## Author Affiliations

1: **BROOKHAVEN** NATIONAL LABORATORY

2: THE UNIVERSITY WISCONSIN MADISON

3: aer Atmospheric and Environmental Research, Inc.

4: THE UNIVERSITY OF UTAH

# The Mergedsounding VAP: Recent Enhancements

**ARM** Atmospheric Radiation Measurement

## David Troyan[1], Michael Jensen[1], David Turner[2], Mark Miller[1], Jennifer Delamere[3], Eli Mlawer[3], Gerald Mace[4]

## Mergedsounding Primer

**What is Mergedsounding?**  Mergedsounding provides a continuous thermodynamic profile of the lower atmosphere.  It uses data from ARM sources (sondes, surface instruments) and ECMWF model output.

**Why do we need this product?**  Radiosondes are launched infequently, and yet the need for a high resolution profile is great.  Use in the BBHRP project is only one example.

**How is this achieved?**  Radiosonde data are combined with ECMWF model output using a double sigmoid weighting function.  The fields are then smoothed before scaling the RH using data from the MWR Ret VAP.

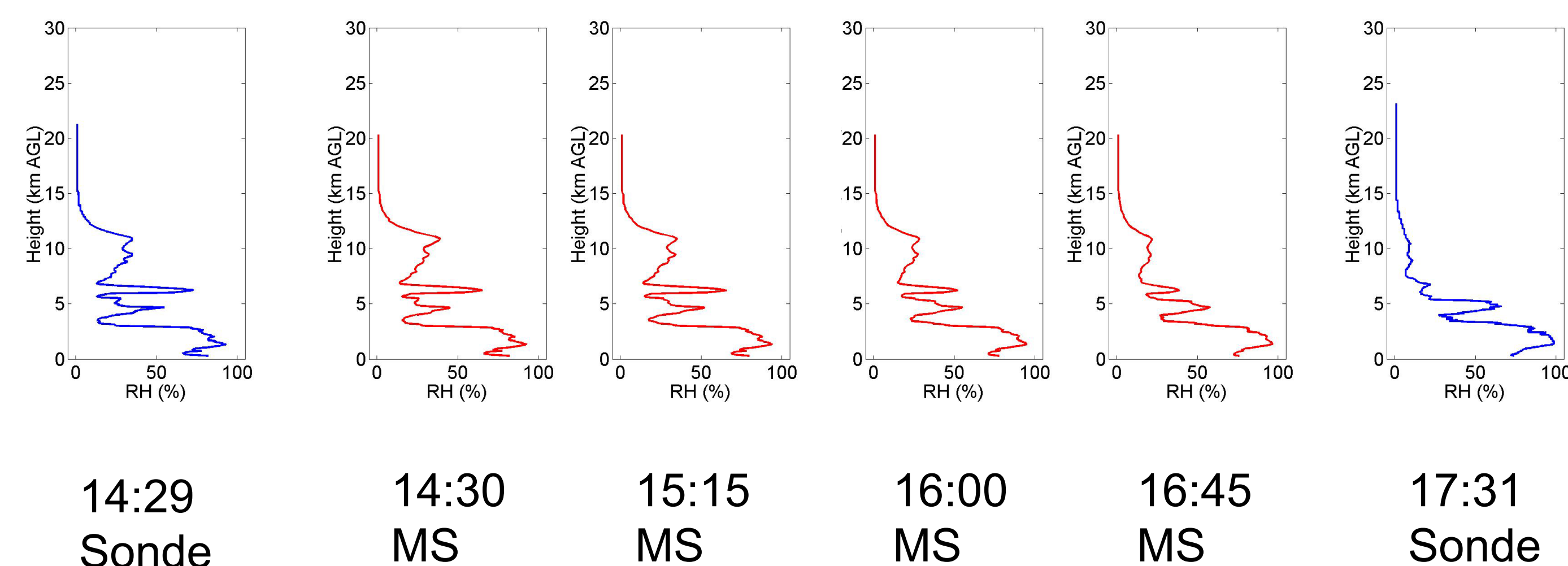**What is the output resolution?**  The temporal resolution is one minute.
The vertical resolution depends on the height above ground level (AGL):

```
GL to 3km AGL .......... 20 m
3 km to 4 km AGL ...... 50 m
4 km to 7 km AGL ...... 100 m
7 km to 20 km AGL .... 200 m
```
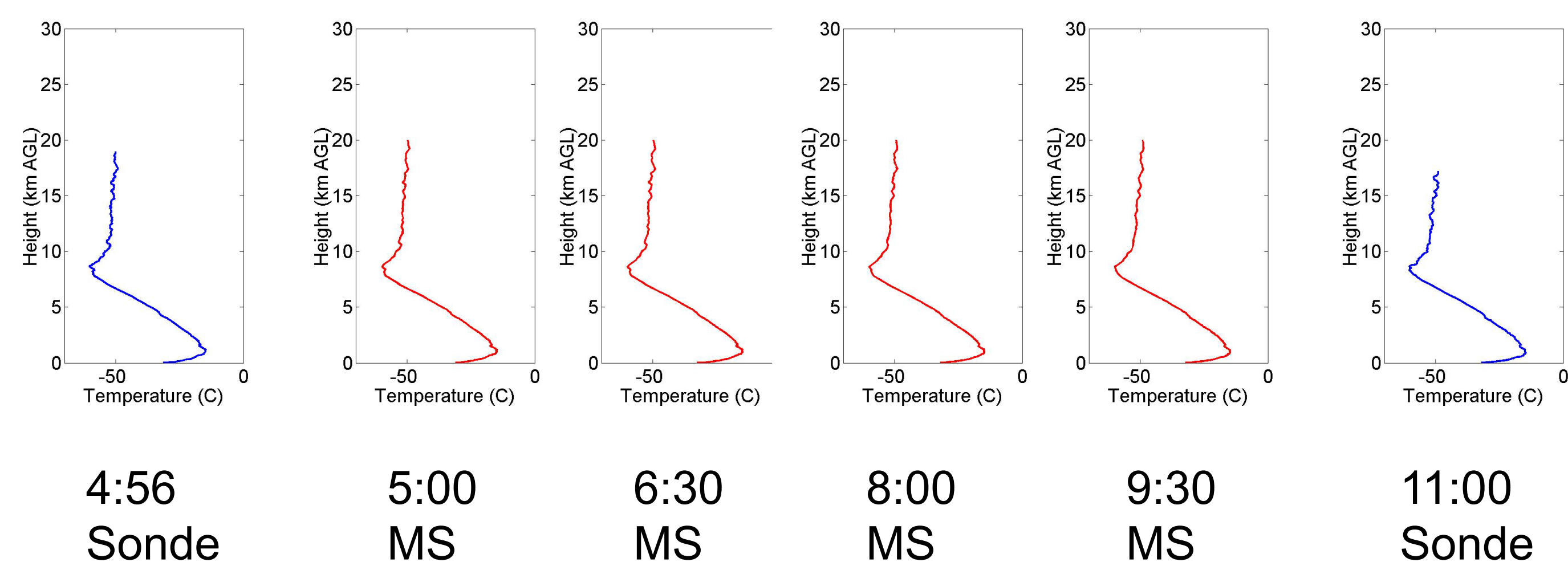
## Mergedsounding Results

The two time series below represents the variation of Mergedsounding output between the launch times of two adjacent radiosondes.  The plots in blue are the sonde profiles and the red plots are the Mergedsounding profiles that are combinations of the blue profiles and the ECMWF profiles.  Double sigmoid functions are used to determine the contribution of each profile in creating the Mergedsounding output.  The two parameters for the double sigmoid function at SGP are slope=1.5 & HWHM=4.0; at NSA these are slope=0.75 & HWHM=8.0.
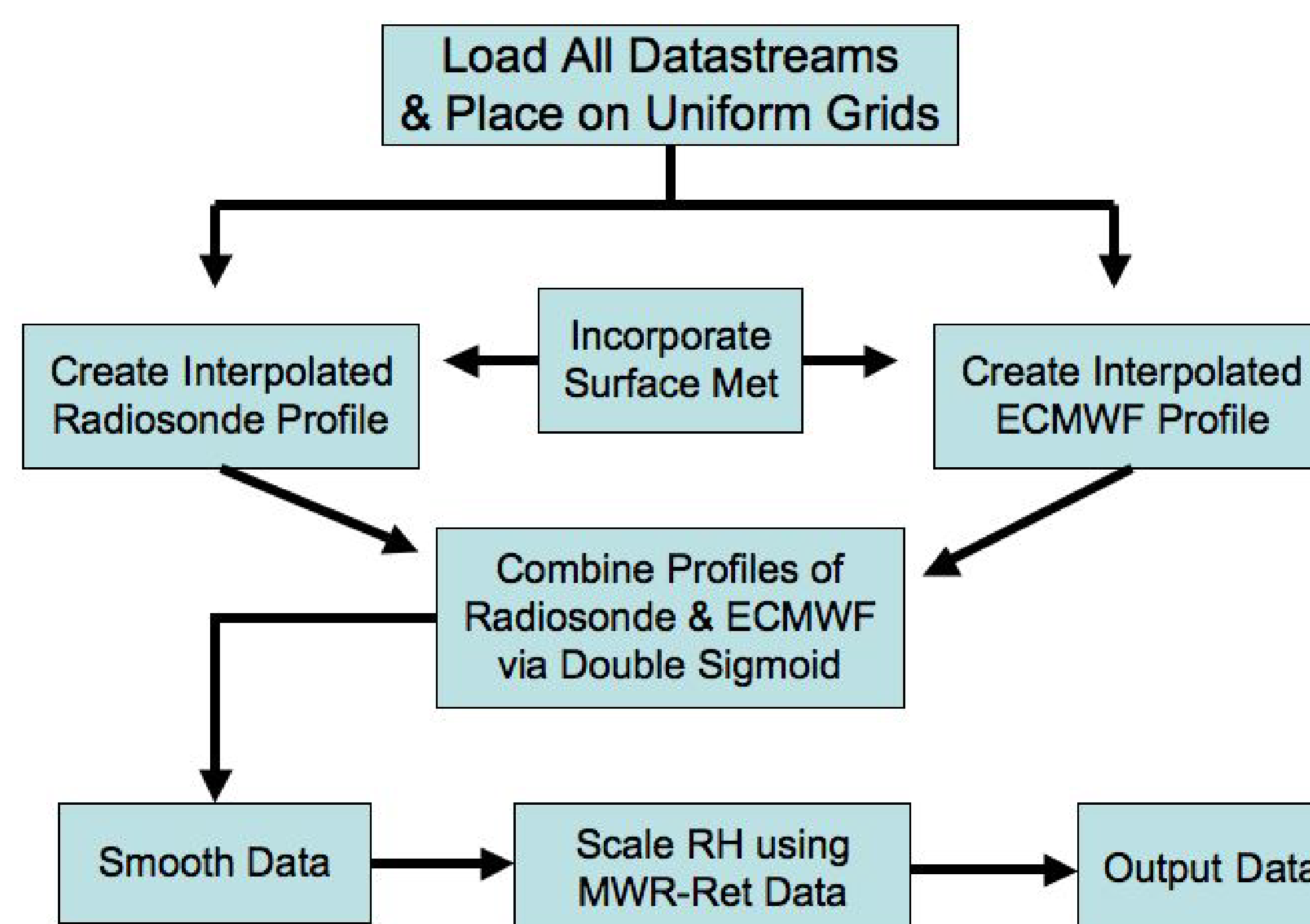
## The Mergedsounding Schematic



Load All Datastreams & Place on Uniform Grids

Create Interpolated Radiosonde Profile — Incorporate Surface Met — Create Interpolated ECMWF Profile

Combine Profiles of Radiosonde & ECMWF via Double Sigmoid

Smooth Data — Scale RH using MWR-Ret Data — Output Data

## What to Expect

**Data to the Archive:**
Mergedsounding (v.1) for SGP and NSA will begin flowing to the Archive within two weeks pending fulfillment of any additional requirements of the Archive and Data Management Facility.
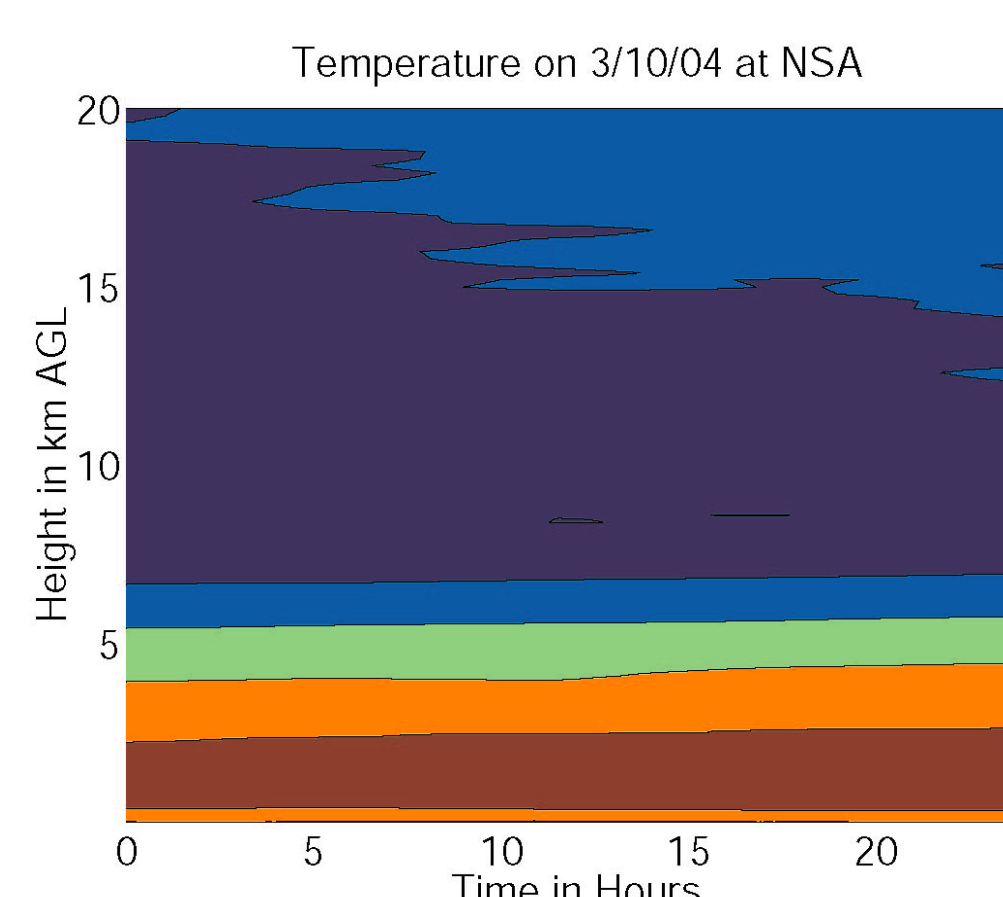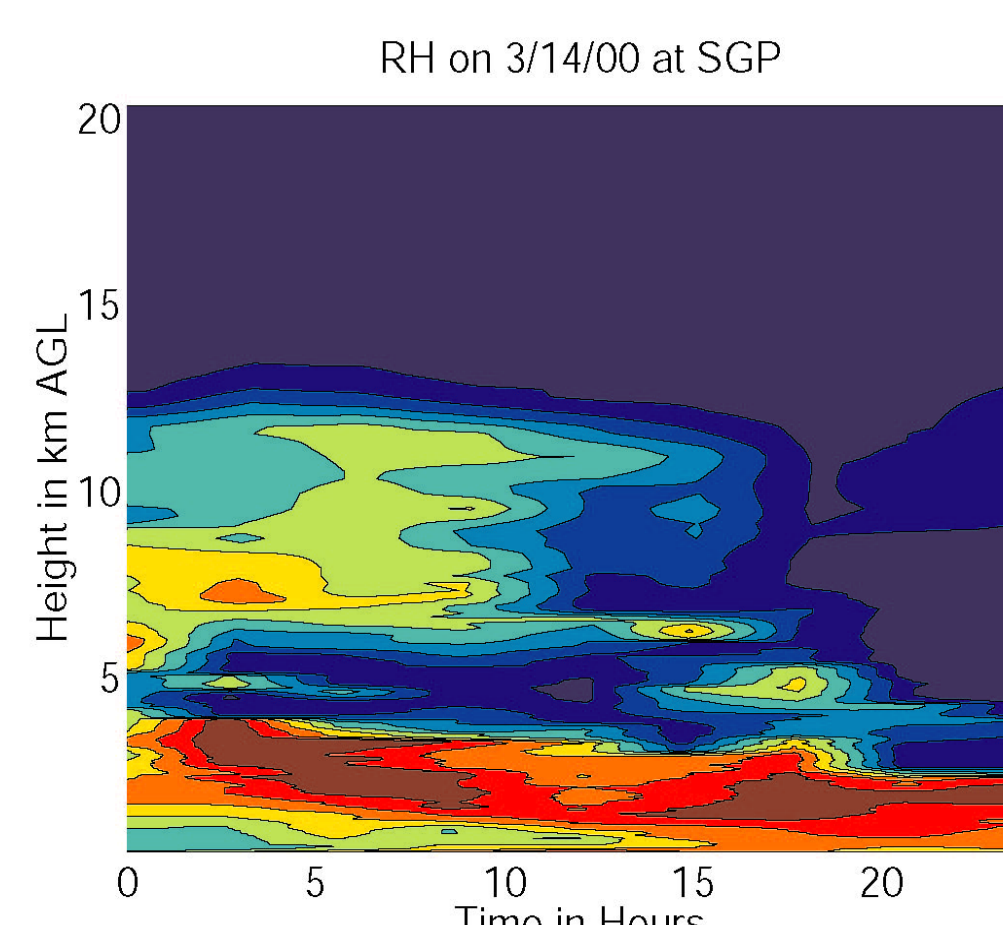
**Future Plans:**
(a) Version 1 to be customized for the TWP and AMF sites.  Runs for the Archive will follow.
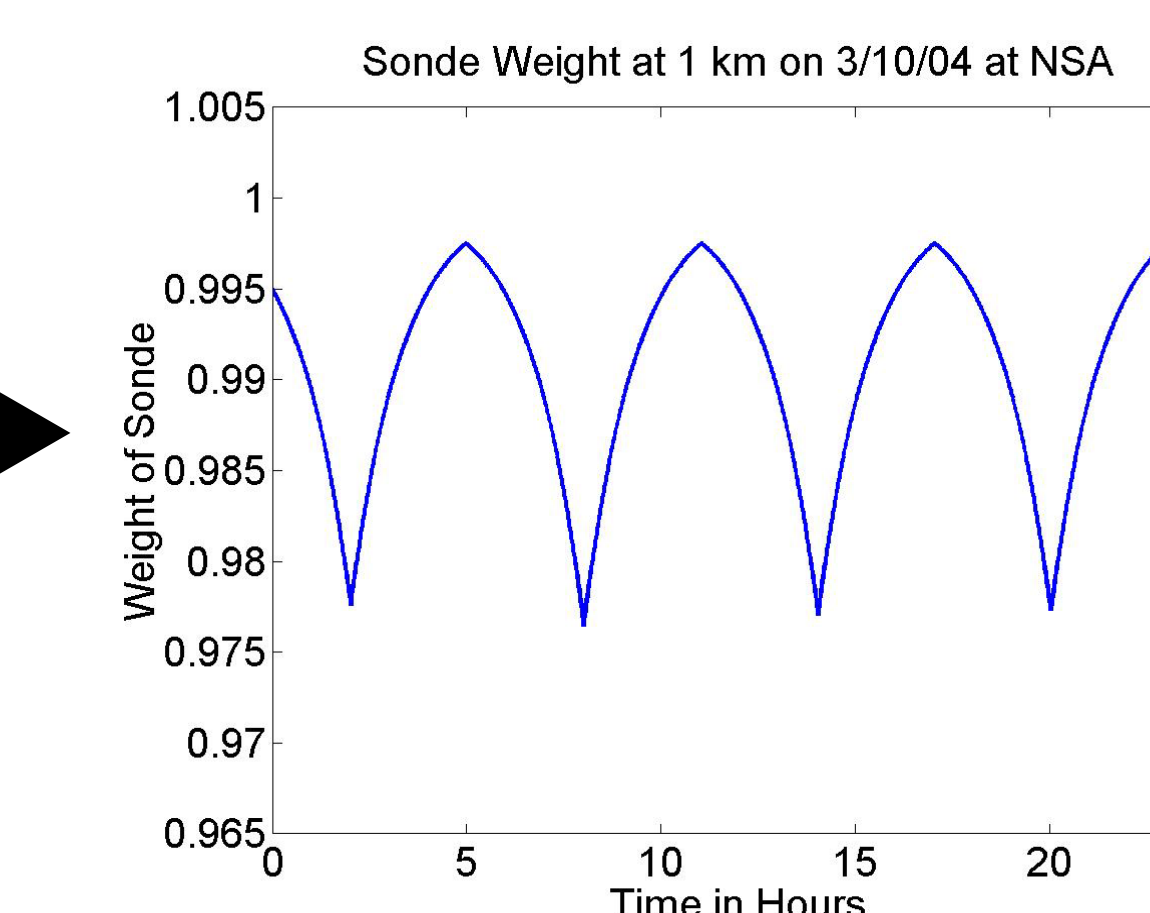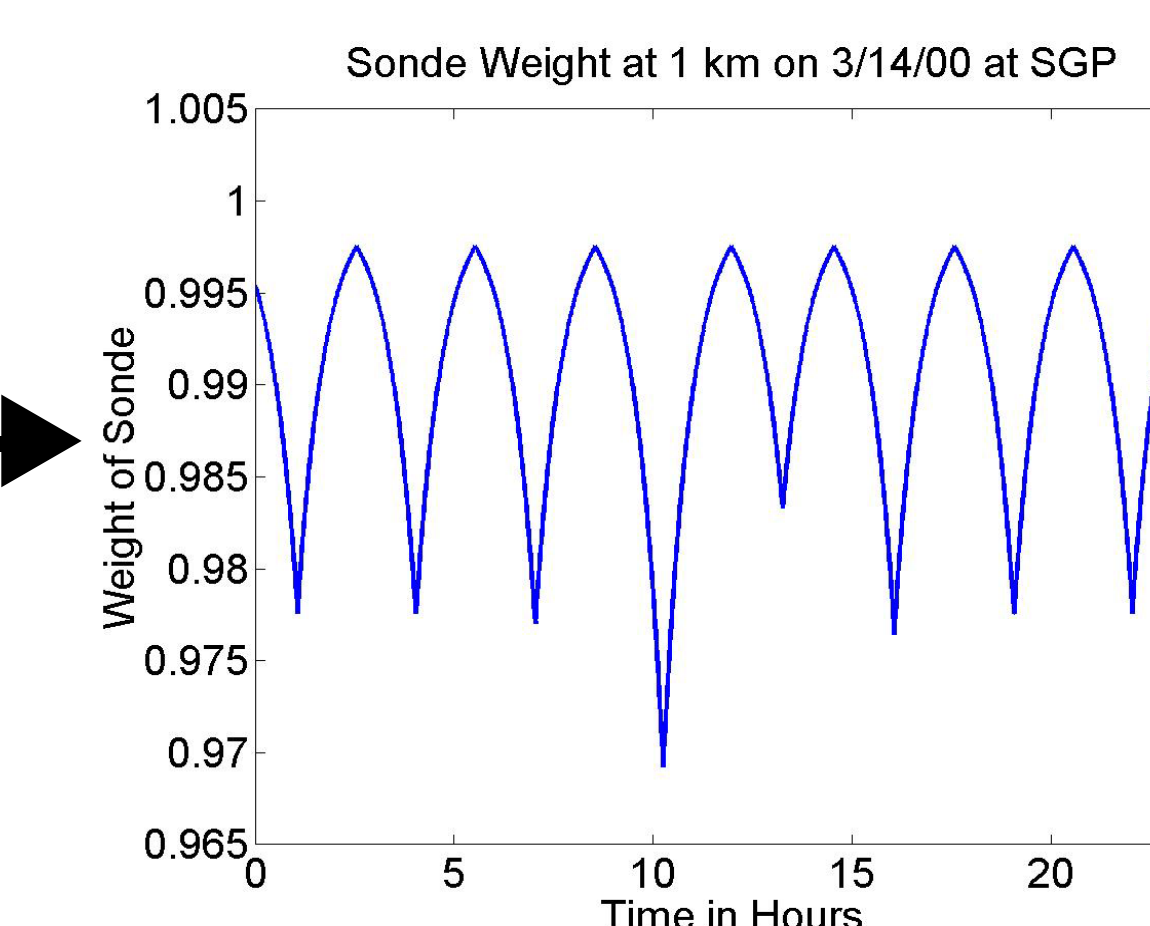
(b) Create Version 2 with the following changes:

  (1) Extend the maximum height to 60 km,
  (2) Incorporate the Miloshevich dry bias correction,
  (3) Apply the Revercomb ECMWF RH correction,
  (4) Incorporate Profiling MWR Data.

**Plots from Case I & Case II**

**Sonde Weights Used at 1 km from the Double Sigmoid Function**

**Case I:** Relative Humidity SGP 3/14/00



14:29 Sonde | 14:30 MS | 15:15 MS | 16:00 MS | 16:45 MS | 17:31 Sonde



RH on 3/14/00 at SGP



Sonde Weight at 1 km on 3/14/00 at SGP

**Case II:** Temperature NSA 3/10/04



4:56 Sonde | 5:00 MS | 6:30 MS | 8:00 MS | 9:30 MS | 11:00 Sonde



Temperature on 3/10/04 at NSA



Sonde Weight at 1 km on 3/10/04 at NSA

## Output Variables

Precipitation
Temperature
Relative Humidity
Vapor Pressure
Barometric Pressure
Dew Point
Potential Temperature
Specific Humidity
Scaled RH
Wind Speed
Wind Direction
U-Wind
V-Wind
Sonde_Fraction
Sonde_Fraction_RH
*Several Status Variables*