopy, eofs - BOTH**

(conda install xarray cartopy)

NetCDF4 files, xarray, cartopy, and plotting maps (30min)

ENSO with regressions and perhaps EOFs? (30)

**18 Feb – HOLIDAY**

**20 Feb (3pm) - lots of preinstalls - BAIRD**

Satellites/raster data?

Example notebooks of importing HDF, GRIB, and Geotiff files, and plotting

Perhaps shapefiles?

**25 Feb - MAYBE BAIRD/CHRIS, HOPEFULLY HOSSEIN**

Wavelet analysis/Fourier/power spectra (maybe applied El Niño 3.4 index?)

Data analysis techniques (windows for filtering data sets)

Bandpass filtering

MAYBE more on EOFs?

Week of Mar 22 = end of quarter

**Meg’s stuff on EV theory and parallel computing**

**Machine learning?**

**UVCDAT with Python 3?**

**Zack’s brain**

Last school year:

* **Week 1 (Baird and Stephan)**
  + Install Python via Anaconda
  + Jupyter Notebook introduction
* **Week 2 (Baird)**
  + Python basics
  + numpy/scipy primer; pandas and csv/txt files
  + Opening MATLAB and NetCDF files
  + Simple plots with matplotlib; Simple maps with cartopy
* **Week 3 (Chris)**
  + Conda environments
  + Plotting and manipulating NetCDF data using UVCDAT
* **Week 4 (Stephan)**
  + xarray for gridded data sets
  + Debugging Python code
* **Week 5 (Baird and Stephan)**
  + matplotlib figures (intermediate level)
  + cartopy and plotting with maps
  + Animations in matplotlib
* **Week 6 (Stephan)**
  + Machine learning basics
  + keras neural network (applied to image classification: recognizing hand-written digits)
* **Week 7 (Galen)**
  + scikit-learn and advanced pandas
  + keras neural network (applied to volcanic eruption data set)
* **Week 8 (Zack)**
  + Data visualization tips (color maps, figure design)
  + Research workflow (documenting code and data)
  + See [Zack's ClimatePython repository](https://github.com/zmlabe/ClimatePython) for more info!
* **Week 9 (Meg)**
  + Extreme value distributions in Python
* **Week 10 (group discussion)**
  + Discussion on writing transparent/reproducible papers