A free, on-line soaring weather forecasting system for world-wide use

Em. Prof. Dr. Edward (Ward) Hindman
Meteorology and Oceanography
Earth and Atmospheric Science Department
The City College of New York
City of New York, NY USA 10031

hindman@sci.ccny.cuny.edu
www.sci.ccny.cuny.edu/~hindman

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Abstract

Forecasts of weather elements important for soaring flights are freely available from a USA government web-server for any location in the world. The forecasted elements are displayed in a time-section for the period of the soaring flight. Additionally, the forecasted atmospheric soundings for the period are displayed. The time-section and soundings are studied together to give the pilot a height-time depiction of the expected weather. I have used the system successfully to produce convective soaring forecasts for national competitions on the east coast and desert southwest of the USA and for mountain wave flights in the eastern USA. The system is demonstrated using a convective forecast and a wave forecast. The forecasts are shown to be valid. The use of the system is encouraged for other locations in the soaring world with reports, especially validations, at the next OSTIV Meteorological Panel meeting.

Background

- Investigated European system in USA
- System has unique presentations of soaring meteorology information
- System not operational in the USA
- A similar presentation is free at *ready.arl.noaa.gov/READYcmet.php*
- USA system can be used world-wide and forecasts up to 8-days

Objectives

This presentation describes how to use the NOAA-ARL-READY server to produce soaring forecast data, how to interpret the data and, most important, validation of the forecasts.

Server limitations

- Not maintained in an ‘operational’ environment
- English-only

Obtaining a time-section of data for a convection forecast

ARL
Air Resources Laboratory
Conducting research and development in the fields of air quality, atmospheric dispersion, climate, and boundary layer

ARL Home > READY > Current & Forecast Meteorology > GFS Meteorogram

GFS Meteorogram

Change Default Model Parameters and Display Options

Starting date/time:	May 17, 2013 at 06 UTC (+ 00 Hrs)		
Forecast duration from starting time:	12 hours		
Fields to plot:	Default	Default with winds	Choose from below
Plot text below wind flags:	None	Speed only	Speed and Direction

(SFC = surface field, 3D = multi-level field)

Field 1:	Mean Sea Level Pressure (SFC)	SFC
Field 2:	Temperature - 2 meters AGL (SFC)	SFC
Field 3:	Accumulated Precipitation (SFC)	SFC
Field 4:	Total Cloud Cover (SFC)	SFC
Field 5:	Mixed Layer Height (SFC)	SFC
Field 6:	Wind Flags (SFC/3D)	SFC
Field 7:	Wind Flags (SFC/3D)	850 mb
Field 8:	Field 8 not selected	SFC
Field 9:	Field 9 not selected	SFC
Field 10:	Field 10 not selected	SFC

Output Options:	Graphic and text		Text only	
Meteorogram size (dpi):	72	84	96	120
Create PDF?	Yes	No		

Type your access code (displayed at right) into the text box. This code is an image that cannot be read by a computer. This access code prevents automated programs from requesting access to READY products, which have saturated the system denying others from obtaining products in a timely manner.

READY Use Agreement

Enter the access code from the box above to request product (case insensitive): rlzpnu Get Meteorogram Reset

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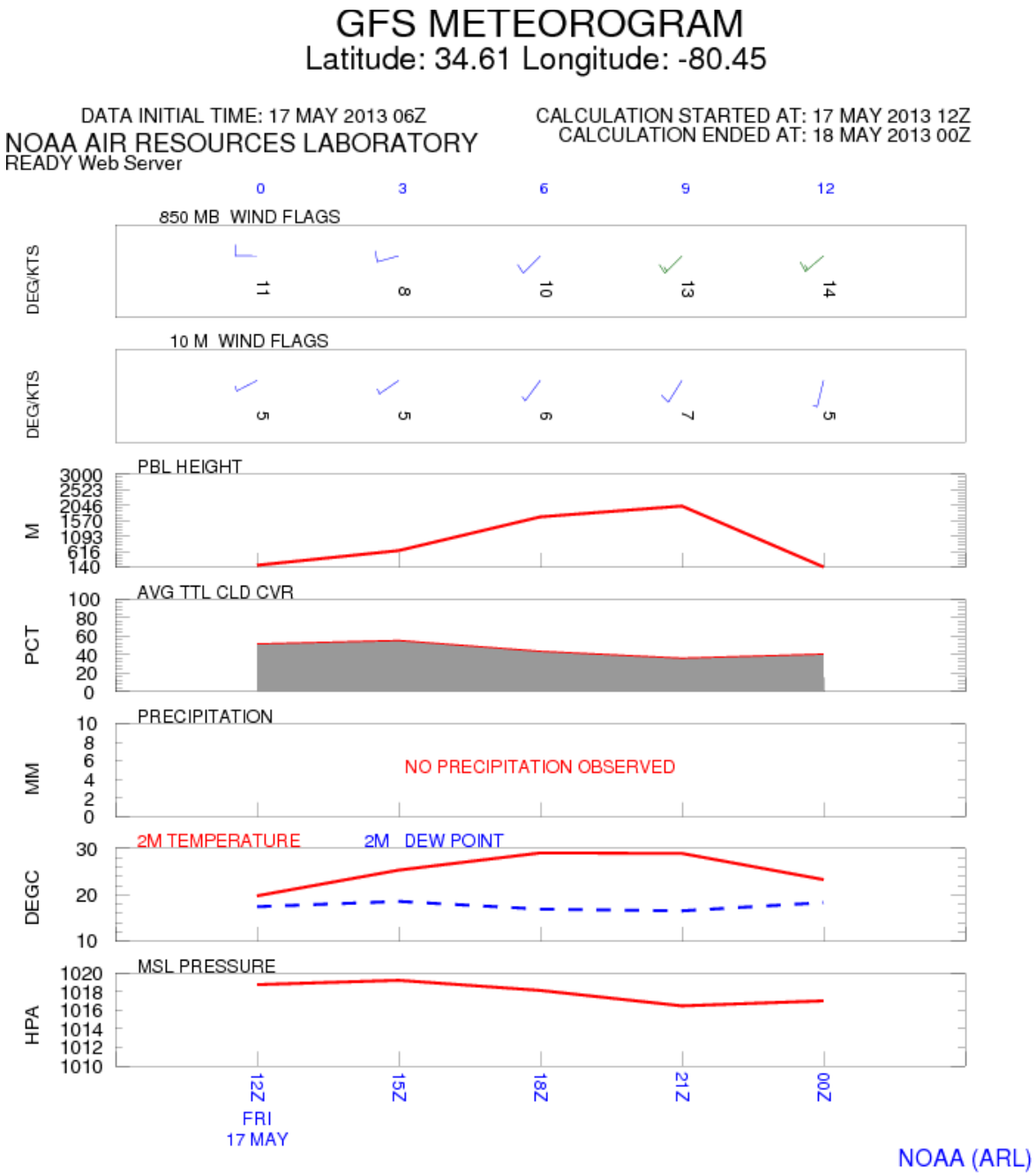
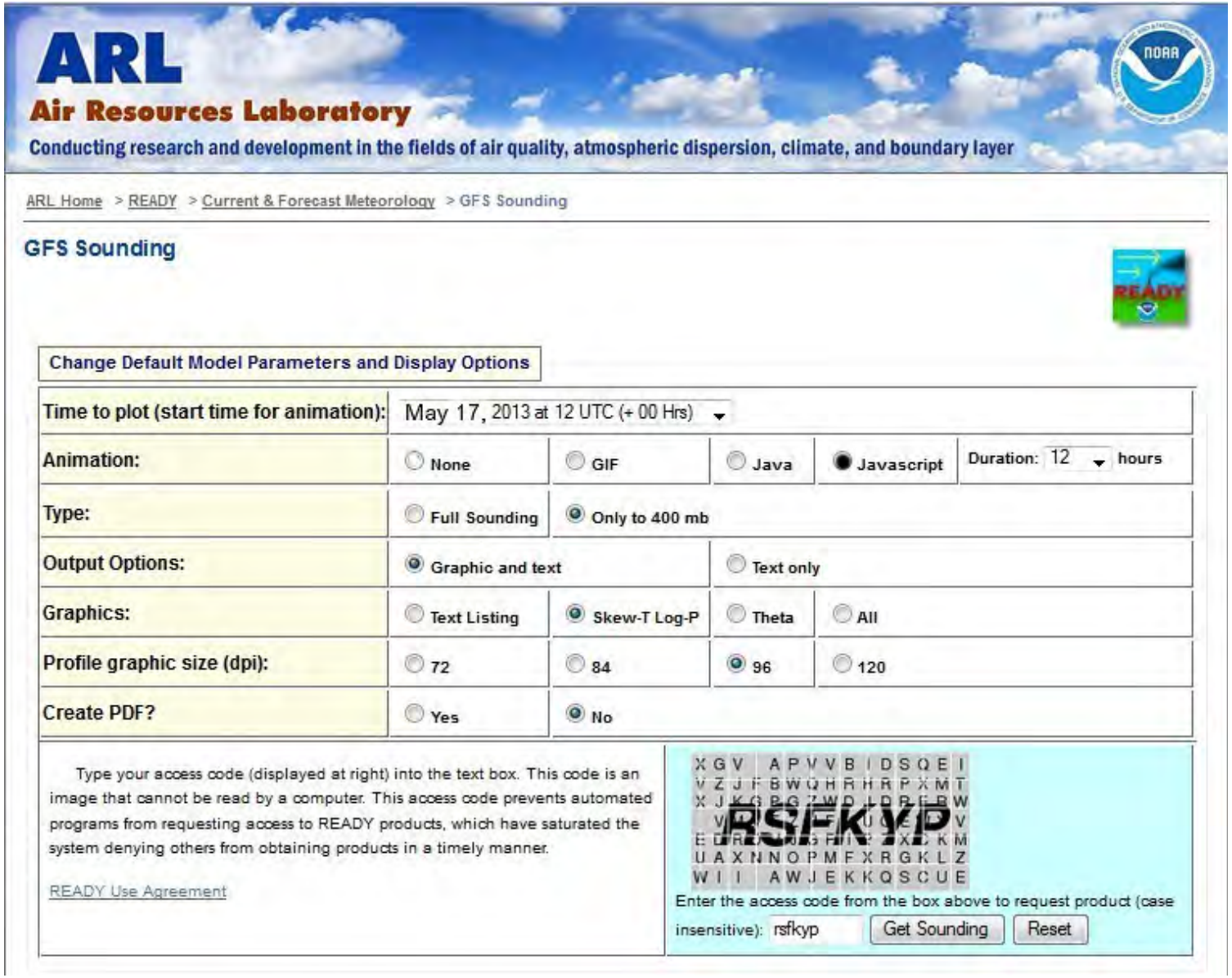
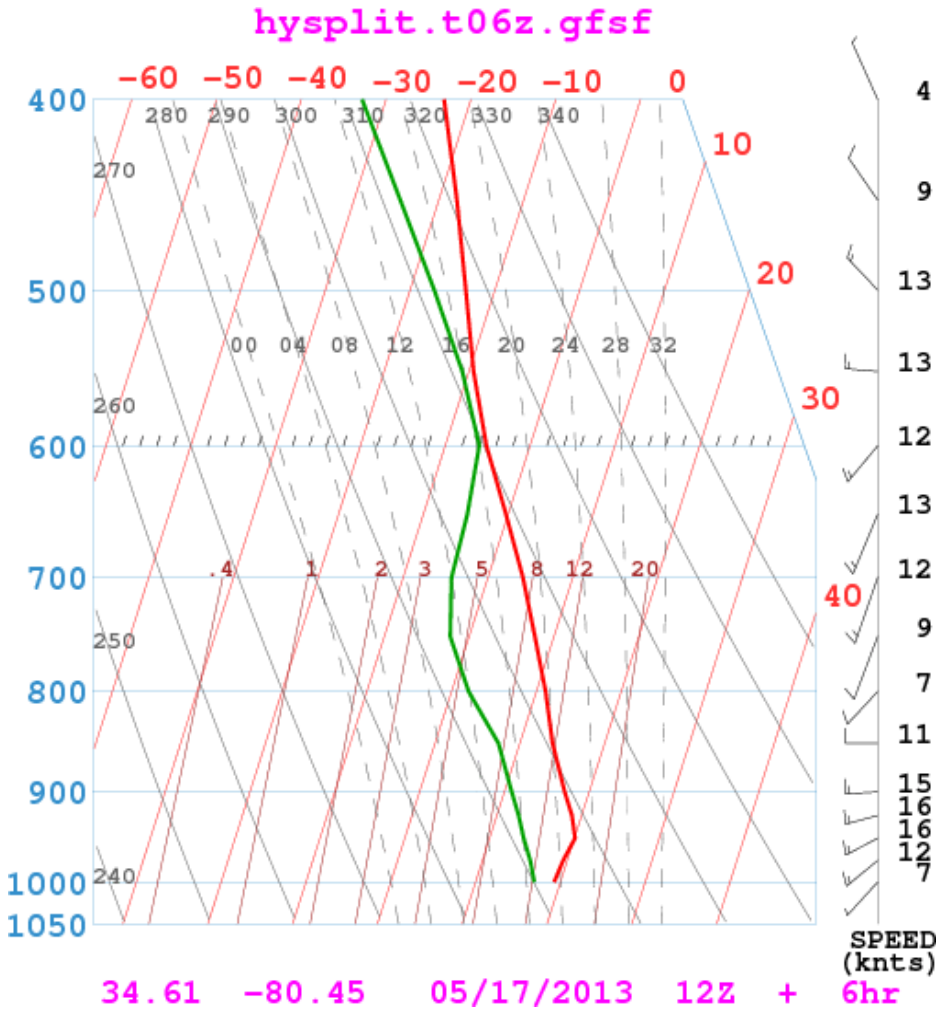
Time-section for a convection forecast

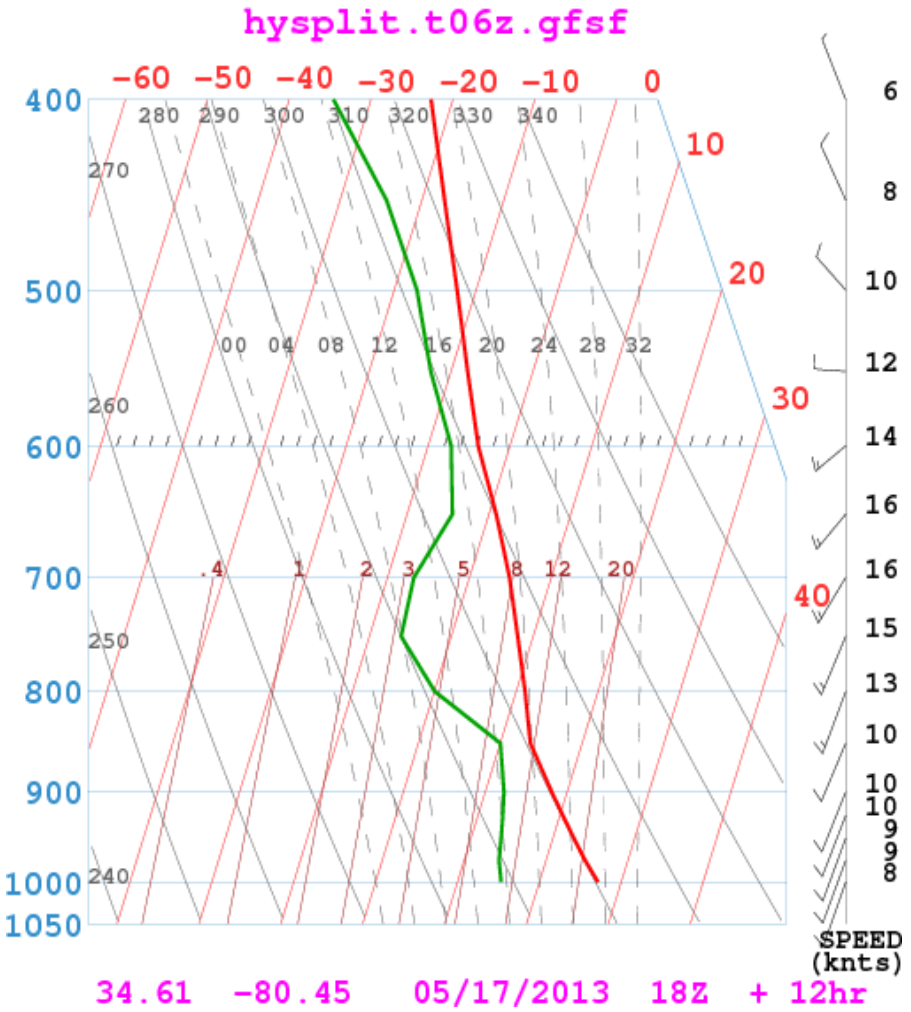


Obtaining atmospheric profiles for a convection forecast



Atmospheric profiles for a convection forecast





Obtaining a time-section of data for a wave forecast

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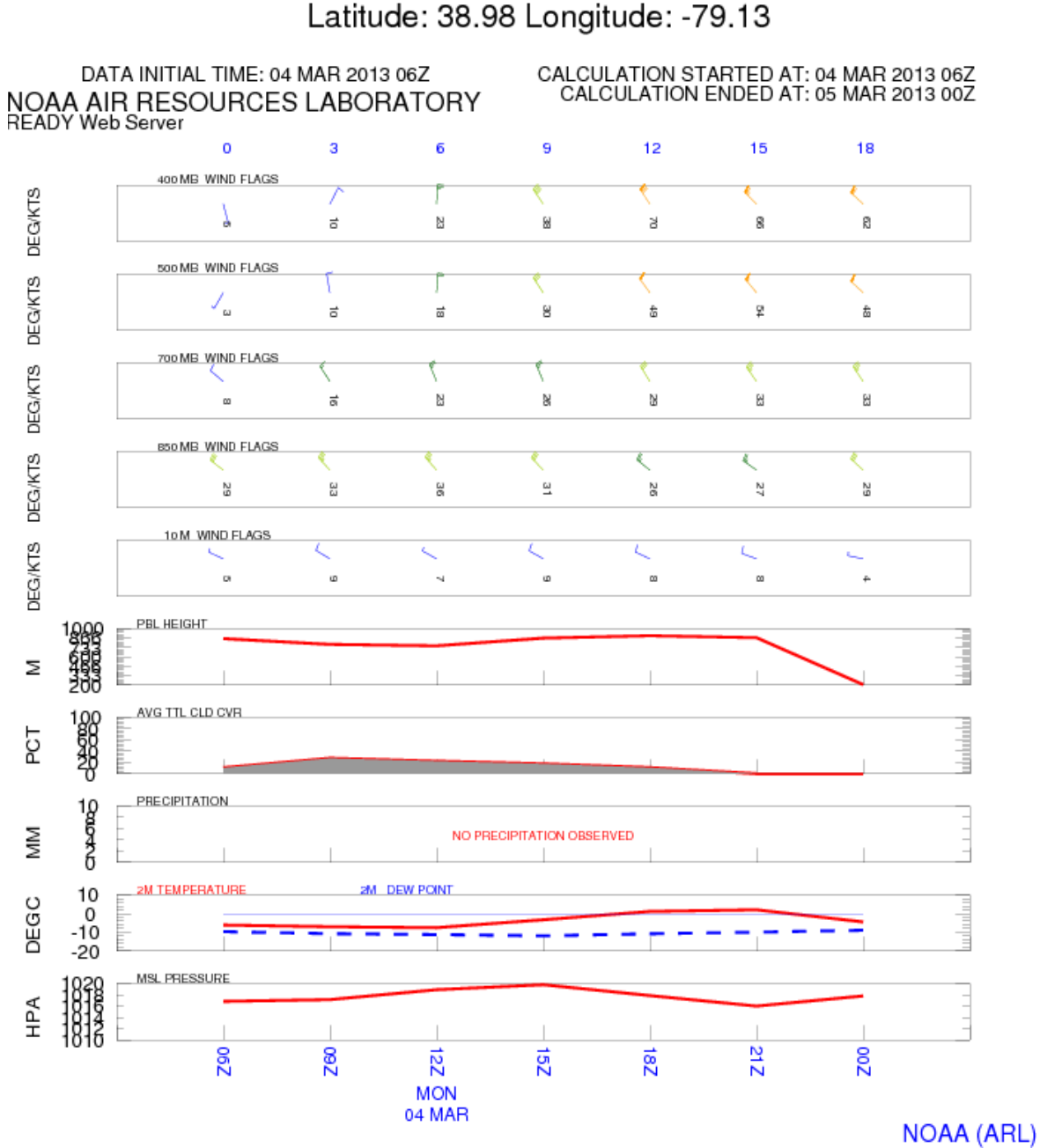
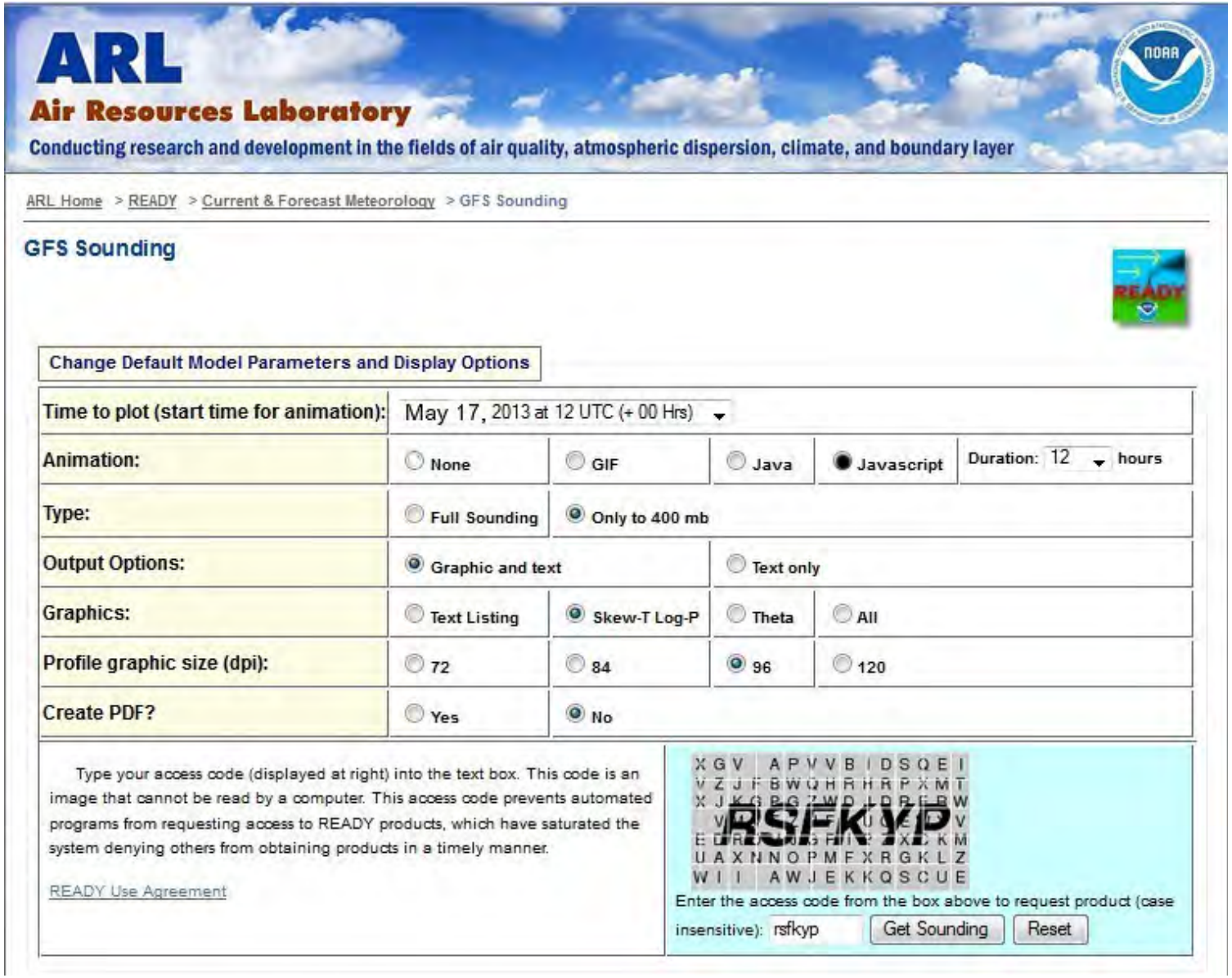
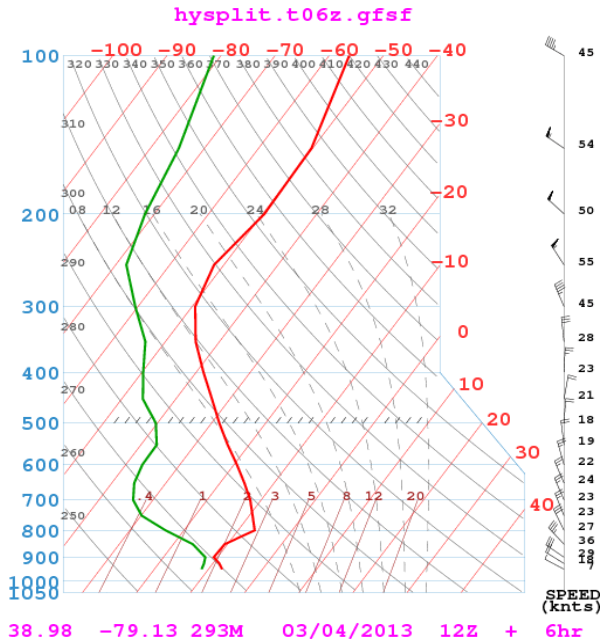
Time-section for a wave forecast

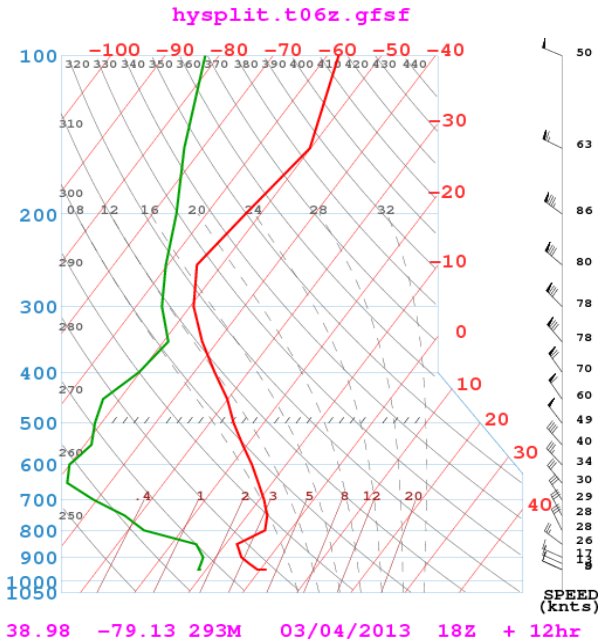


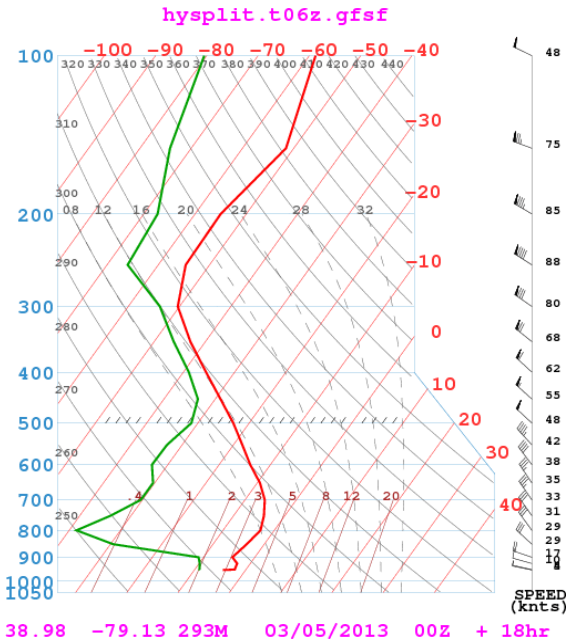
Obtaining atmospheric profiles for a wave forecast



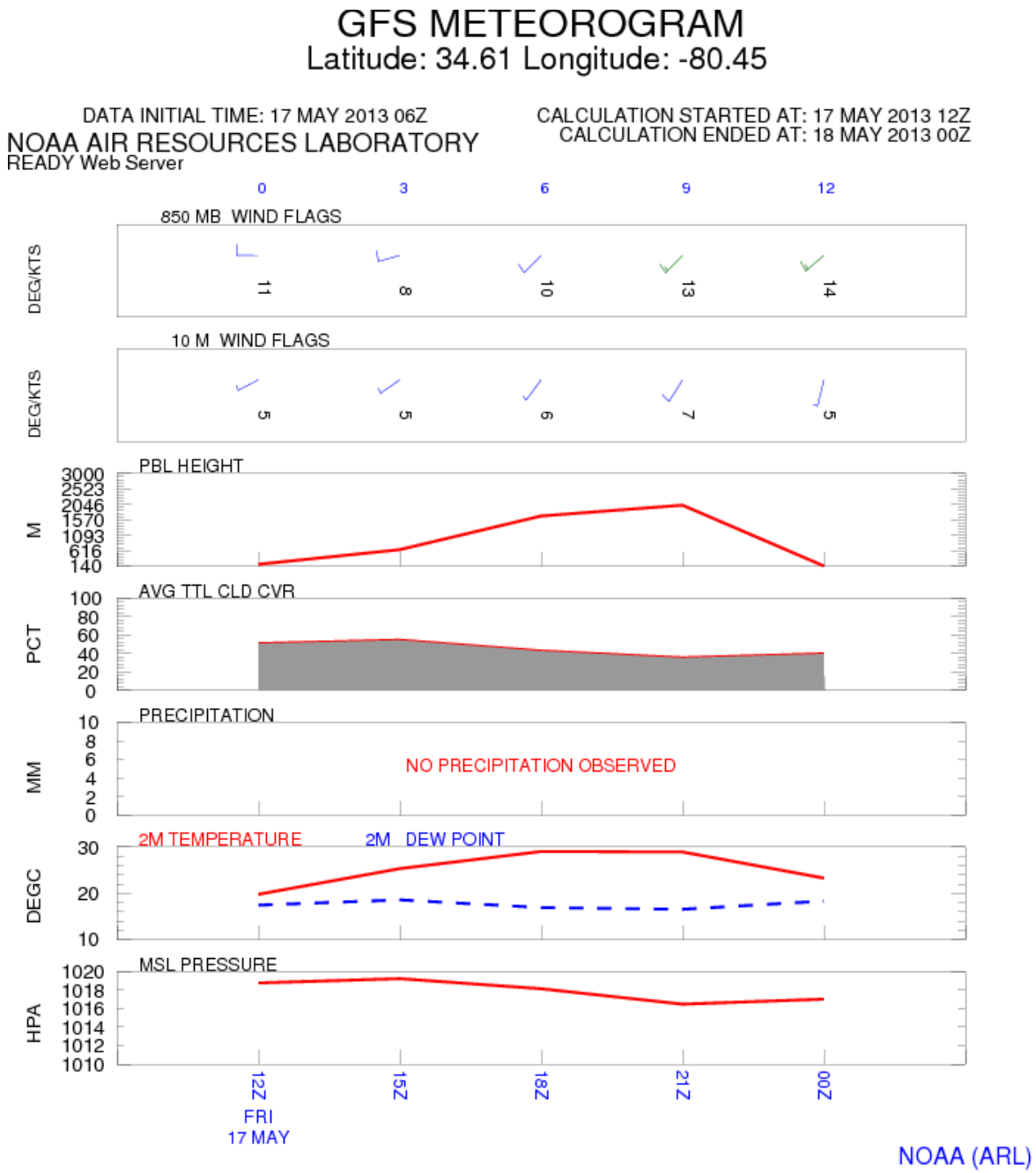
Atmospheric profiles for a wave forecast







Interpreting the time-section for a convection forecast



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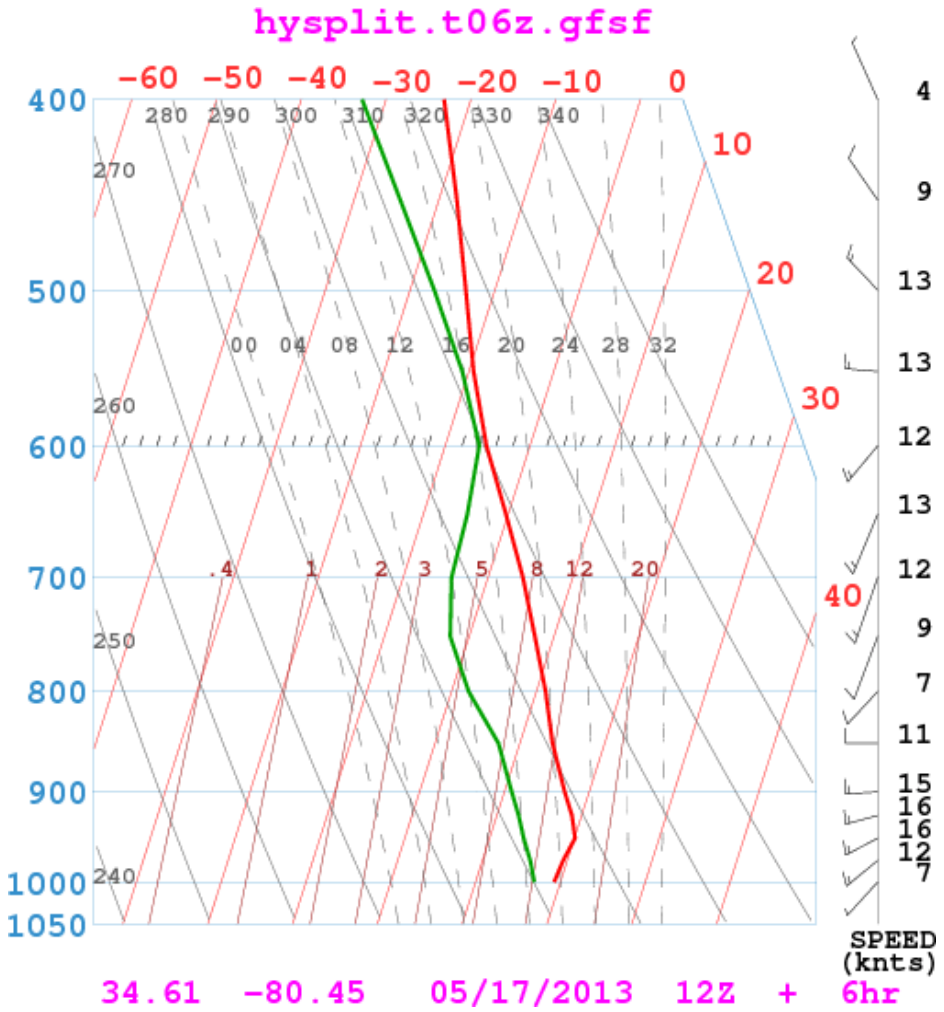
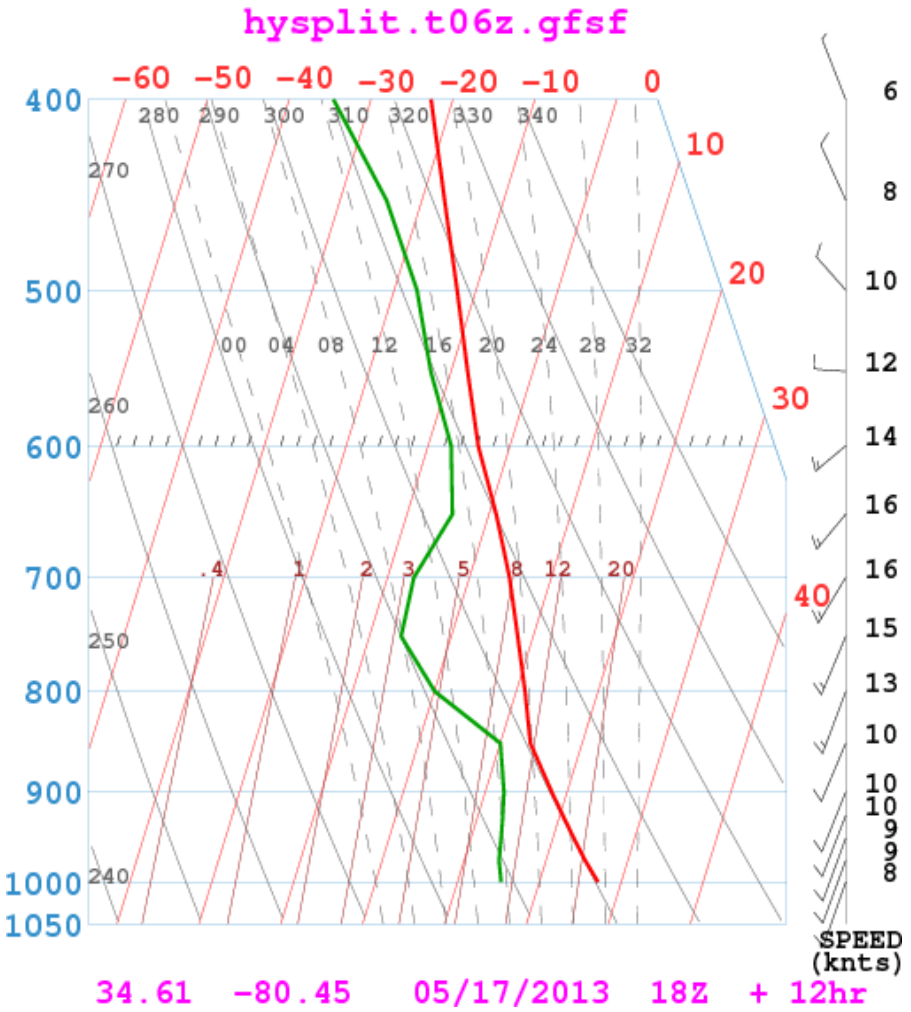
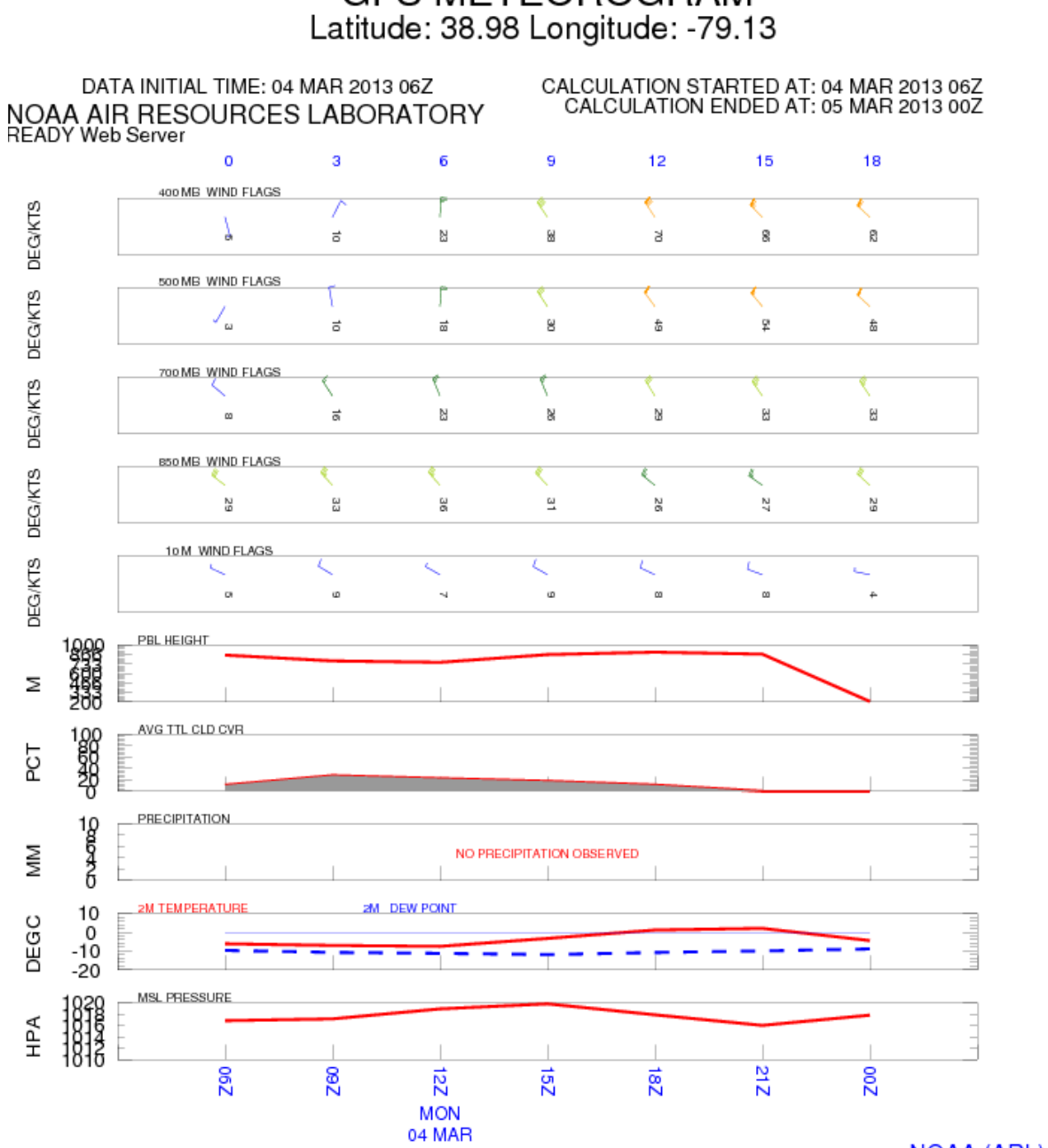




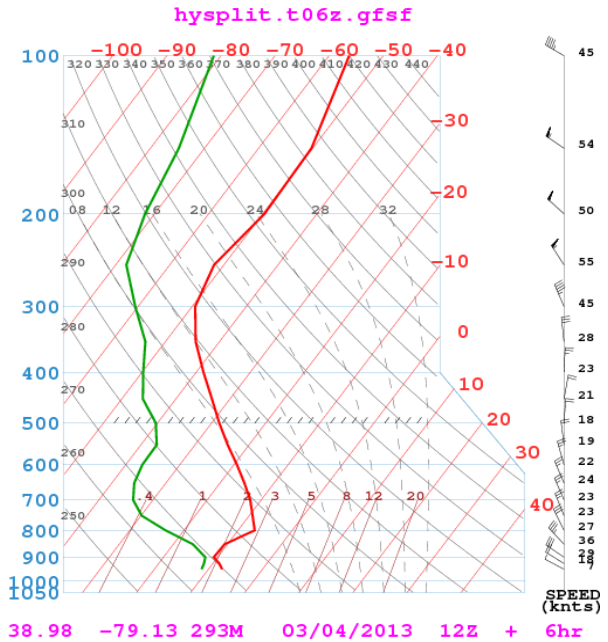
Estimating thunderstorm potential for a convection forecast

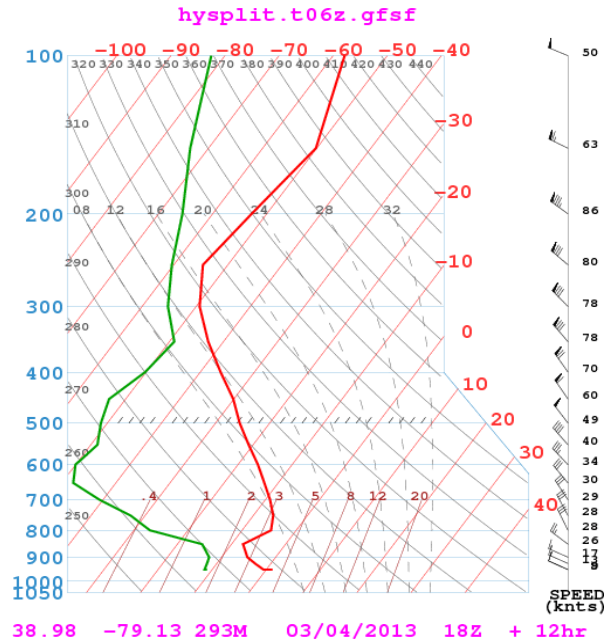
The potential for thunderstorm development (K Index) can be estimated graphically from the forecasted morning (12 Z) atmospheric profile: $K = (T_{850} - T_{500}) + (Td_{850} - Tdd_{700})$ where T_{850}, T_{500}, Td_{850} are the temperatures (C) at those pressure levels (mb) and Tdd is the dew-point depression at the 700 mb level. A K value between 15 and 25 indicates a small potential, between 26 and 39 indicates a moderate potential and 40+ indicates a large potential. The value from the morning profile in was 25, a small potential.

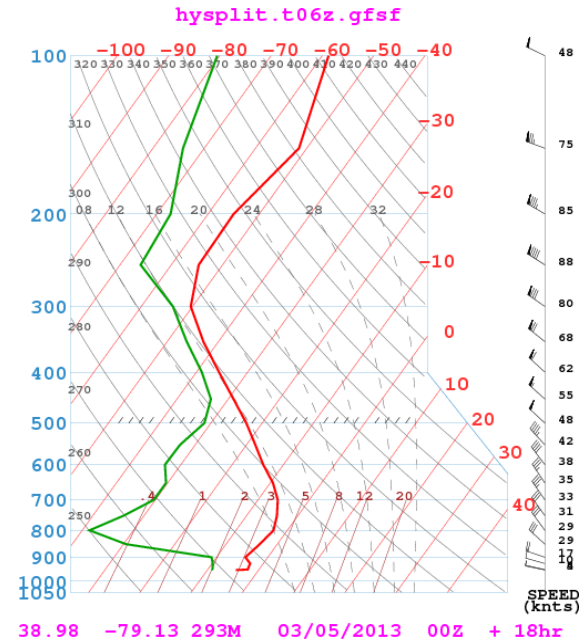
Interpreting the time-section for a wave forecast



Interpreting atmospheric profiles for a wave forecast







Validating the convection forecast: Criteria

A soaring forecast is a success if the task that was set based on the forecast had a large number of completions (few land-outs) and close 1st, 2nd and 3rd place finishers. The forecast led to a 207 nautical mile turn-area-task (TAT), with a minimum and maximum distance of, respectively, 105 and 319 nautical miles with a minimum time on course of 3.5 hours.

Validating the convection forecast: Results

Results from the 18 Meter Nationals, Contest Day 7 (last contest day), 17 May 2013

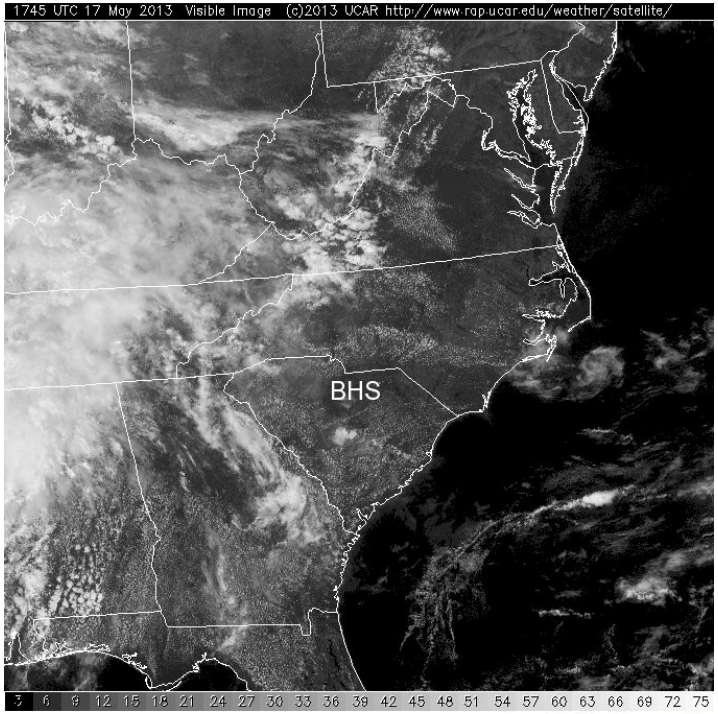
Cumulative		Pilot			Day					
Rank	Points	ID	Name	Glider	Rank	Points	Speed	Distance	Start Time	TOC
1	6187	DJ	Jacobs, D.	Ventus	4	905	66.85	237.09	13:47:33	03:32:47
2	6173	XG	Szemplinski, J.	ASG-29	1	1000	73.86	260.92	13:50:04	03:31:57
3	6153	P7	Ittner, G.	ASG-29	2	968	71.50	250.63	13:47:12	03:30:19
4	5882	JW	Walker, J.	Ventus	5	896	66.20	235.40	13:50:20	03:33:21
5	5695	F2	Fidler, S.	LAK	9	847	62.59	226.81	13:49:50	03:37:25
6	5575	CG	Garner, C.	Duckhawk	3	930	68.67	241.64	13:53:00	03:31:08

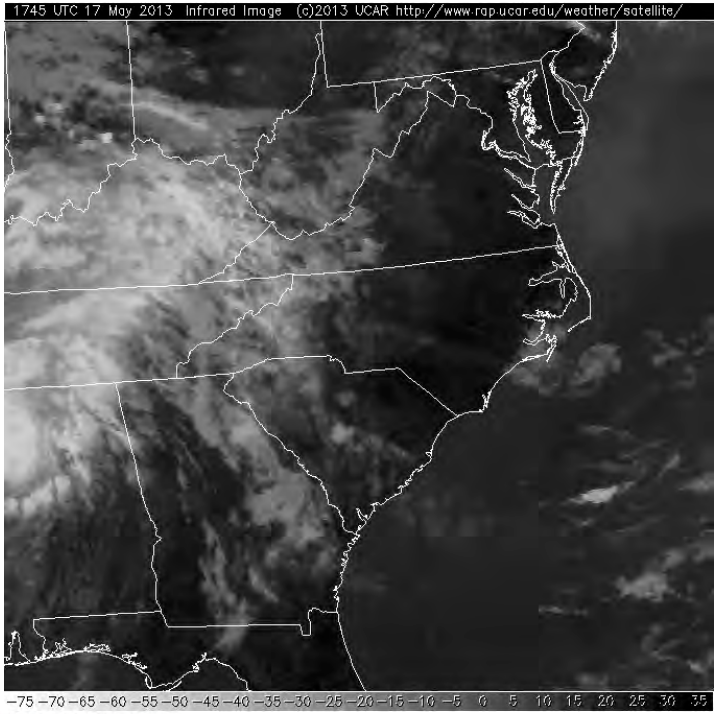
Validating the convection forecast: Thermals

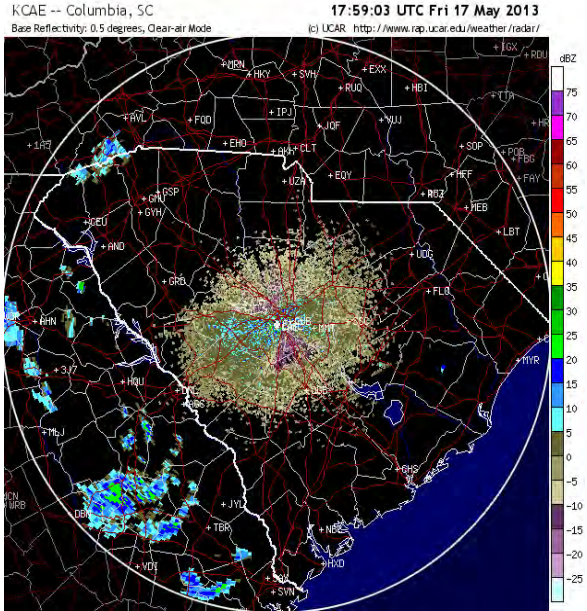
18 Meter Nationals, 17 May 2013, Predicted and Actual Meteorology

	Max thermal heights (m ASL)		Average updraft speeds (m/s)		Winds aloft (DEG/km/h)	
ID	**Predicted**	**Actual**	**Predicted**	**Actual**	**Predicted**	**Actual**
XG	2040	2200	2.0	1.4	225/19	222/15
P7	2040	2200	2.0	1.7	225/19	218/14
CG	2040	2200	2.0	1.5	225/19	217/16

Validating the convection forecast: Clouds



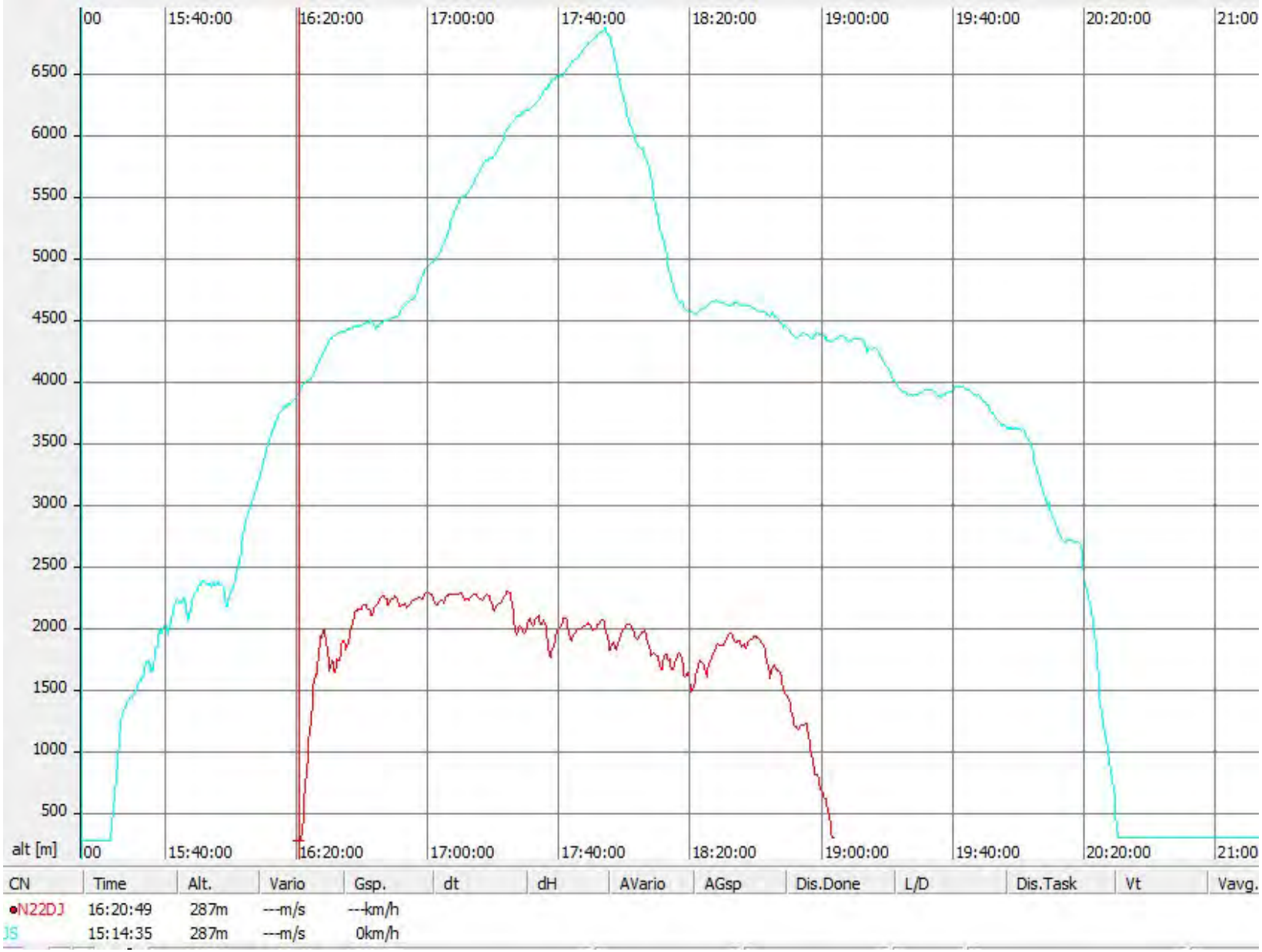




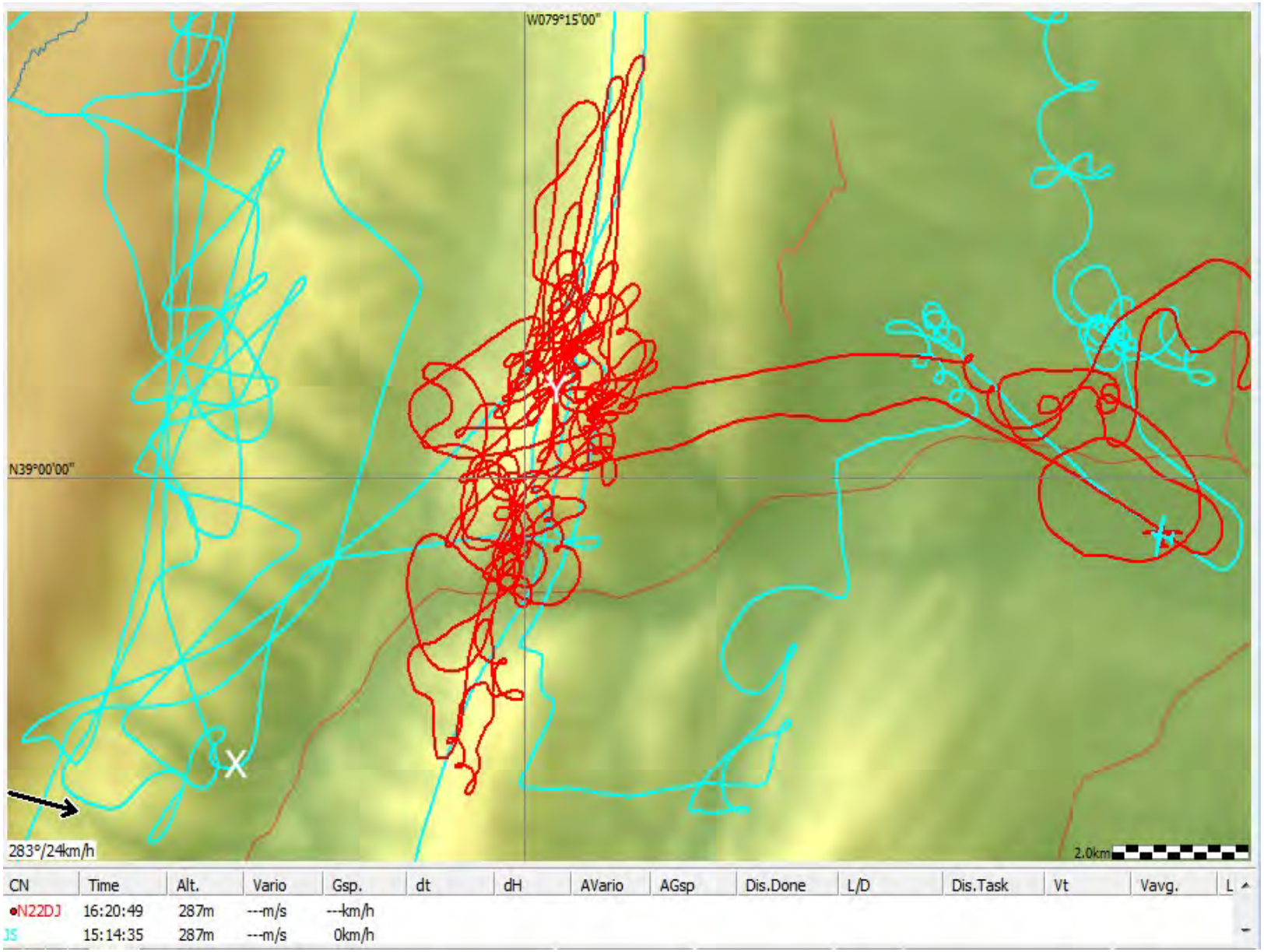
Validating the wave forecast: Background

The forecast was for the day after the scheduled end of the wave camp. The forecast was so promising that the organizers agreed to keep the tow plane at the campsite one more day. However, a significant snowstorm was forecasted to arrive early the next day. So, the organizers would provide only morning tows; they needed the afternoon to fly the tow plane to its home base. Because the wave was forecasted to be strongest in the afternoon, I took the last launch in my HP-14T glider (N22DJ). Two other pilots launched before me, one flying a PIK-20 glider (N9Z) and the other an LS-4 glider (N370JS). The pilot of 'JS' and I were attempting to earn the FAI Diamond-altitude, a documented climb of 5 km from low- to high-point.

Validating the wave forecast: Barograms



Validating the wave forecast: Plan-view



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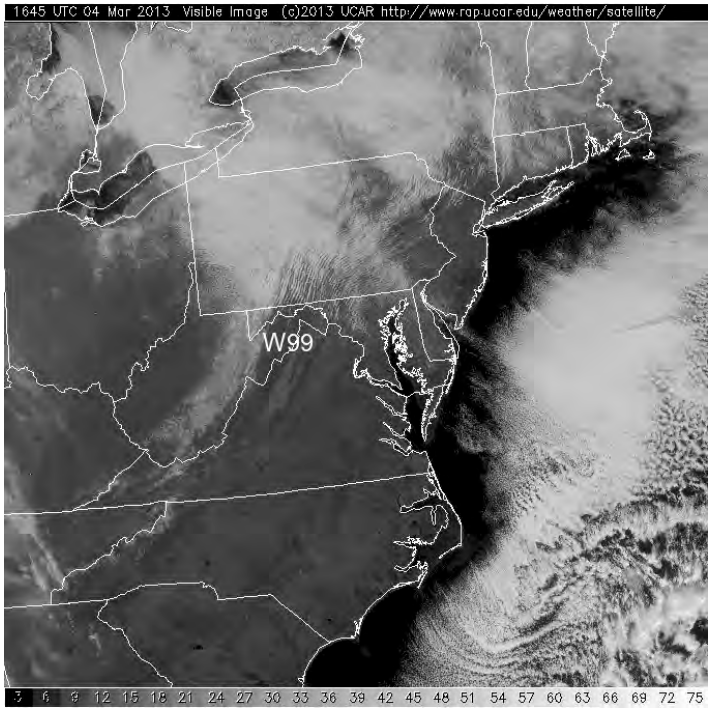
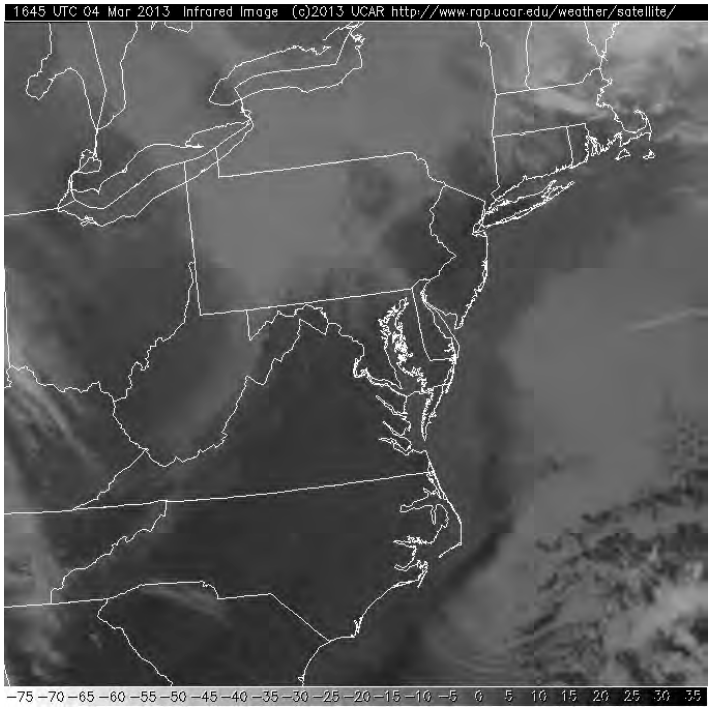




Visible (left), infrared (right) satellite images for 1645 EST (1645 Z), 17 May 2013. The location of Petersburg WV is identified (the lower-left corner of the 'W' in W99) in the visible image. The white regions just west of W99 is snow cover on the Allegany Plateau, not clouds.

Validating the wave forecast: Clouds

1326 Z (0826 EST)

1430 Z (0930 EST)

1538 Z (1038 EST)

2027 Z (1527 EST)

4 March 2013 looking west from Petersburg Airport towards the escarpment of the Allegany Plateau. The plateau is visible through the Hopewell Gap.

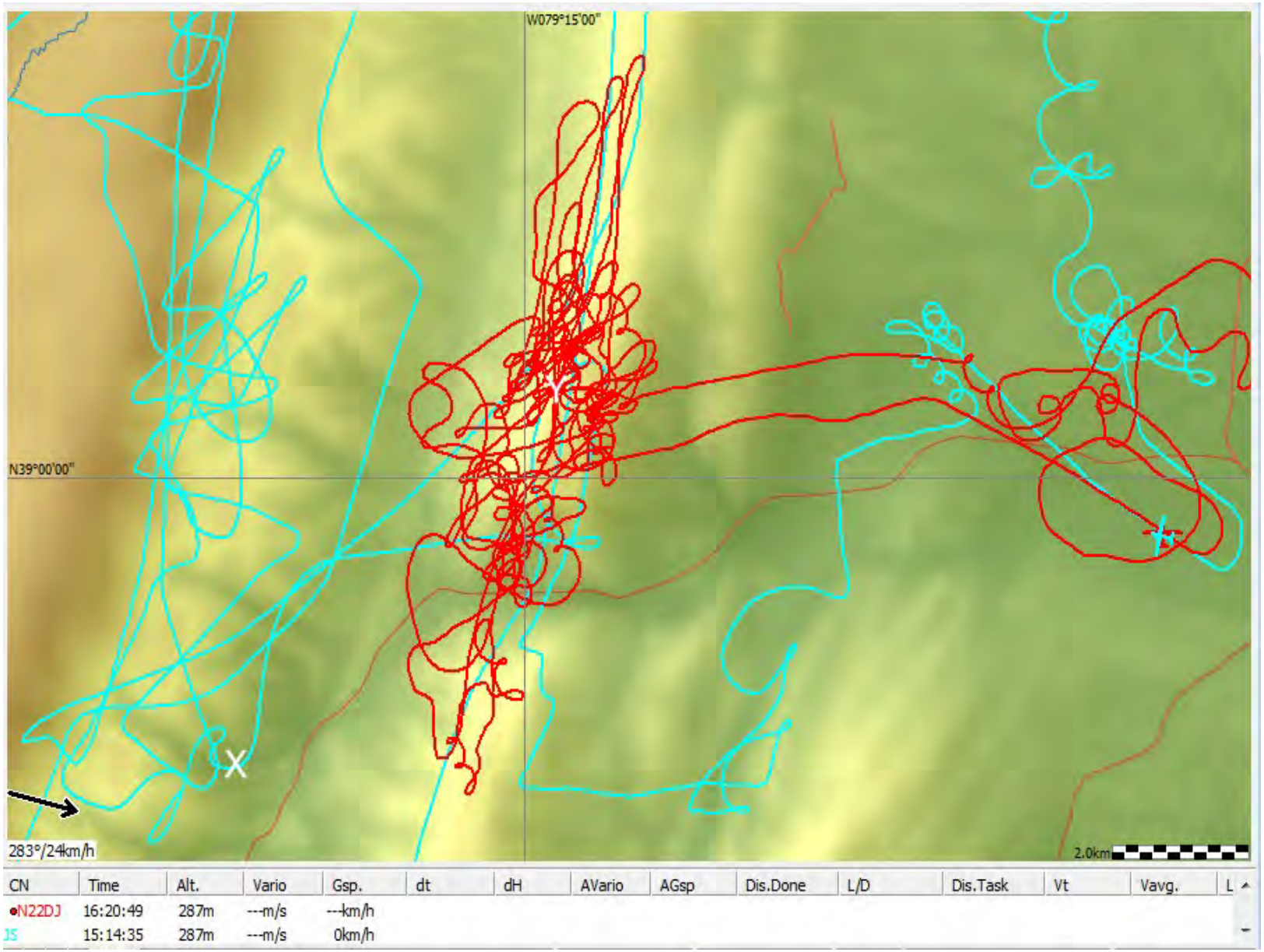
Validating the wave forecast: Winds

Measured and predicted winds aloft for 18 Z (13 EST) wind speeds
for 4 March 2013 at Petersburg VW (1300 EST)

Pressure Level (mb)	Altitude (km ASL)	Measured (DEG/ kmh^{-1})	Predicted (DEG/ kmh^{-1})
450	6.22	308/48	318/104
500	5.47	308/48	314/80
550	4.77	308/48	310/63
600	4.12	308/48	312/60
650	3.52	308/48	317/57
700	2.95	308/48	322/54
750	2.41	308/46	323/55
800	1.90	307/43	318/55
850	1.43	307/41	309/42
900	0.98	290/16	298/29
950	0.28 (surface)	300/18*	295/19

*From METAR

Validating the wave forecast: Plan-view



Conclusions

This presentation described how to use the NOAA-ARL-READY web-server to produce forecasted meteorological data, how to interpret the data to produce a soaring forecast and how to validate the forecast.

A convection forecast was presented for 17 May 2013, a day during a glider contest in the Piedmont region of southeastern USA. The following predictions were made: winds at the surface and at the top of the convectively-mixed boundary layer, depth, timing and strength of the convection, cloud cover and the potential for thunderstorm development. These predictions were validated using analyses of glider flight recorder data, meteorological satellite and radar images and results from the day's task. The predictions were shown to be valid; a 1000 point day was flown.

A wave forecast was presented for 4 March 2013, a day during a wave camp in the mountains of West Virginia. The following predictions were made: winds and the surface and aloft to near the Tropopause, strength of updrafts, the base and top of the wave and cloud cover. These predictions were validated using analyses of glider flight recorder data, meteorological satellite images and photographs from the surface. The predictions were shown to be valid; a 5 km Diamond altitude ascent was flown.

To determine the robustness of the forecast system, the system needs to be employed at other locations in the soaring world with reports, especially validations, at the next OSTIV Meteorological Panel meeting.