

SHARPy: Skew-T and Hodograph Analysis and Research Program

Patrick T. Marsh^{1,2,3} and John Hart⁴

Liaison to the Hazardous Weather Testbed

¹NOAA National Severe Storms Laboratory

²University of Oklahoma Cooperative Institute for Mesoscale Meteorological Studies

³University of Oklahoma School of Meteorology

⁴NOAA National Weather Service Storm Prediction Center

AMS Python Symposium

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patrick.marsh@noaa.gov

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 SHARPy?

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... Because ...

Why SHARPy?

... Why not? ...

Why SHARPy?

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

Why SHARPy?

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

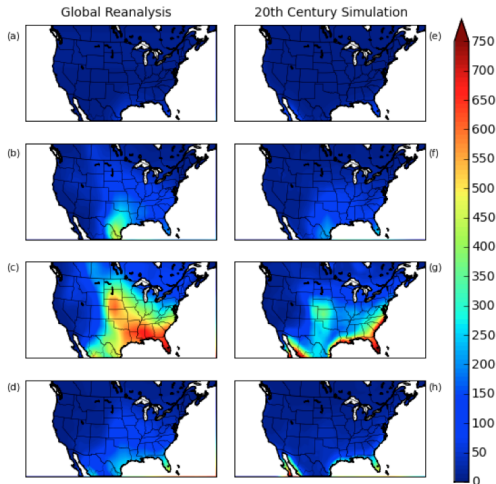
Why SHARPy?

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

But it's more than just my wants

Why SHARPy?

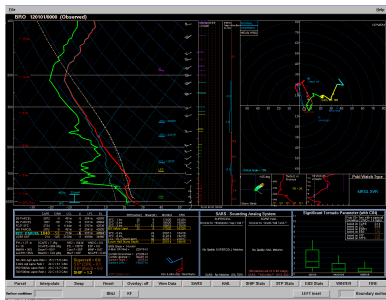
Meteorologists vs. Climatologists



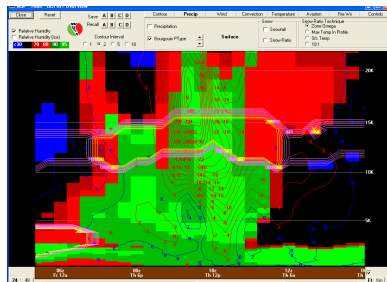
Why SHARPy?

Meteorologists vs. Meteorologists

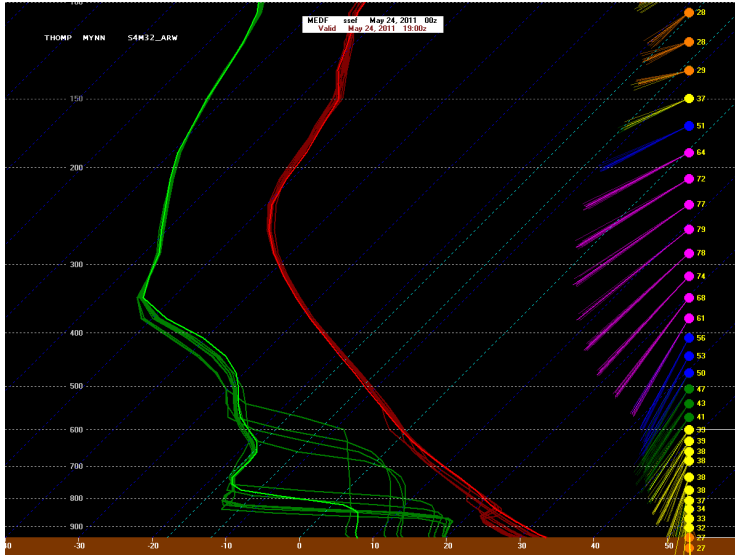
BigSHARP: SPC Internal



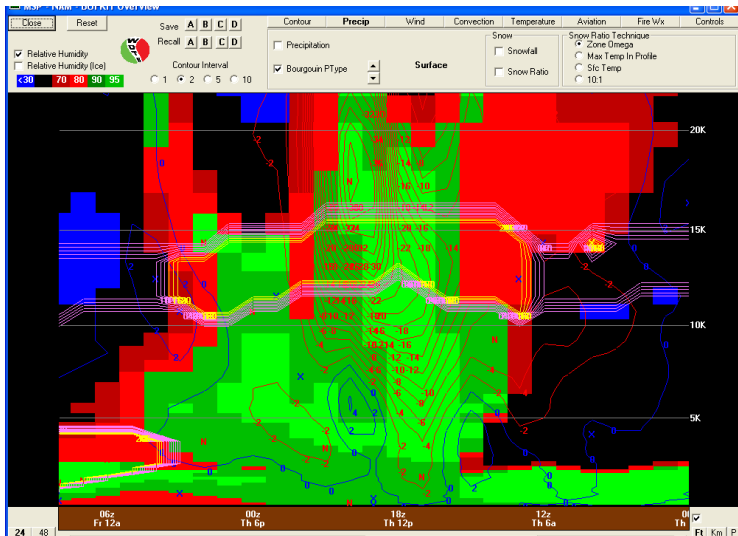
BUFKIT: Public



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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 SHARPy?

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!

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So over the Christmas Holidays I set out to fix that

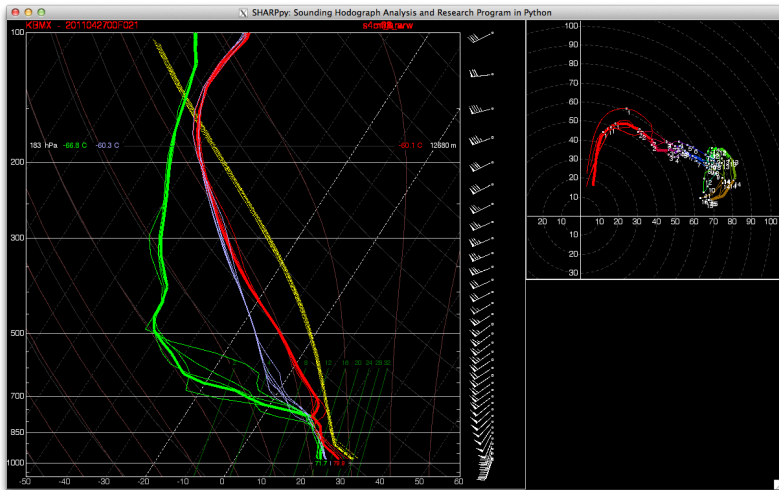
What is SHARPy?

- 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

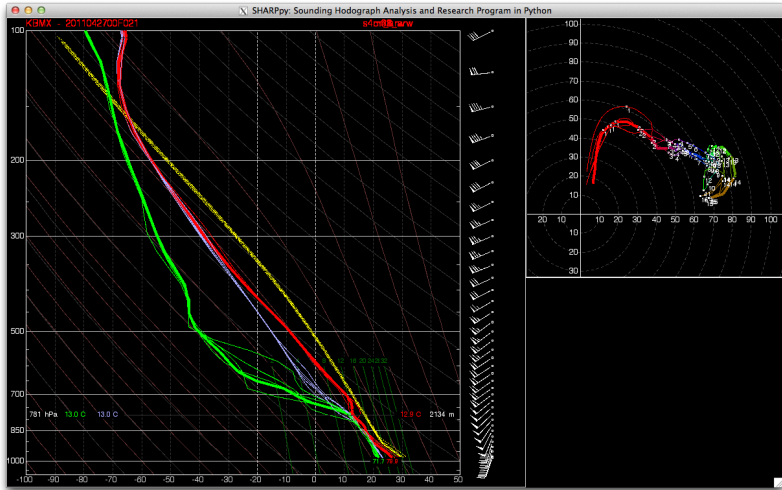
SHARPy Internals

- 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

SHARPy: Primitive Ensemble Support!



SHARPy: 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!

SHARPy: Thermodynamic Calculations

```
#####
Version: 0.1.dev.964db6(2012-01-05)
http://www.spc.noaa.gov/exper/soundings/LATEST/WFL.txt
#####

Parcel Type | SFC ML FCST MU EFF
-----|-----
Pressure: 1011 hPa 1011 hPa 1011 hPa 1011 hPa 960 hPa
Temperature: 23 C (73.0 F) 24 C (75.9 F) 31 C (87.4 F) 23 C (73.0 F) 21 C (69.1 F)
Dew Point: 20 C (67.3 F) 18 C (64.4 F) 18 C (64.4 F) 20 C (67.3 F) 17 C (62.3 F)
-----|-----
Parameter | SFC ML FCST MU EFF
-----|-----
CAPE: 1195 J/kg 781 J/kg 2440 J/kg 1195 J/kg 765 J/kg
CLM: -97 J/kg -116 J/kg 0 J/kg -97 J/kg -115 J/kg
LCL: 408 m 812 m 1600 m 408 m 934 m
L1: -4 -3 -6 -4 -3
LFC: 2129 m 2558 m 1600 m 2129 m 2613 m
EL: 41824 ft 41495 ft 42161 ft 41824 ft 41495 ft
HPL: 46953 ft 46102 ft 52860 ft 46953 ft 46102 ft
BRN Shear: 26 m2/s2 26 m2/s2 26 m2/s2 26 m2/s2 26 m2/s2
BRN: 151 99 308 151 97
-----|-----
Parameter | SFC ML FCST MU EFF
-----|-----
3km CAPE: 29 J/kg 12 J/kg 188 J/kg 29 J/kg 12 J/kg
6km CAPE: 364 J/kg 262 J/kg 689 J/kg 364 J/kg 258 J/kg
0 C CAPE: 0 J/kg 0 J/kg 0 J/kg 0 J/kg 0 J/kg
-10 C CAPE: 303 J/kg 216 J/kg 586 J/kg 303 J/kg 212 J/kg
-20 C CAPE: 513 J/kg 374 J/kg 941 J/kg 513 J/kg 368 J/kg
-30 C CAPE: 713 J/kg 512 J/kg 1319 J/kg 713 J/kg 504 J/kg
-----|-----
PM = 1.40 in K = 32 VT = 28
TT = 46 ConvT = 87F
MaxT = 87F
0C = 650 hPa (12197 ft) -10C = 515 hPa (18229 ft)
-20C = 426 hPa (22933 ft) -30C = 347 hPa (27826 ft)
SF2-3km AGL = 6.4 C/kg 3km-6km AGL = 6.2 C/kg
850-500 hPa = 6.8 C/kg 700-500 hPa = 6.1 C/kg
SCP = 2.7

pmarsh@marsh-nbp: SHARPy $
```

SHARPy: Kinematic Calculations

```
#####
http://www.spc.noaa.gov/exper/soundings/LATEST/MFL.txt
Version: 0.1.dev.9604db6(2012-01-05)
#####

MSL Heights:          1005.00, 3005.00, 6005.00
Pressure @ MSL Heights:  900.44, 709.87, 485.63

NP Storm R-Motion:    27.36, -5.15, 281 @ 28
NP Storm L-Motion:    23.65, 23.69, 224 @ 33

Mean 1km Wind:        13.79, 10.06, 233 @ 17
Mean 3km Wind:        15.89, 10.92, 235 @ 19
Mean 6km Wind:        21.91, 9.58, 246 @ 23

SR 1km Wind:          -13.57, 15.21, 138 @ 20
SR 3km Wind:          -11.47, 16.07, 144 @ 19
SR 6km Wind:          -5.45, 14.73, 159 @ 15

NPW Mean 1km Wind:    13.95, 10.34, 233 @ 17
NPW Mean 3km Wind:    15.98, 10.84, 235 @ 19
NPW Mean 6km Wind:    25.48, 9.25, 250 @ 27

NPW SR 1km Wind:      -13.40, 15.49, 139 @ 20
NPW SR 3km Wind:      -11.38, 15.99, 144 @ 19
NPW SR 6km Wind:      -1.88, 14.39, 172 @ 14

1km Wind Shear:       17.94, 24.01, 216 @ 29
3km Wind Shear:       13.19, 3.71, 254 @ 13
6km Wind Shear:       56.51, 8.45, 261 @ 57

Surface to 1km Helicity: 119.97, 119.97, 0.00
Surface to 3km Helicity: 69.19, 159.38, -90.19
Surface to 6km Helicity: 191.64, 293.97, -102.33

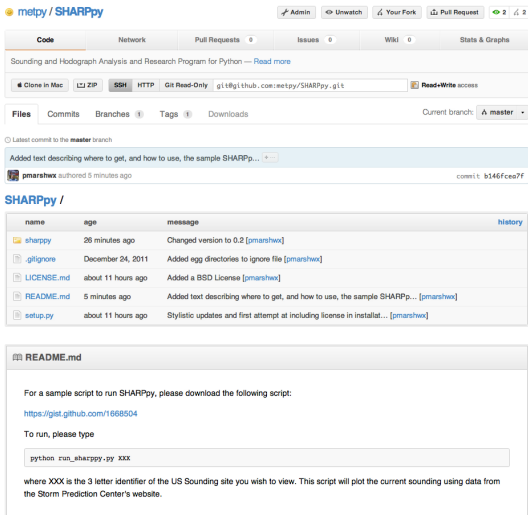
MBE Down-Shear:       58.73, 11.38, 259 @ 59
MBE Up-Shear:         21.20, -1.30, 273 @ 21

Pressure of Maximum Wind Level: 179.55
Maximum Wind (Components):  78.86, 36.77
Maximum Wind (Vector):      245 @ 87

marsh@marsh-nbp: SHARPy $
```

SHARPPy: Where to Get It?

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



metpy / SHARPPy

Admin Unwatch Your Fork Pull Request 2

Code Network Pull Requests 0 Issues 0 Wiki 0 Stats & Graphs

Sounding and Hodograph Analysis and Research Program for Python — Read more

Clone in Mac ZIP SSH HTTP Git Read-Only git@github.com:metpy/SHARPPy.git Read+Write access

Files Commits Branches 1 Tags 1 Downloads Current branch: A master

Latest commit to the master branch

Added text describing where to get, and how to use, the sample SHARPPy... + ...

marshwx authored 5 minutes ago commit b146fcee7f

SHARPPy /

name	age	message	history
sharppy	26 minutes ago	Changed version to 0.2 [marshwx]	
.gitignore	December 24, 2011	Added egg directories to ignore file [marshwx]	
LICENSE.md	about 11 hours ago	Added a BSD License [marshwx]	
README.md	5 minutes ago	Added text describing where to get, and how to use, the sample SHARPPy... [marshwx]	
setup.py	about 11 hours ago	Stylistic updates and first attempt at including license in installat... [marshwx]	

README.md

For a sample script to run SHARPPy, please download the following script:

<https://gist.github.com/1668504>

To run, please type

```
python run_sharppy.py XXX
```

where XXX is the 3 letter identifier of the US Sounding site you wish to view. This script will plot the current sounding using data from the Storm Prediction Center's website.

SHARPy: 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