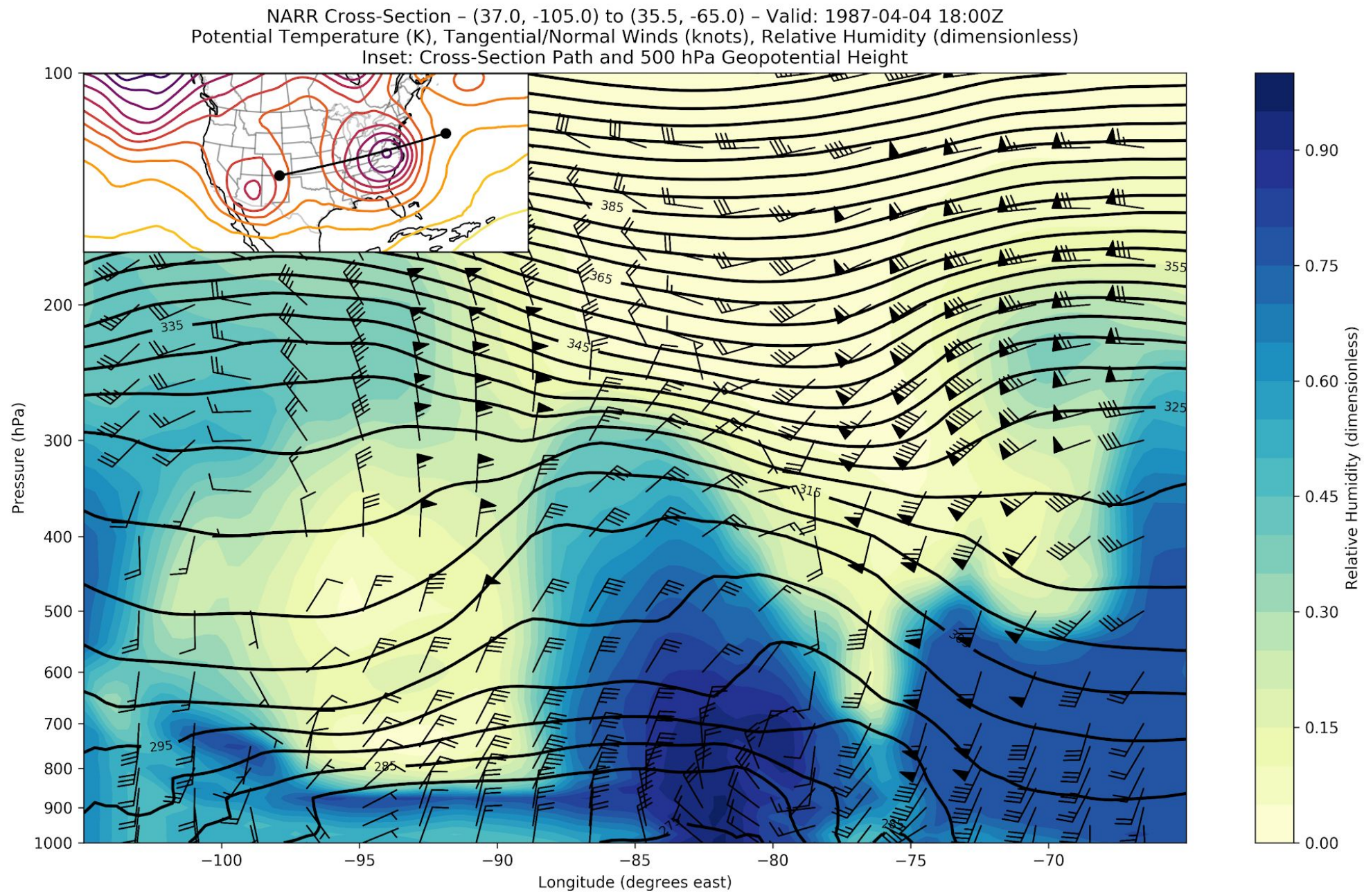


# SI2-SSE: MetPy - A Python GEMPAK Replacement for Meteorological Data Analysis

Ryan May; University Corporation for Atmospheric Research (UCAR), Unidata Program Center, Boulder, USA  
Kevin Goebbert; Valparaíso University, Valparaíso, IN

## What is MetPy?

MetPy is an open-source Python toolkit for meteorology. Our goal is to replace GEMPAK, a popular legacy tool for scripted weather analysis, with Python. To facilitate this replacement, we have added a simplified plotting model to MetPy, as well as added additional calculations and cross-section capabilities. These features are made possible by reliance on XArray.



Sample cross section from reanalysis

## XArray

XArray provides a standard data model for us to base functionality around. It's use within the ecosystem increases interoperability between projects. Specific features include:

- Container for multiple fields
- Support for attached metadata
- Coordinates with data fields
- Selection and subsetting
- Standard extension points



For more information, see MetPy's documentation at: <https://unidata.github.io/MetPy>



## Declarative Plotting

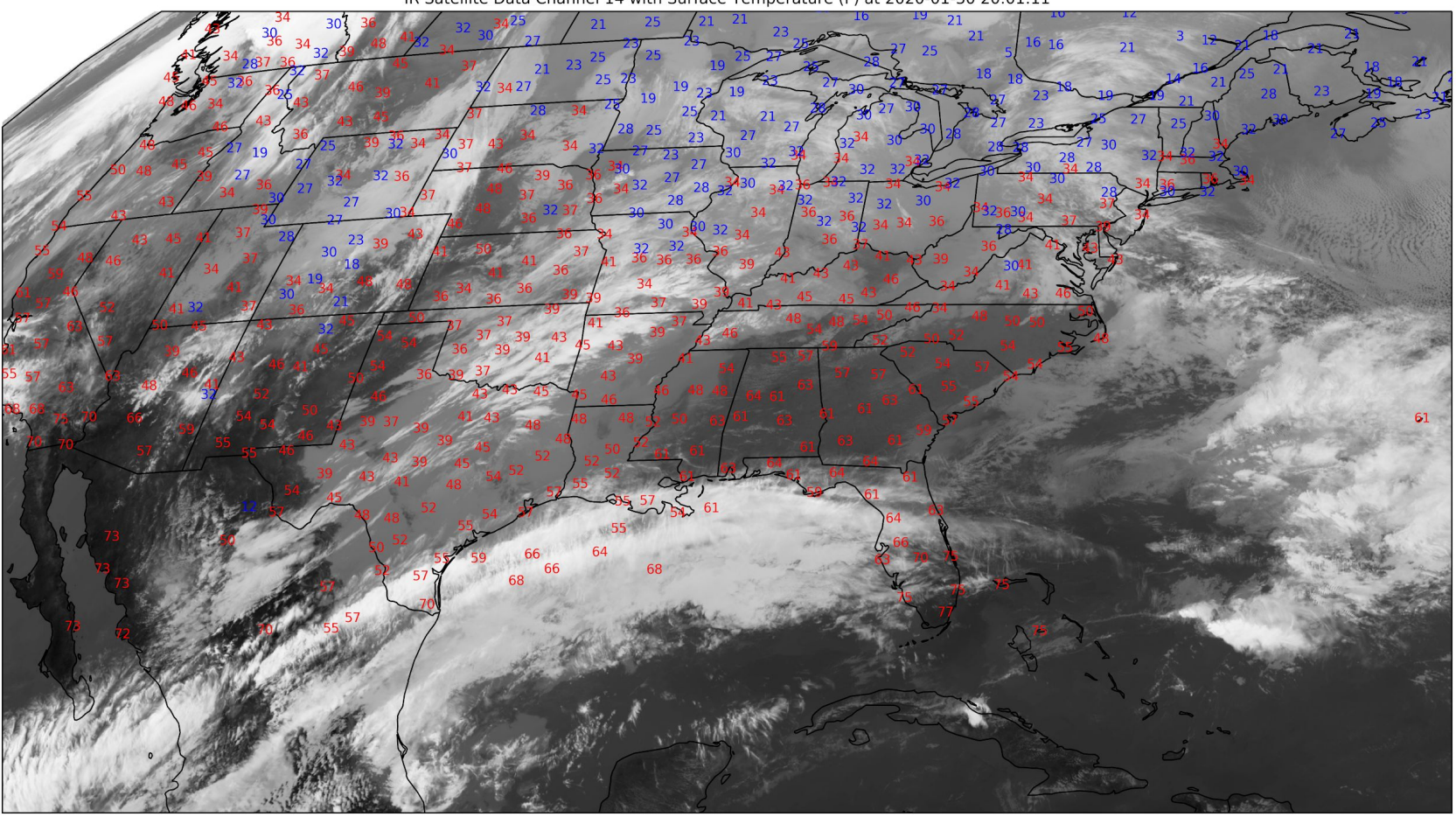
```
obs = PlotObs()
obs.data = df[df.tmpf > 32]
obs.time = vtime
obs.time_window = timedelta(minutes=30)
obs.level = None
obs.fields = ['tmpf']
obs.colors = ['red']
obs.reduce_points = 0.7

# Plot all obs less than 32F blue
obs2 = PlotObs()
obs2.data = df[df.tmpf <= 32]
obs2.time = vtime
obs2.time_window = timedelta(minutes=30)
obs2.level = None
obs2.fields = ['tmpf']
obs2.colors = ['blue']
obs2.reduce_points = 0.7

# Add the IR image to the plot
img = ImagePlot()
img.data = ds
img.field = 'Sectorized_CMI'
img.colormap = 'Greys'

# Bring plots together in a map panel and add a title
panel = MapPanel()
panel.area = [-112, -65, 20, 50]
panel.title = f'IR Satellite Data Channel 14 with Surface Temperature (F) at {vtime}'
panel.layers = ['coastline', 'borders', 'states']
panel.plots = [img, obs, obs2]

# Place the panel on a figure
pc = PanelContainer()
pc.size = (20, 20)
pc.panels = [panel]
pc.show()
```



Surface temperatures plotted with infrared satellite

## What is it?

Declarative interfaces differ from imperative by describing what is desired rather than what to do. We currently support:

- Image Plots
- Contours/Filled Contours
- Barb Plots
- Station Model Plots
- Maps and Projections