

VORTRAC – A Utility to Deduce Central Pressure and Radius of Maximum Wind of Landfalling Tropical Cyclones Using WSR-88D Data

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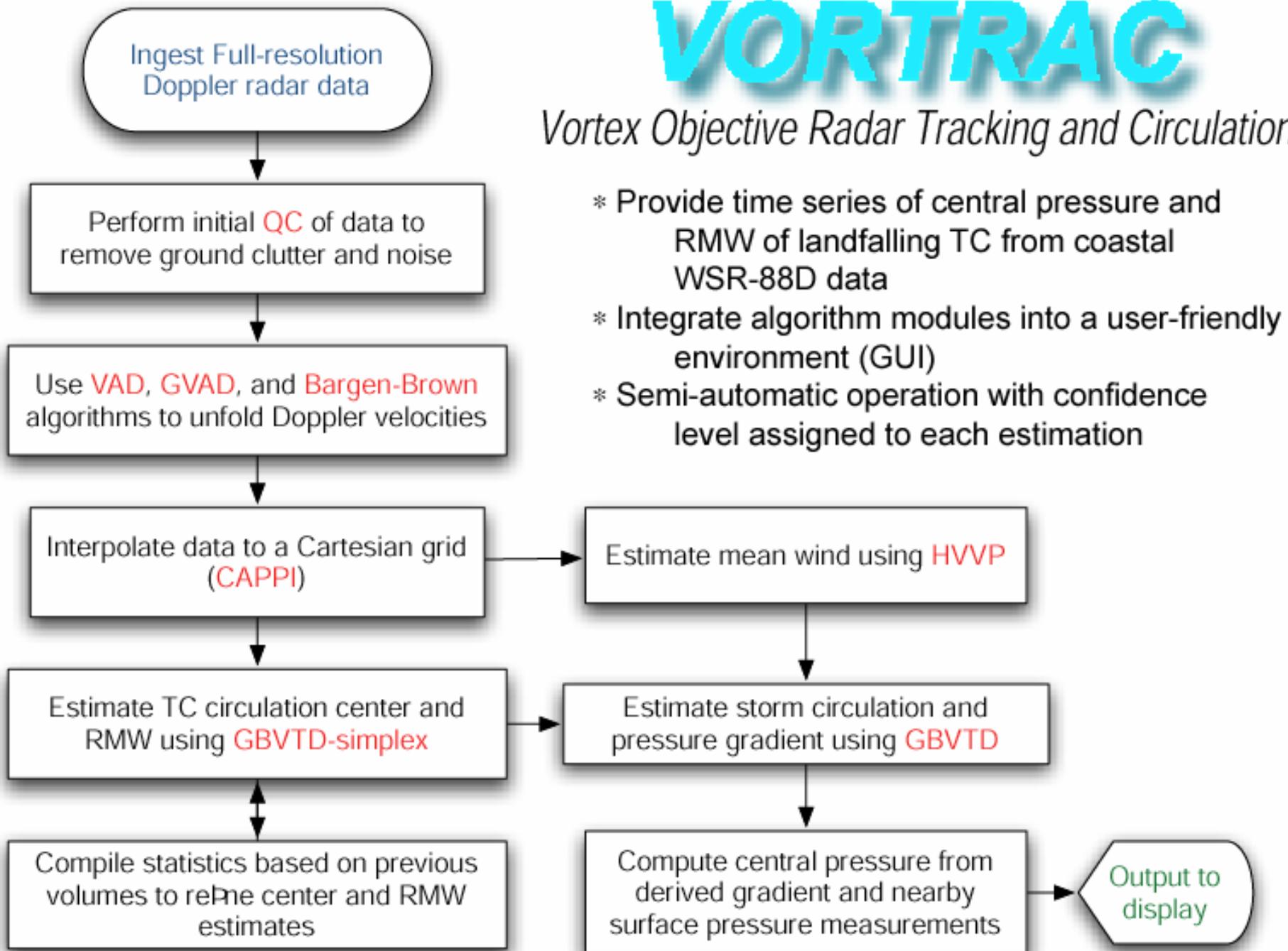
Progress Report

- A preliminary version of VORTRAC was installed at NHC July 2006
- Real time test run using LDM radar feed during Ernesto (2006)
- Graphical User Interface (GUI) improvements after receiving feedback from NHC
- Implementation of the objective center finding algorithm



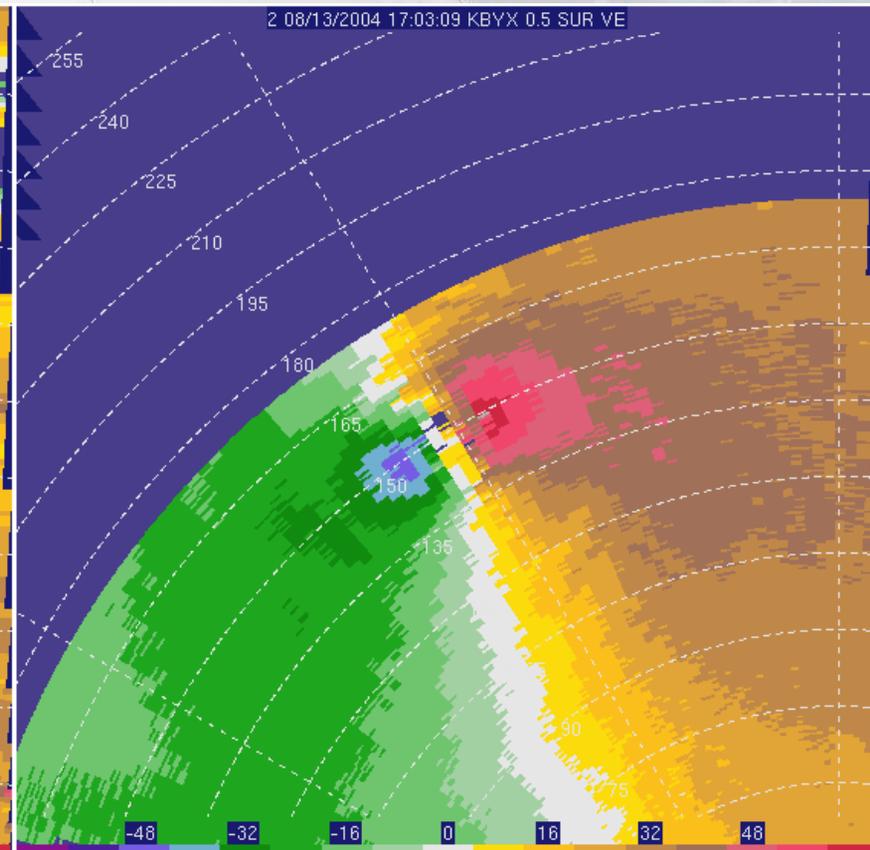
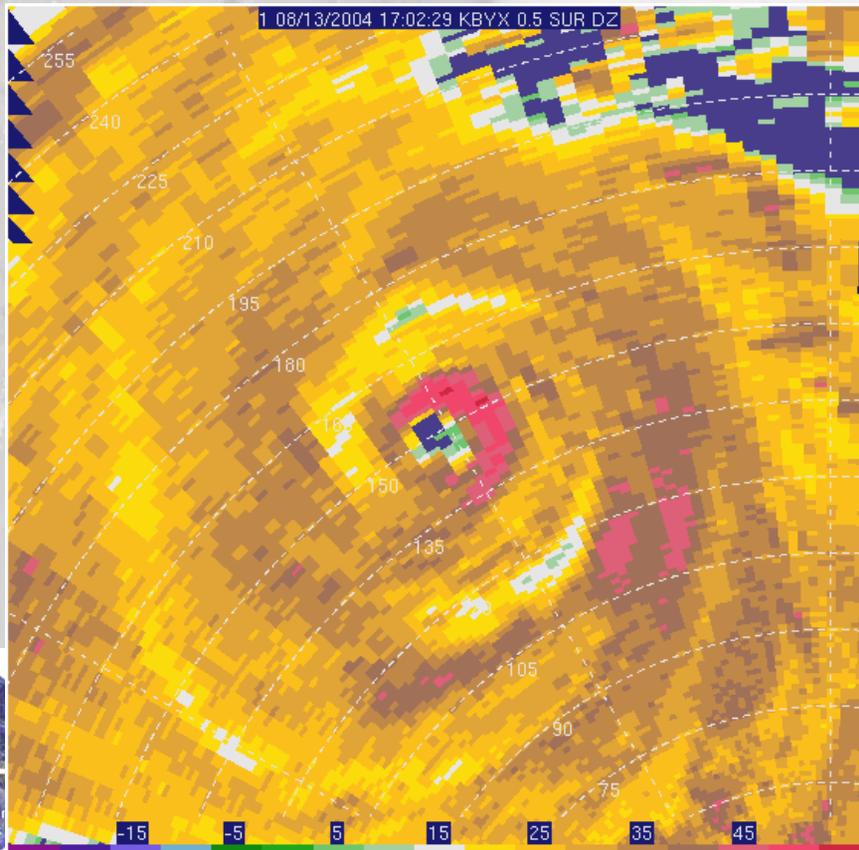
VORTRAC

Vortex Objective Radar Tracking and Circulation



Basic Assumptions

- A single circulation center and the center can be identified accurately
- Gradient wind balance

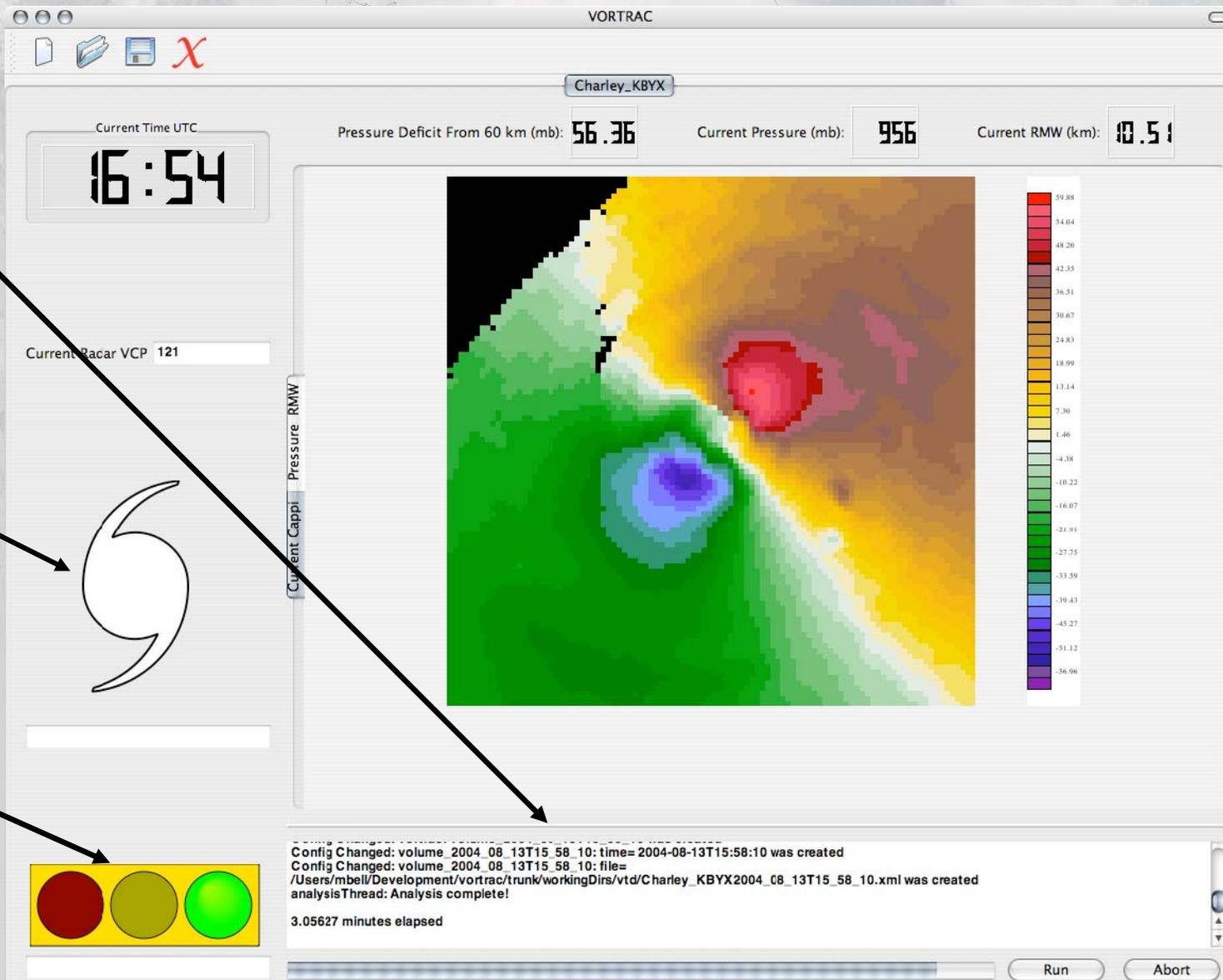


GUI Improvements

Status
Log and
Progress
Bar

Storm Status

Program
Status





Charley_KBYX

Current Time UTC

16:52

Pressure Deficit From 60 km (mb): 56.36

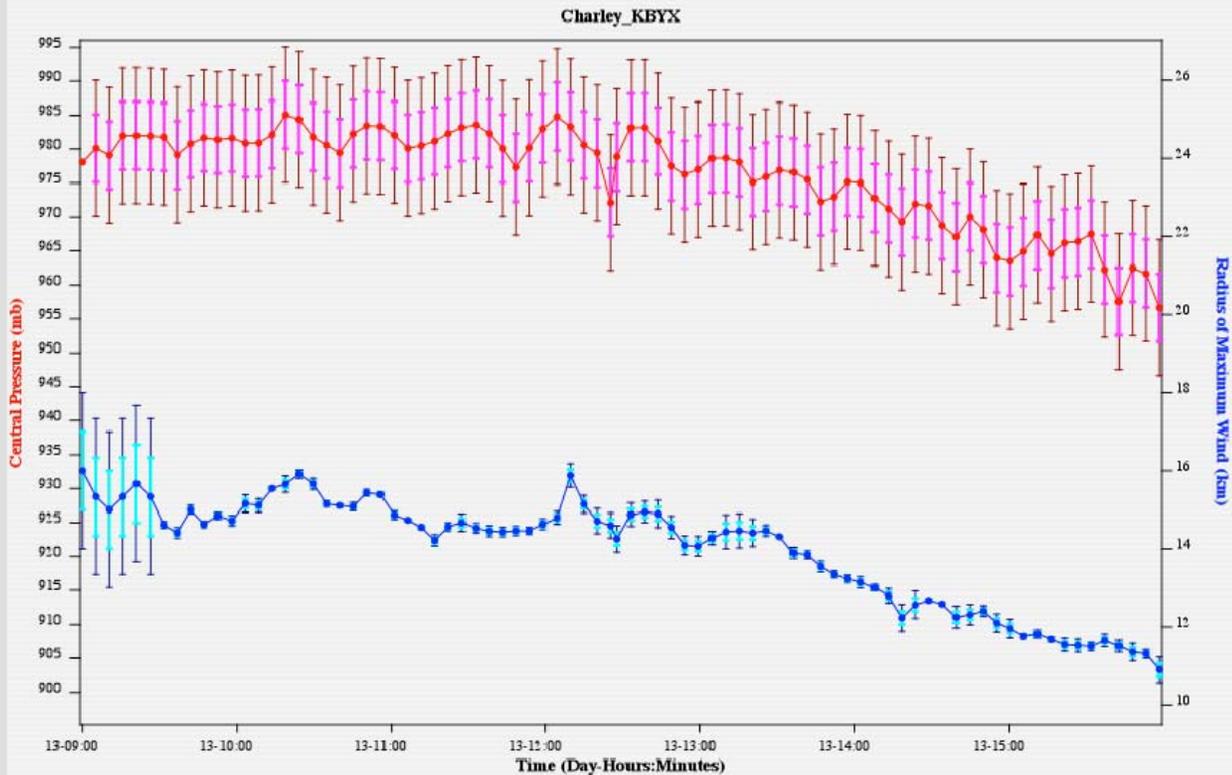
Current Pressure (mb): 956

Current RMW (km): 10.51

Current Radar VCP 121



Current Cappi Pressure RMW



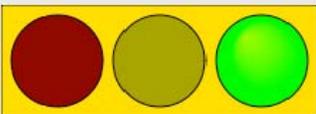
See Legend

Plot Example Points

Save Graph

Config Changed: volume_2004_08_13T15_58_10: time=2004-08-13T15:58:10 was created
 Config Changed: volume_2004_08_13T15_58_10: file=
 /Users/mbell/Development/vortrac/trunk/workingDirs/vtd/Charley_KBYX2004_08_13T15_58_10.xml was created
 analysisThread: Analysis complete!

3.05627 minutes elapsed



Run

Abort



VORTRAC CONFIGURATION

Vortex Configuration

Radar Configuration

CAPPI Configuration

Simplex Configuration

Choose Center Configuration

VTD Configuration

HVVP Configuration

Pressure Configuration

Graphics Configuration

Quality Control Configuration

Vortex Name: Charley

Cyclone Magnitude

- Hurricane
- Tropical Storm
- Tropical Depression

Vortex Latitude: 25.70

Vortex Longitude: -82.50

Direction of vortex movement (degrees cw from north): 20.00

Speed of vortex movement (m/s): 10.00

Time of Above Observations: Aug-13-2004 17:00:00

Working Directory

./workingDirs

Browse..

Apply

Cancel

Initial storm position and motion can be preset before TC enter radar range

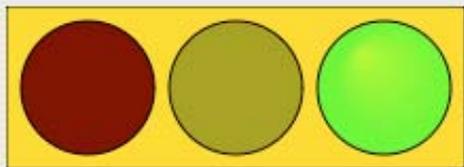


Countdown

Current Radar VCP



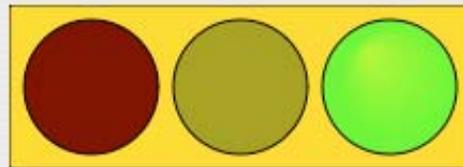
Storm in range in 86 min



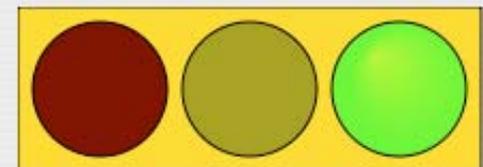
Current Radar VCP

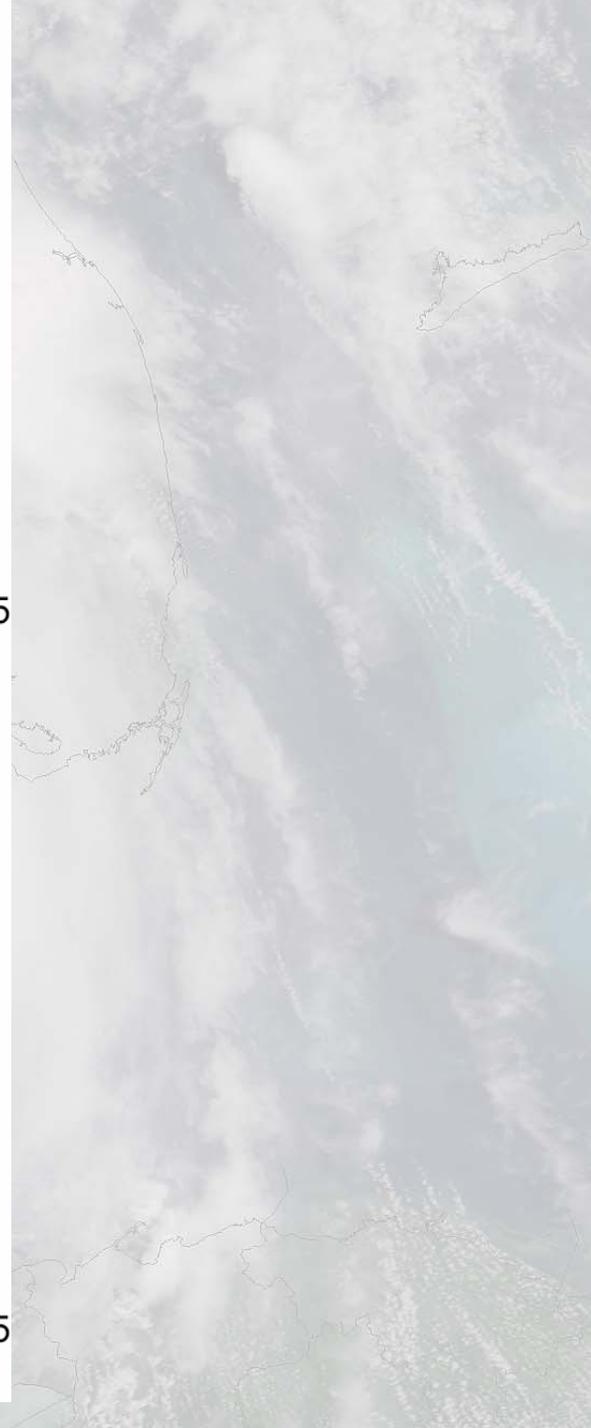
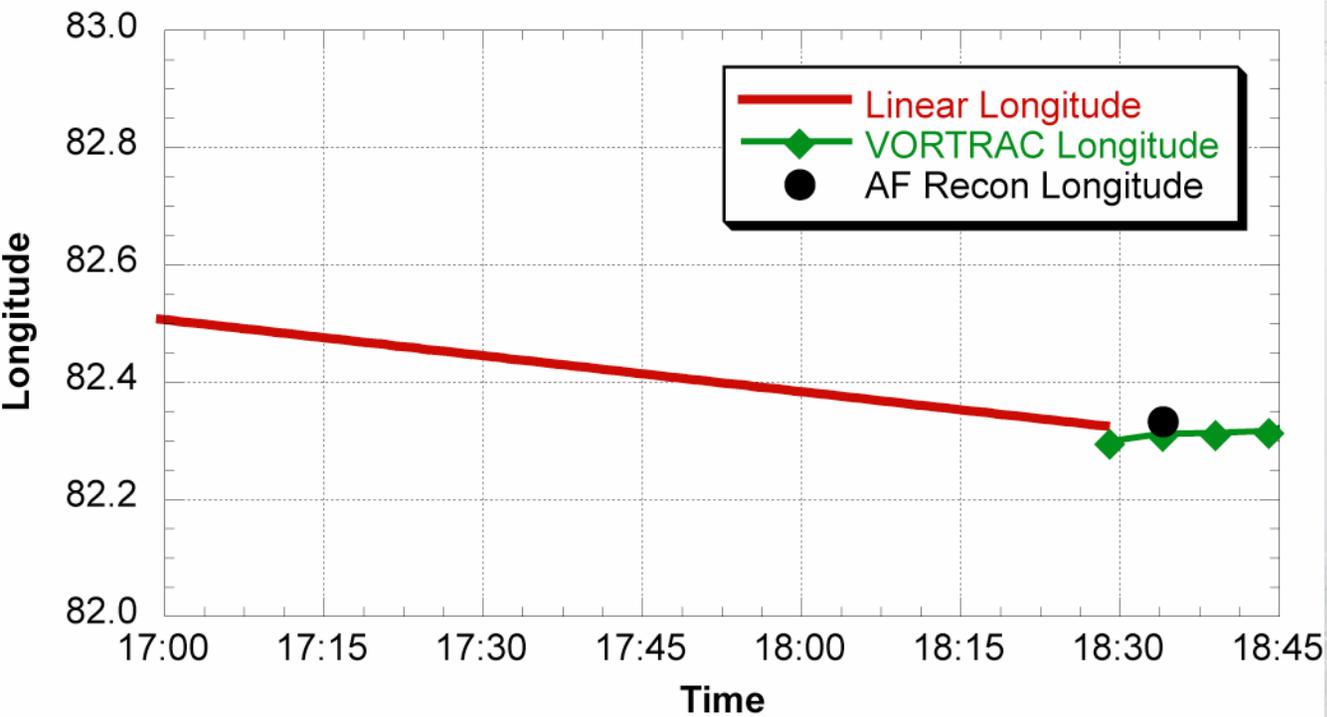
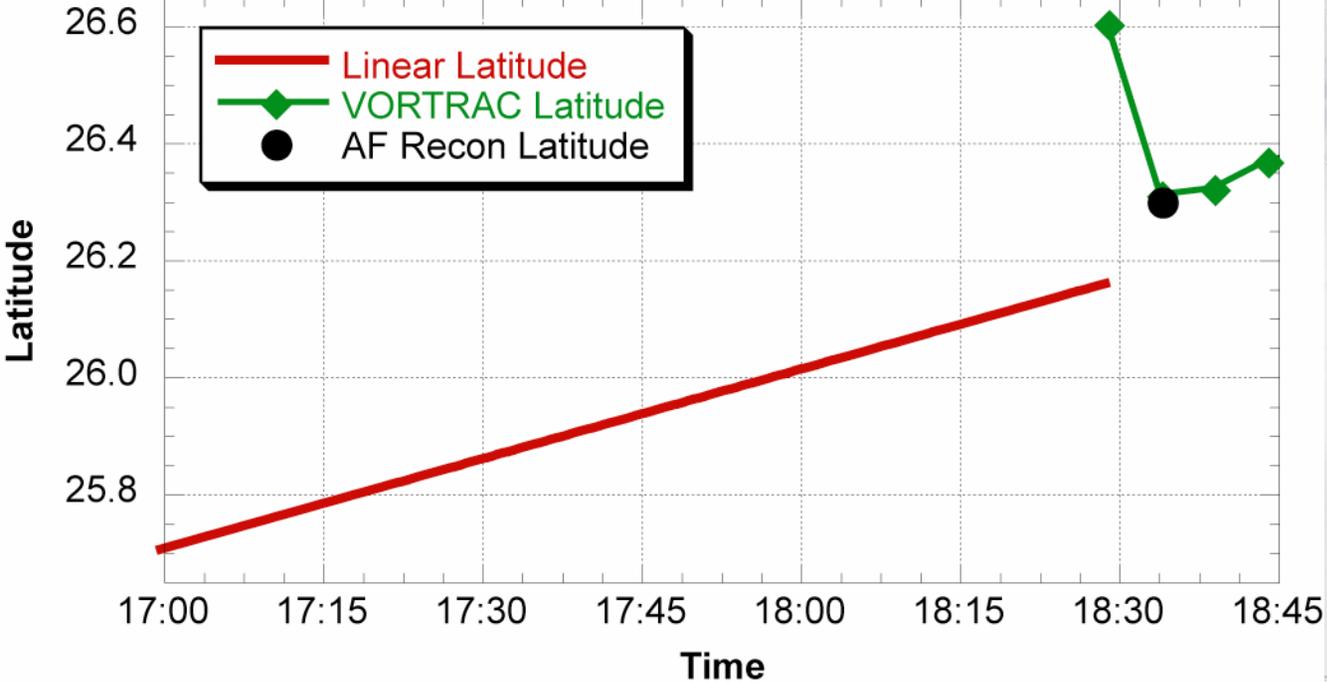


Storm in range in 2 min



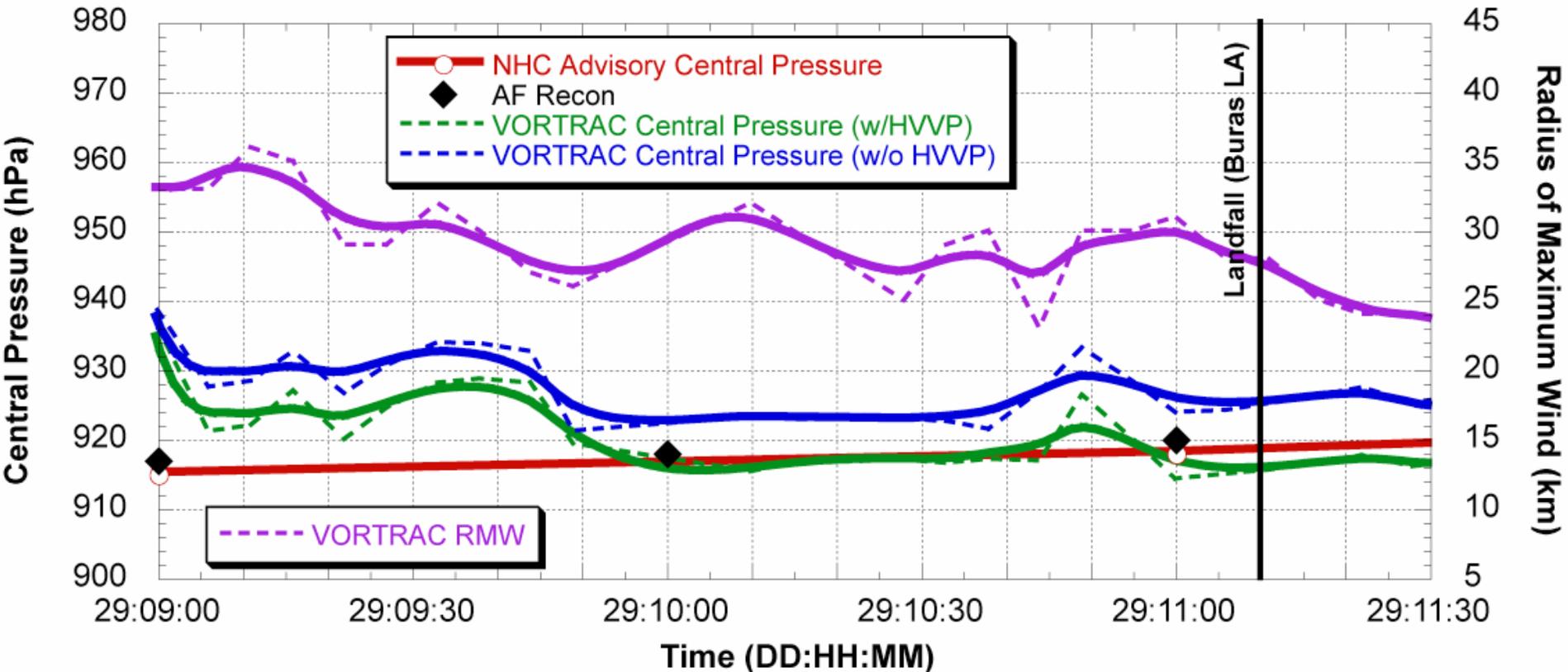
Current Radar VCP





Hurricane Katrina (2005)

Hurricane Katrina (2005)
Central Pressure and Radius of Maximum Wind Estimates



Summary

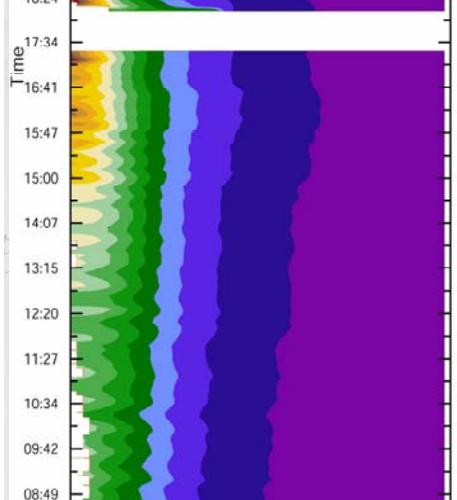
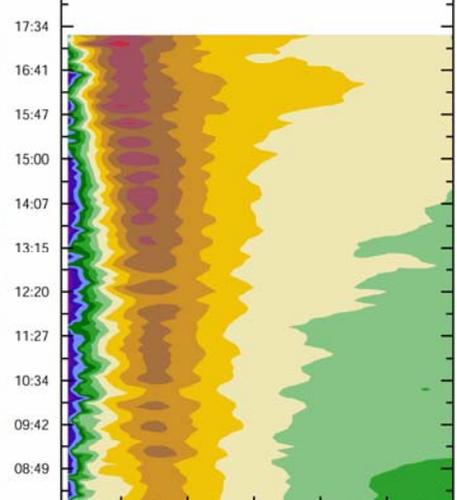
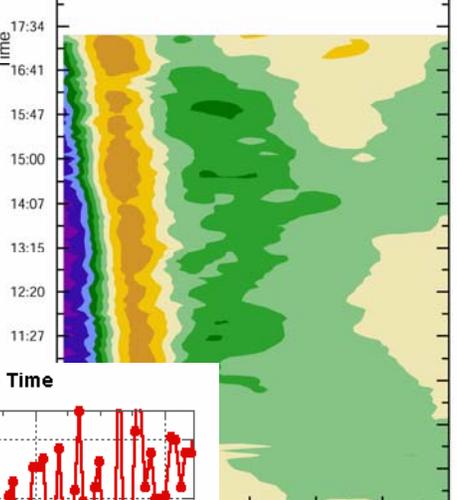
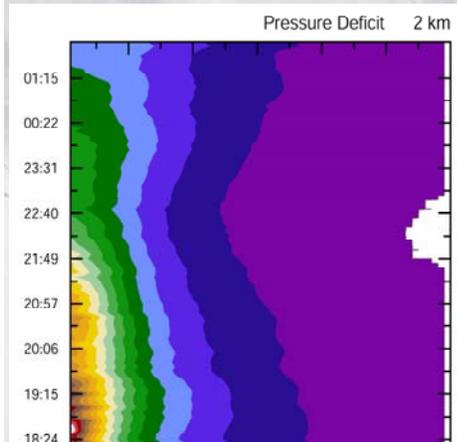
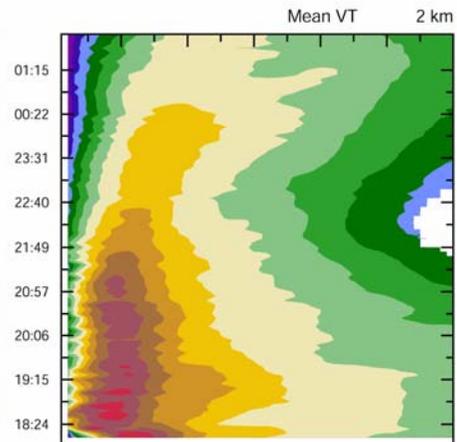
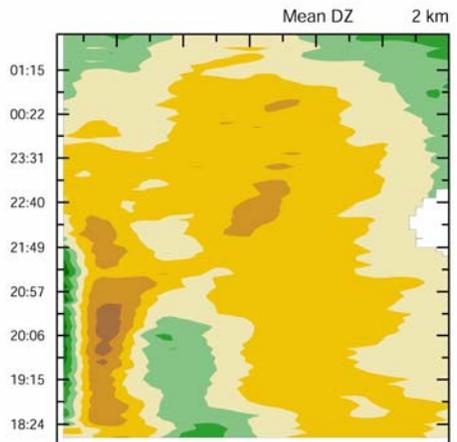
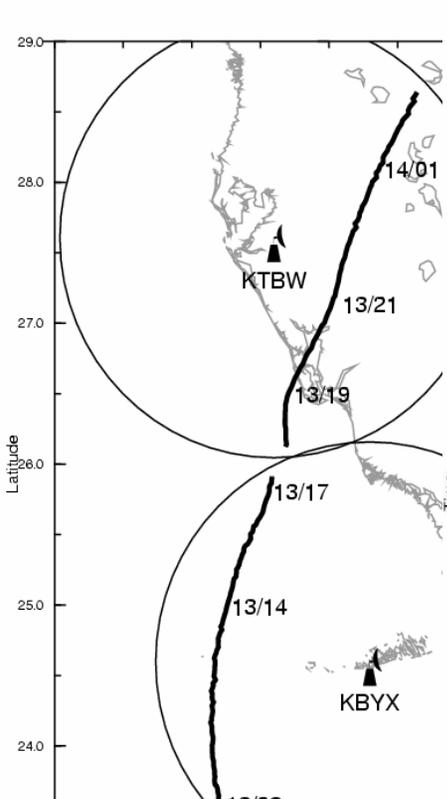
- VORTRAC is the first TC nowcasting system provides a basic framework to integrate TC algorithms for operation and research use
- GUI improvements allow for semi-automated operations with minimum human interactions after an initial trend is established
- The retrieved pressure field can be biased by the uncertainty in the mean wind and wavenumber two structure of the storm
- Extreme events should be detected based on time averaged quantities, not by short term variations
- VORTRAC will be running and tested at NHC during 2007 TC season
- Documentation of VORTRAC will be completed and delivered in 2007

Optimal radar sampling strategy of landfalling TCs is critical

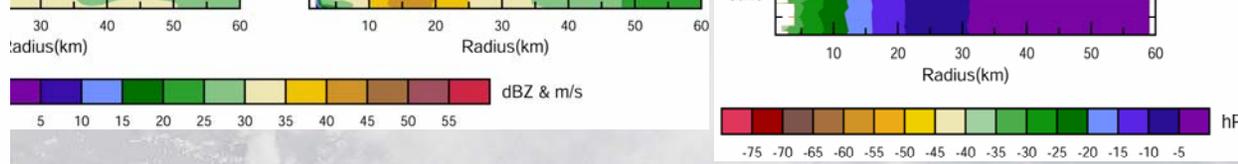
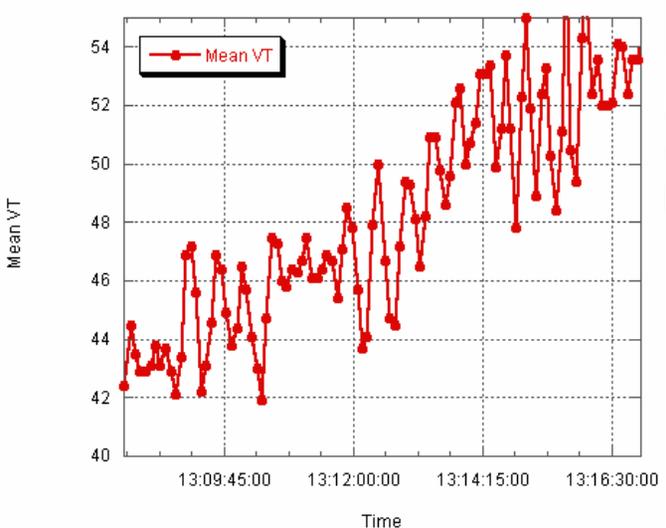


Hurricane Charley (2004) GBVTD-d

Hurricane Charley (2004) 13/08Z - 14/02Z

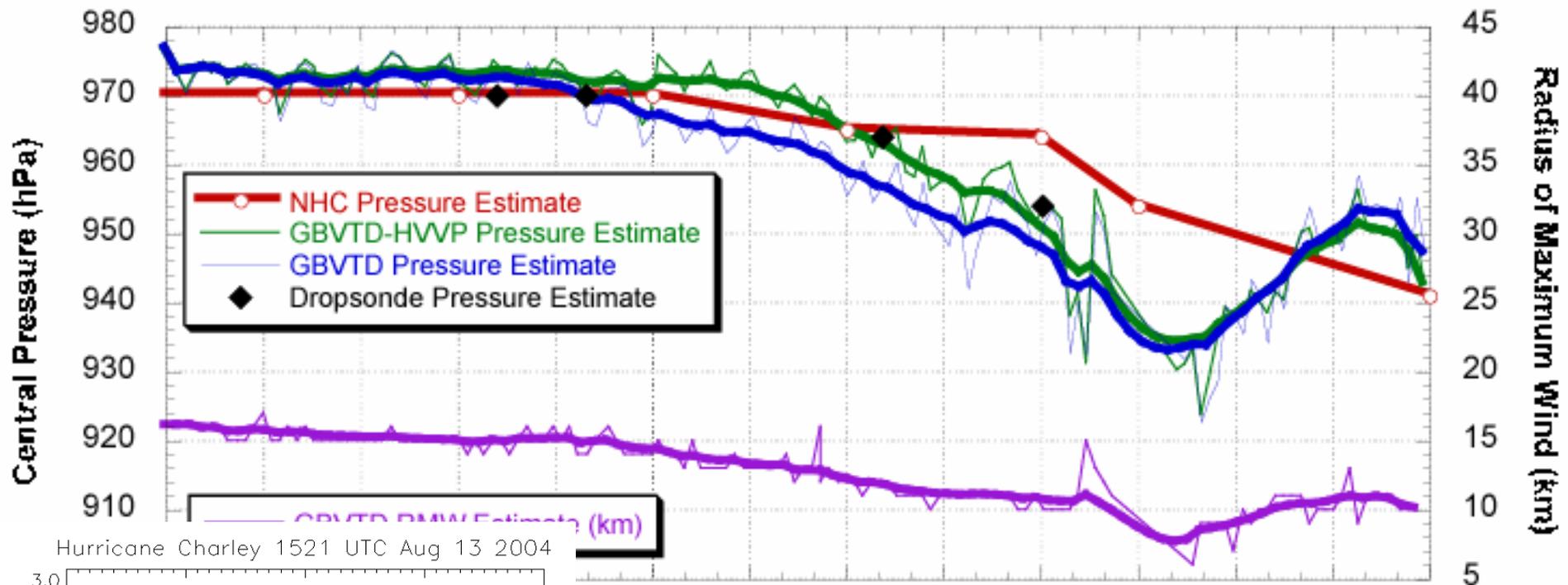


KBYX Mean VT vs. Time

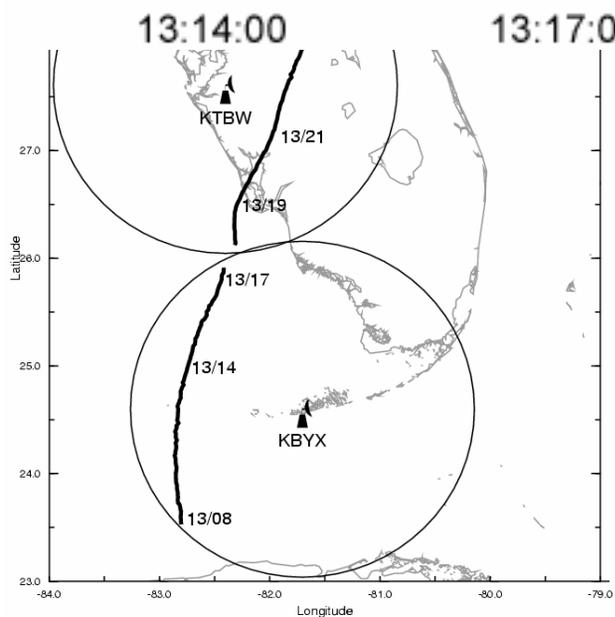
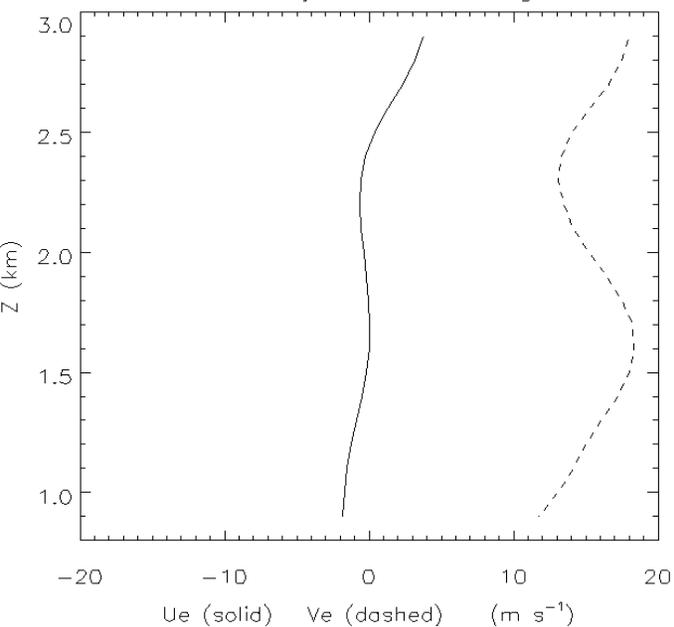


Hurricane Charley (2004)

Central Pressure and Radius of Maximum Wind Estimates



Hurricane Charley 1521 UTC Aug 13 2004



Cat.	Maximum Sustained Wind Speed m/s	Minimum Surface Pressure mb
1	33-42	>980
2	43-49	979-965
3	50-58	964-945
4	59-69	944-920
5	>70	<920

Confidence Level

- Charlie

- X: 0.56 km
- Y: 0.70 km
- RMW: 0.82 km
- VT: 1.9 m/s

- Katrina

- X: 0.86 km
- Y: 2.58 km
- RMW: 4.38 km
- VT: 9.00 m/s



Statistical Method to Objectively Determine the Best Vortex Centers in VORTRAC

