SHARPpy: Skew-T and Hodograph Analysis and Research Program

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AMS Python Symposium
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Hi, my name is Patrick, and I'm a python-aholic.

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It's been less than an hour since I last coded.

Necessary Apologies

- My Family: For spending the Christmas holiday coding

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... You think I'm kidding ...

Why SHARPpy?

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. . . Because . . .

Why SHARPpy?

. . . Why not? . . .

Why SHARPpy?

. . . To prove I could do it . . .

Why SHARPpy?

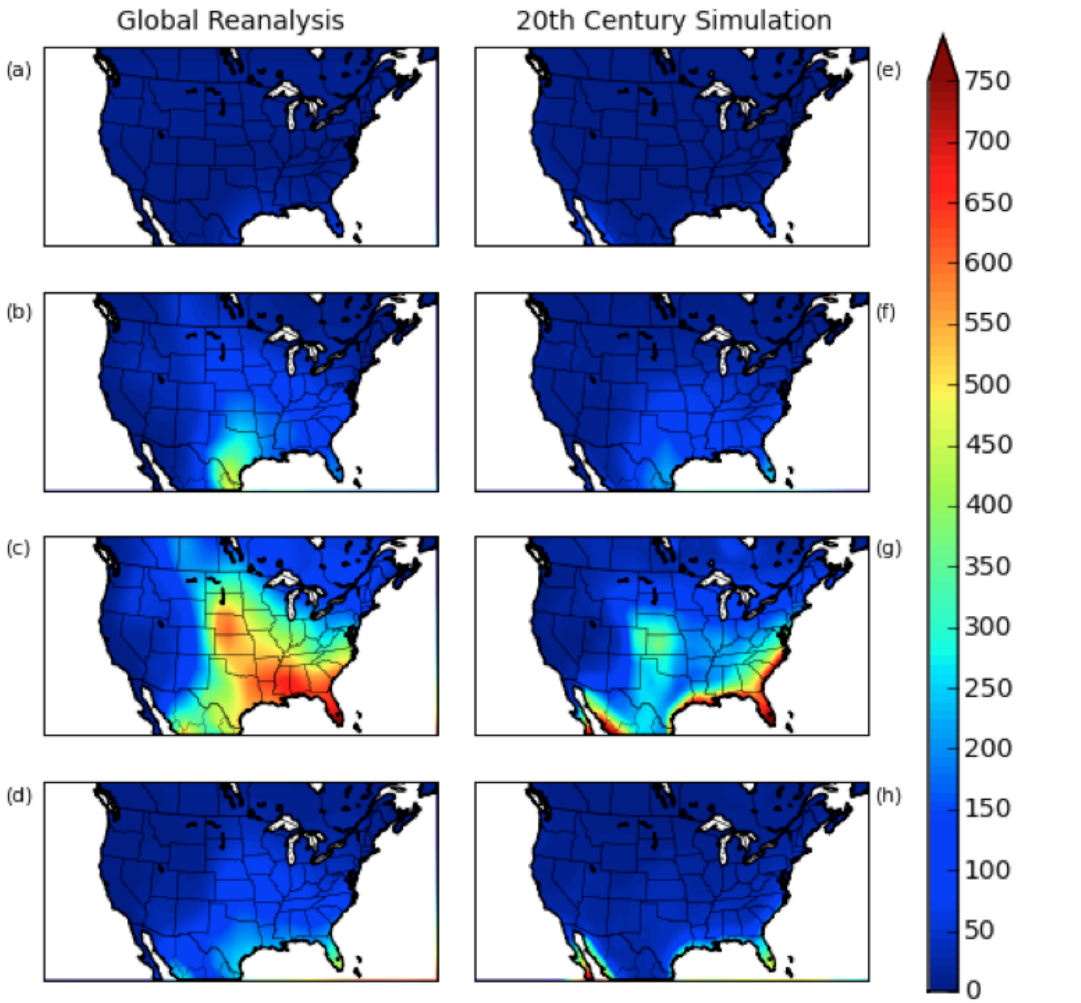
. . . 7 days is too long to spend with 10 family members in a single house . . .

Why SHARPpy?

. . . I'm tired of never "knowing" what I'm using . . .

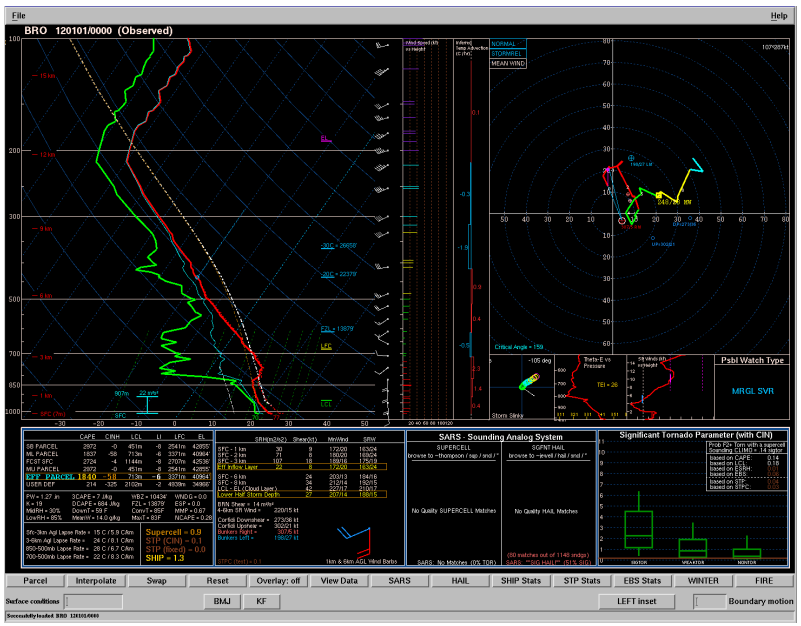
But it's more than just my wants

Why SHARPpy?
Meteorologists vs. Climatologists

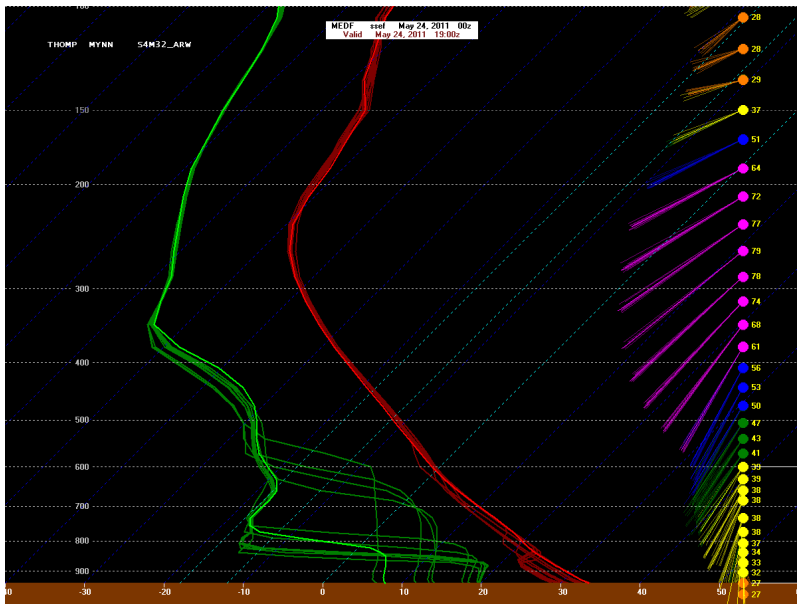


Why SHARPpy?
Meteorologists vs. Meteorologists

BigSHARP: SPC Internal

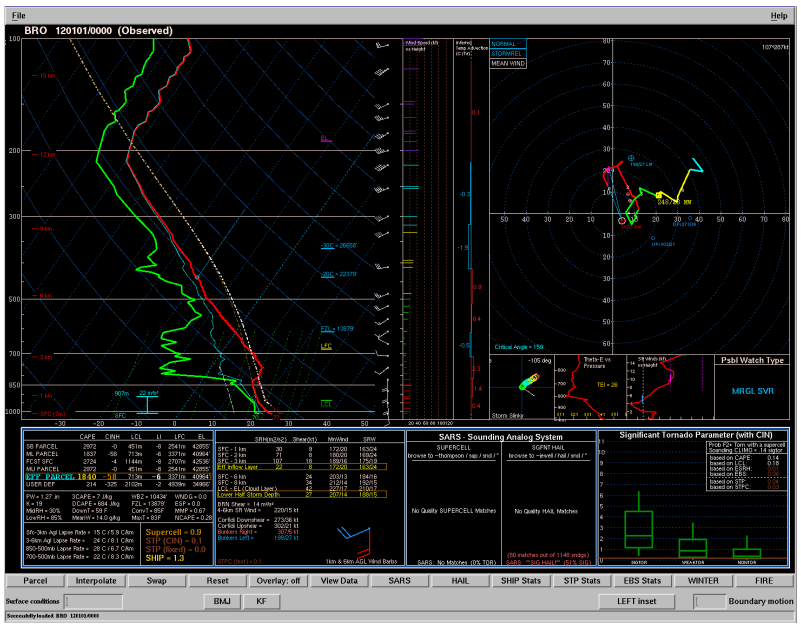


BUFKIT: Public

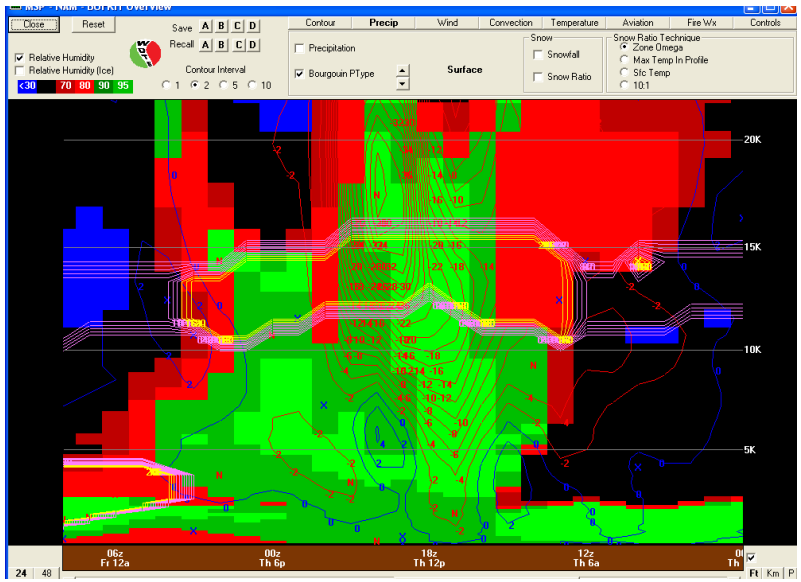


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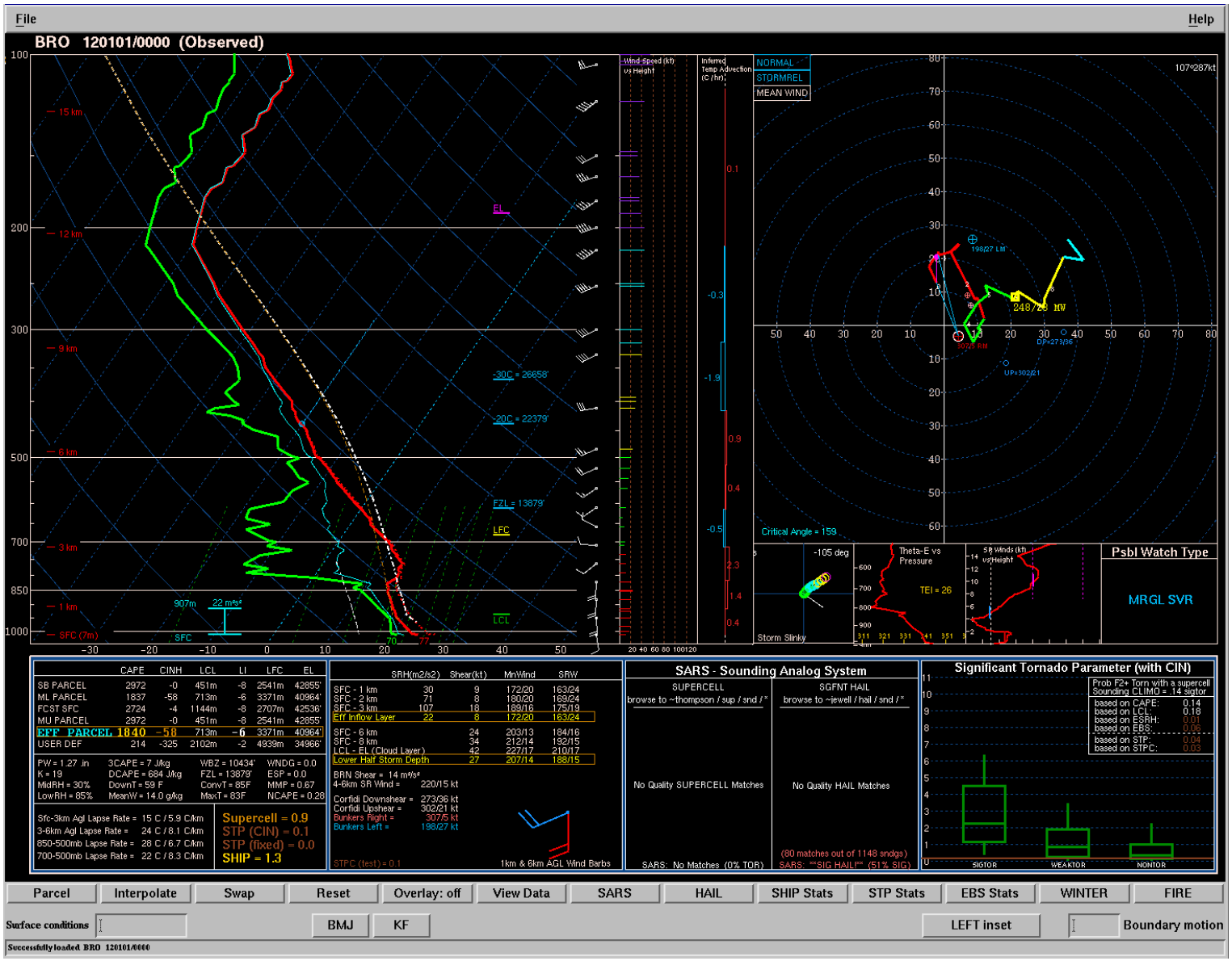
BigSHARP: SPC Internal



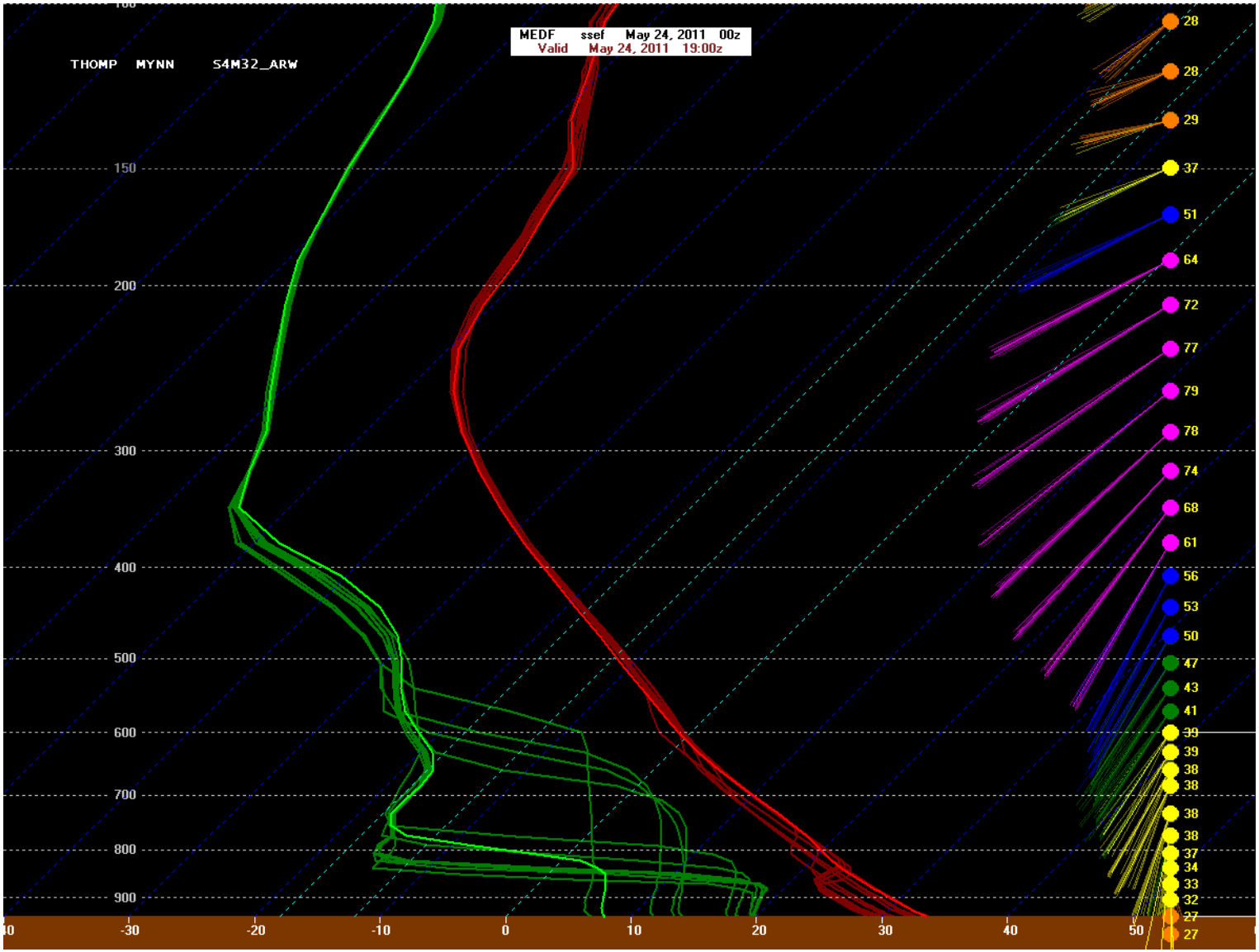
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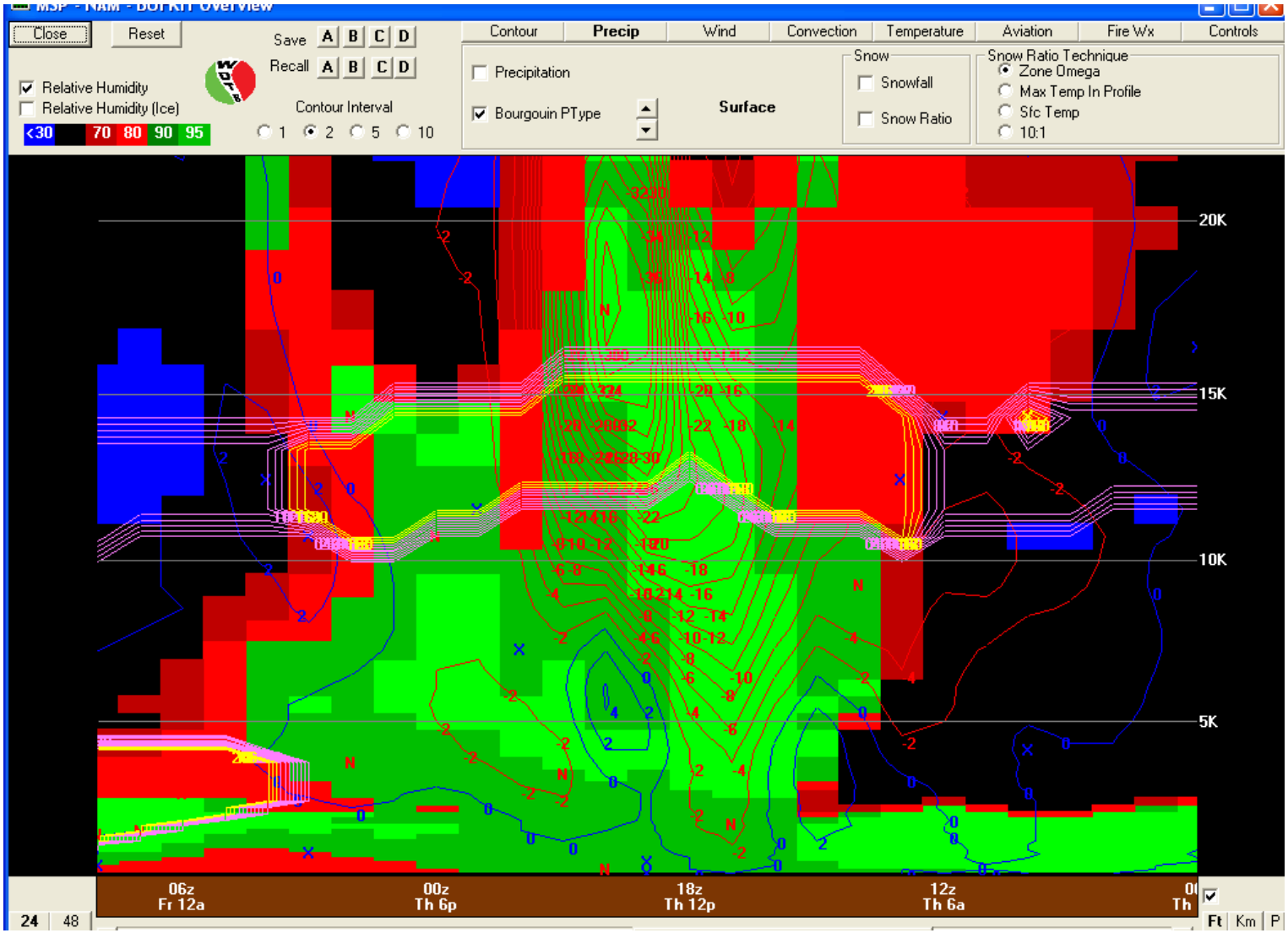
NSHARP (Bigsharp): SPC Internal



BUFKIT: Public



BUFKIT: Public



Why SHARPpy?
Research

Two weeks before my Masters defense, I discovered a bug in the CAPE routines contained in the NCAR Command Language (NCL). I had to redo every calculation and rewrite a large part of the thesis.

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(This task has never been funded.)

Why SHARPpy?
2011 Hazardous Weather Testbed Activities

Needed to visualize:

- 1100+ Point Forecast Soundings (PFCs)
- 36 Forecast Hours + 1 Initialization Hour
- 18 Different Members
- 51 Vertical Levels per Sounding
- Ultimately wrote routine to convert model text output to BUFKIT

Hazardous Weather Testbed



I'm not really sure what I'm doing with my hands!

This was a dirty hack; wanted more pythonic solution

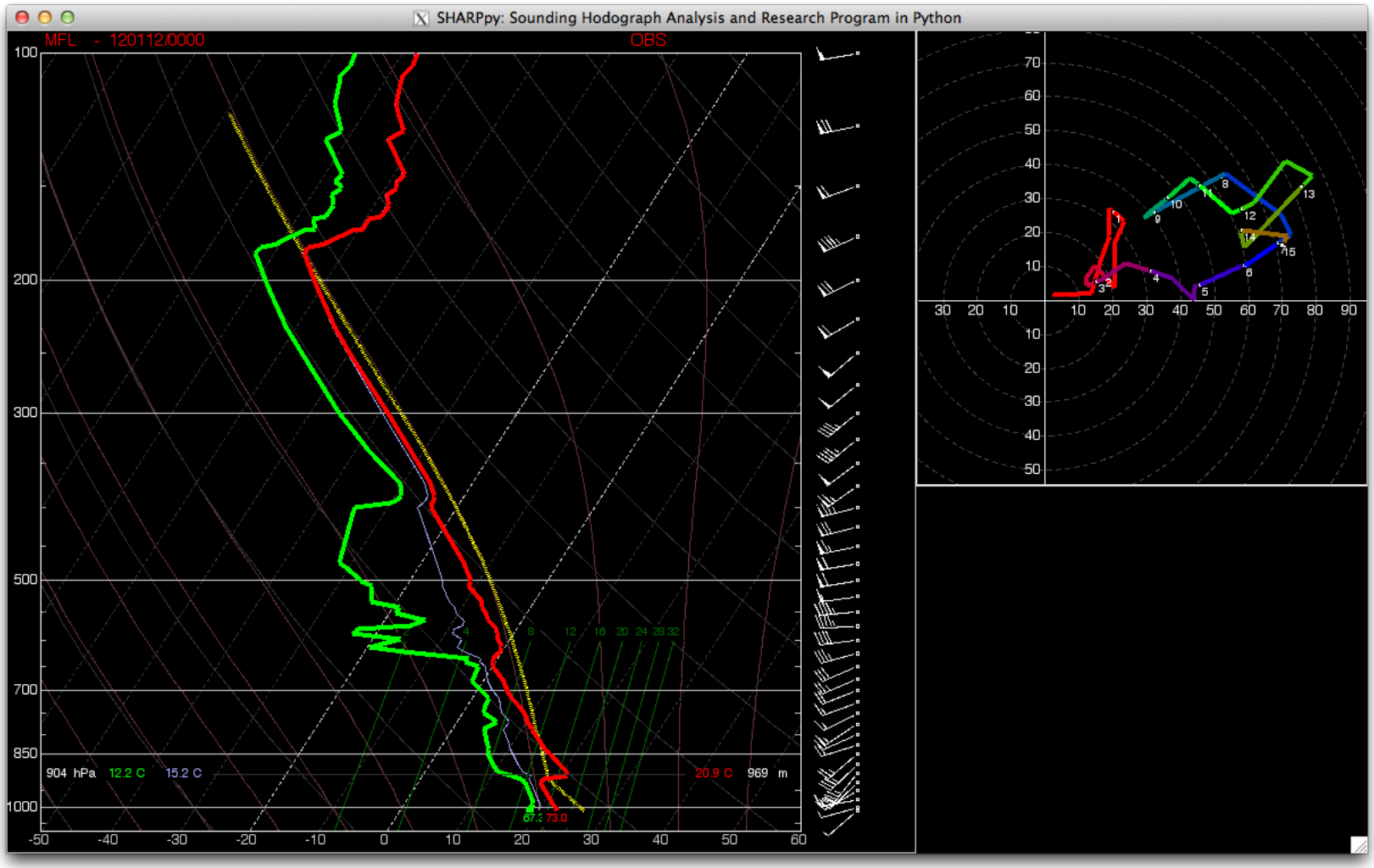
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So over the Christmas Holidays I set out to fix that

What is SHARPpy?

- A Pure Python Implementation of the SPC's Bigsharp
- No dependency on Numpy, Scipy, nor Matplotlib
- Graphics handled by Tkinter
- Plans are to eventually extend to Numpy, Scipy, &/or Matplotlib

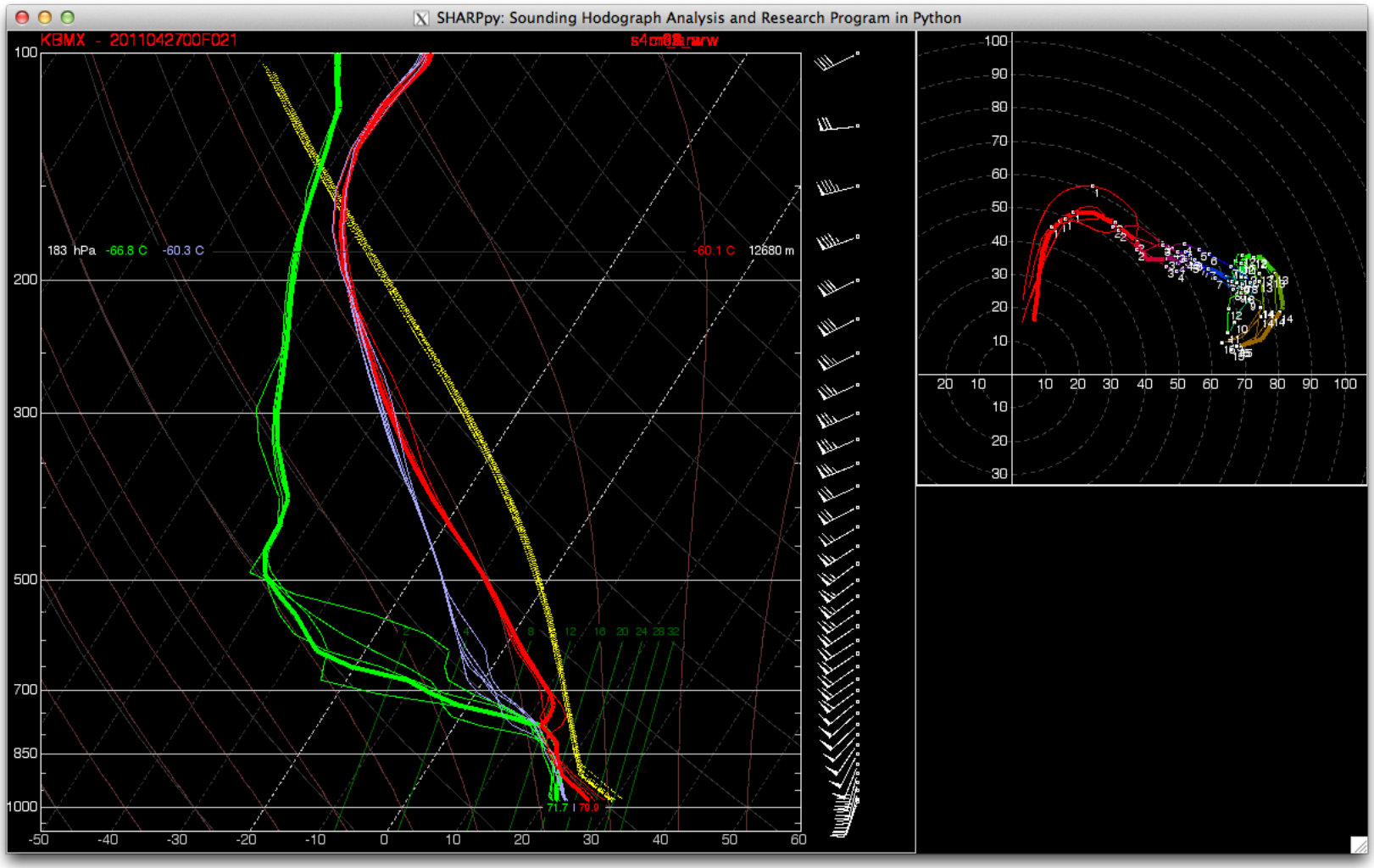
SHARPpy: Observed Soundings



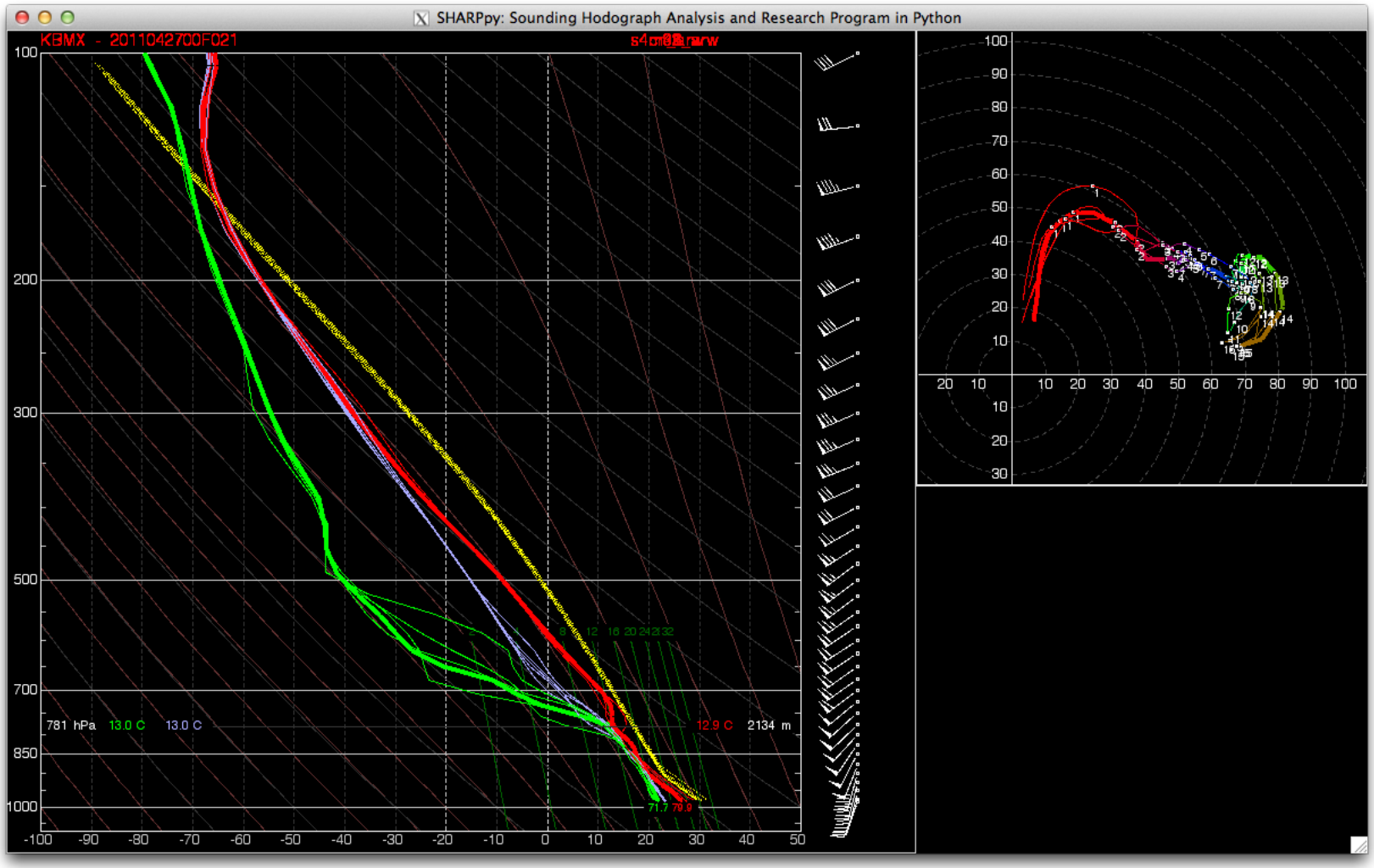
SHARPpy Internals

- Utilizes a custom "Profile" class
- Profile class is essentially pure python representation of 6-d array with meta data auto-generated by the class
- Profile class only requires following keyword arguments:
  - Pressure
  - Height
  - Temperature
  - Dew Point
  - U-component of Wind **OR** Wind Direction (degrees)
  - V-component of Wind **OR** Wind Speed
- Thus, it is easy to extend to new data sources

SHARPpy: Primitive Ensemble Support!



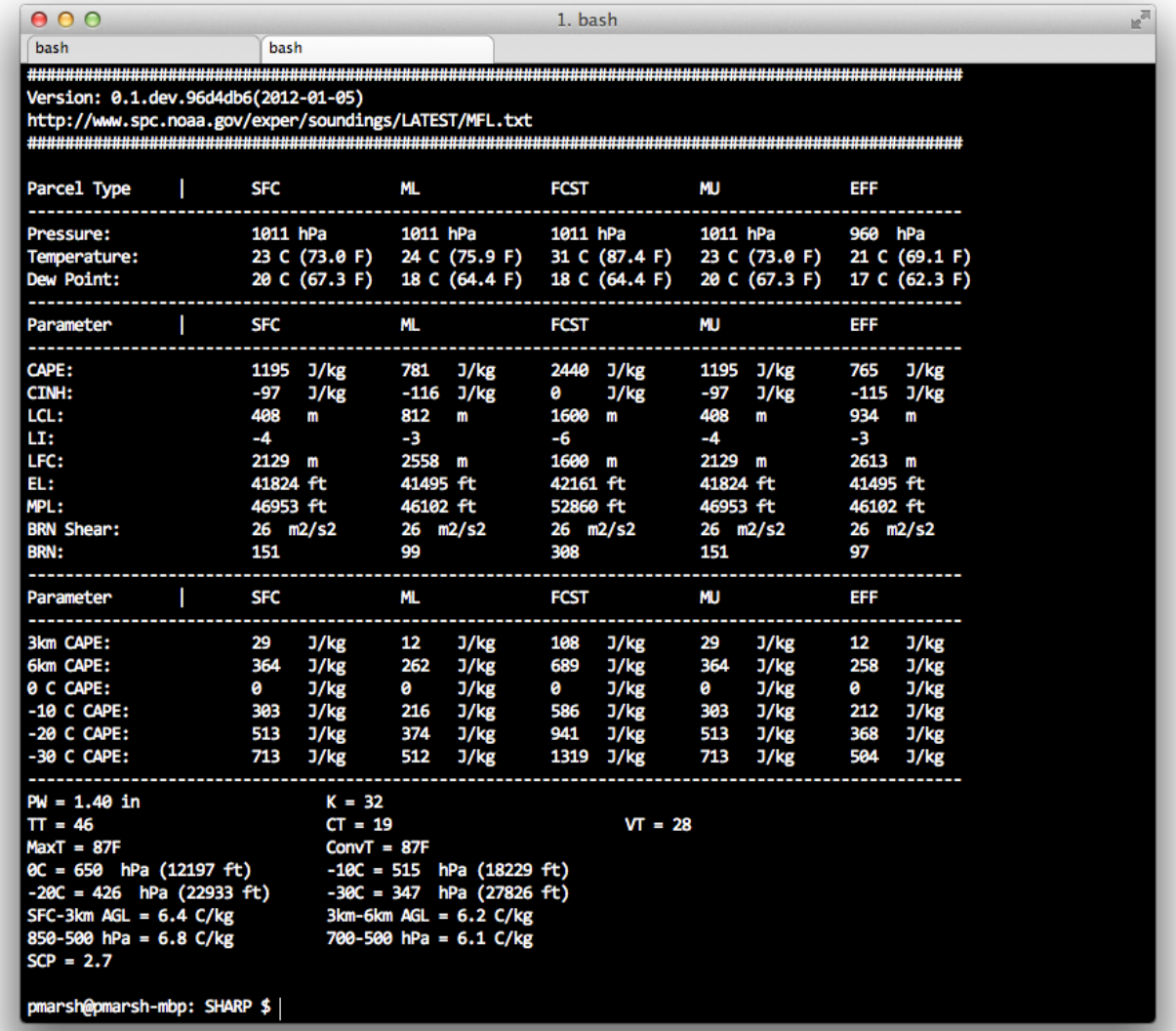
SHARPpy: STUVE



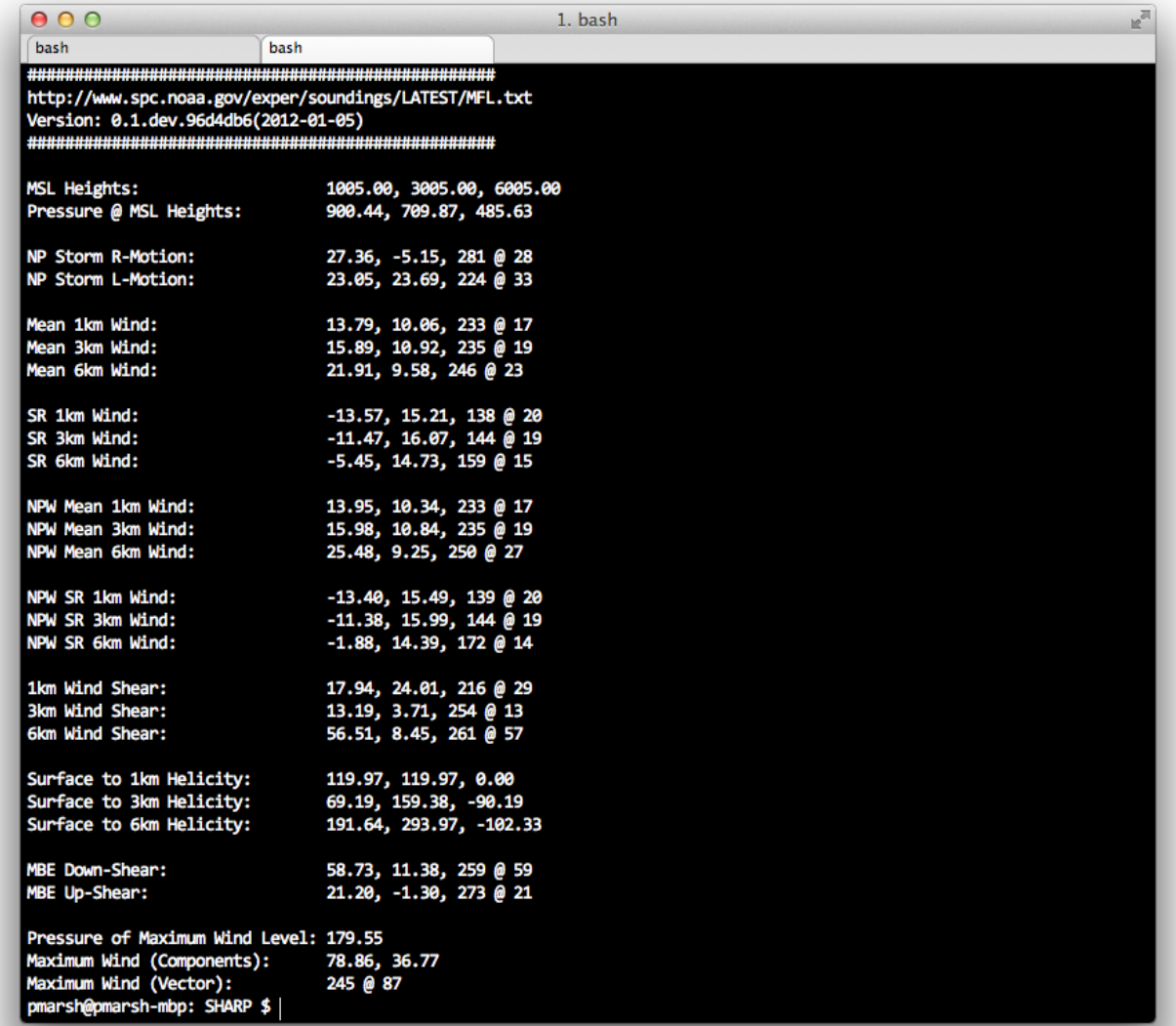
But Wait! There's More!

- Graphical Routines rely on Numerical Routines
- Numerical Routines **do not** rely on Graphical Routines
- No need to "draw" every sounding or hodograph to do analyses!

SHARPpy: Thermodynamic Calculations

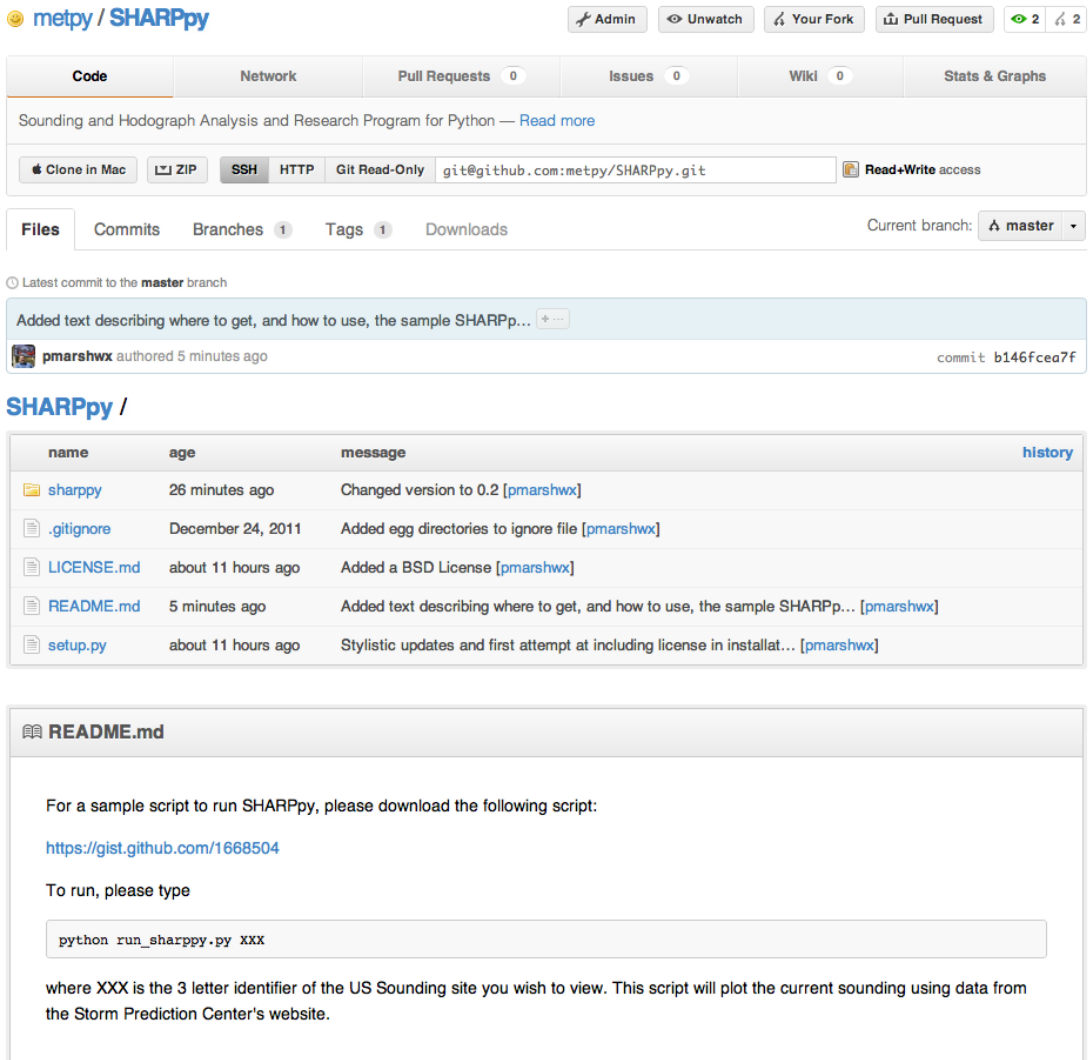


SHARPpy: Kinematic Calculations



SHARPpy: Where to Get It?

http://www.github.com/metpy/sharppy



SHARPpy: Where From Here?

- Finish Porting Bigsharp Routines
- Finish GUI Display (e.g., add parameter fields to display)
- Add Time-Height Cross Section Functionality!
- More Dynamic Control of Ensemble Members
- Utilize Numpy, Scipy, & Matplotlib
- . . . To Be Continued . . .

Please Get Involved!

- My Github Account:
  `http://www.github.com/pmarshwx`
- MetPy Github Account:
  `http://www.github.com/metpy`
- My Website (Most Analyses and Images Done in Python):
  `http://www.patricktmarsh.com`
- My Email: `patrick.marsh@noaa.gov`
- Twitter: `@pmarshwx`