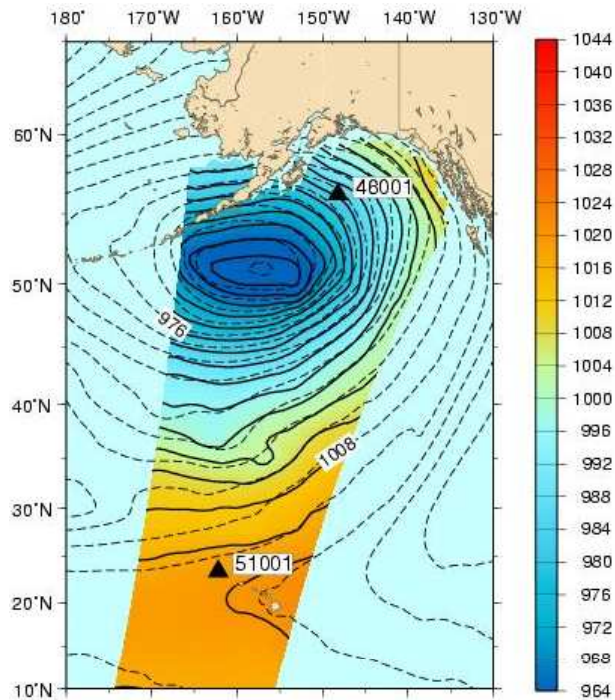


Outline of Plan to Use SLP data in Hurricane Wind Retrievals

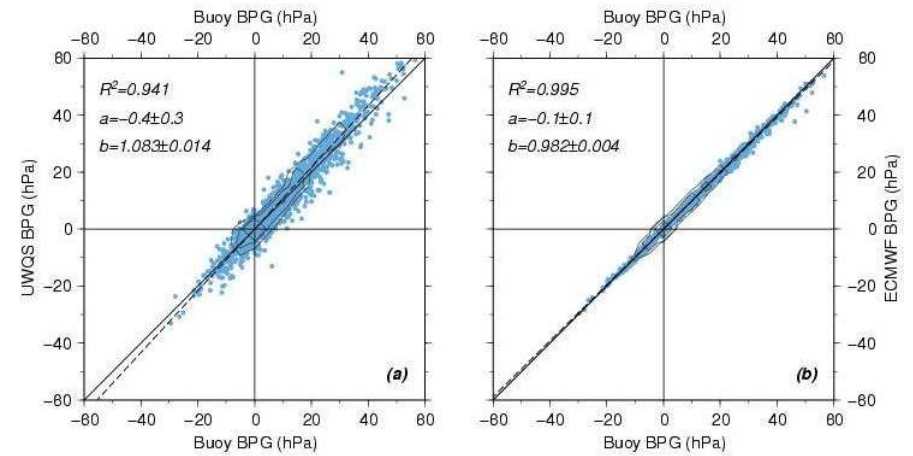
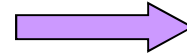
Ralph Foster, APL, UW

Jerome Patoux, Atmos Sci, UW

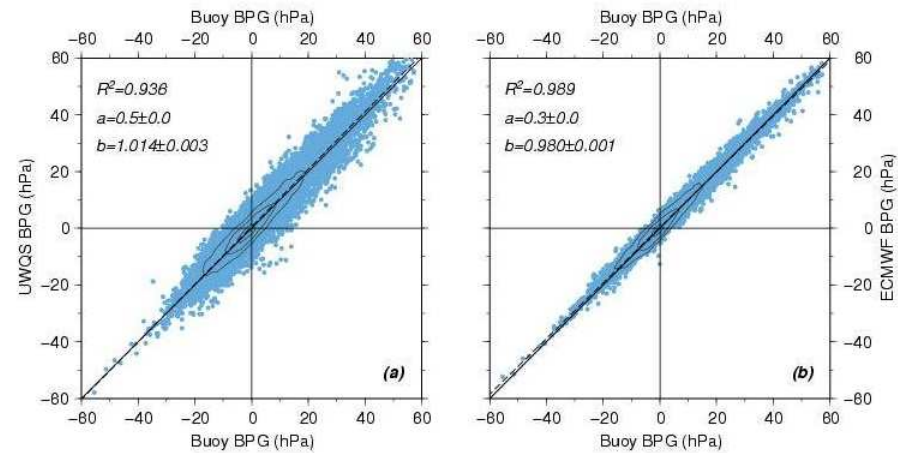
RA Brown, Atmos Sci, UW



All swaths between this buy pair



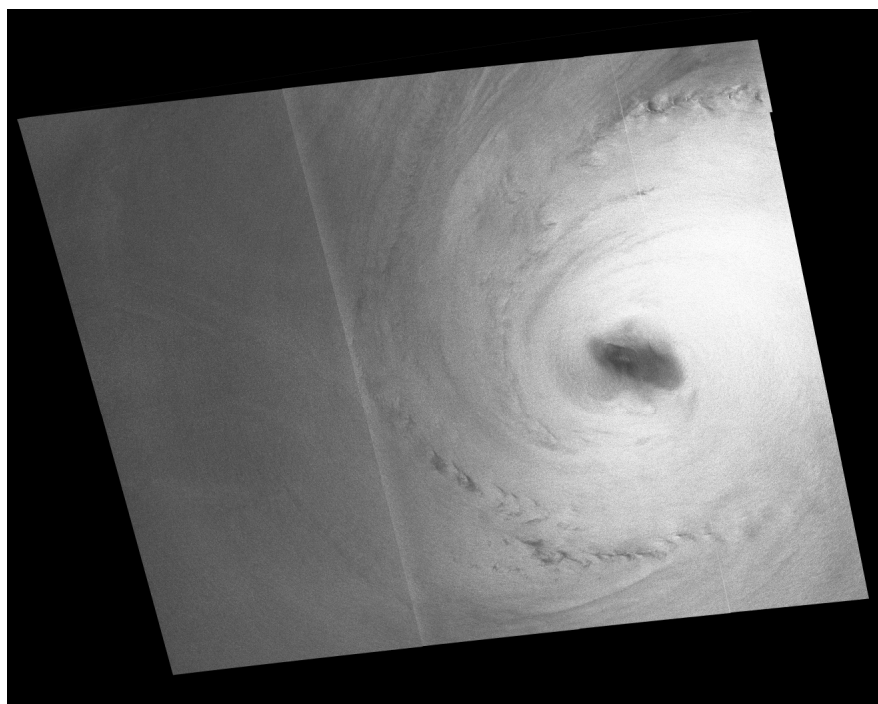
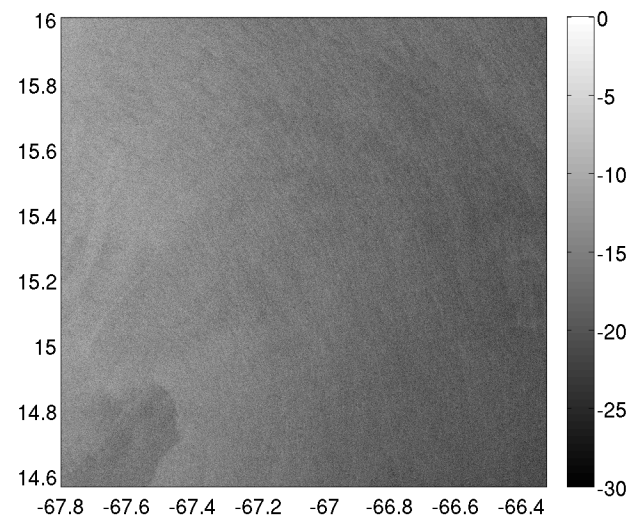
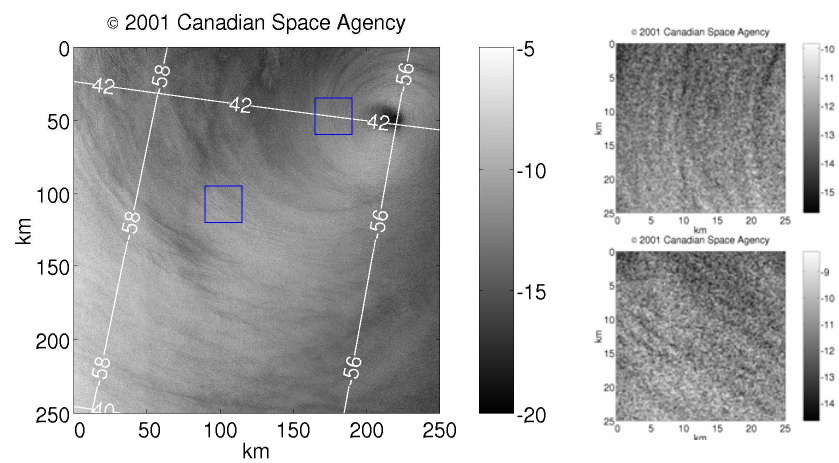
All Buoy Combinations

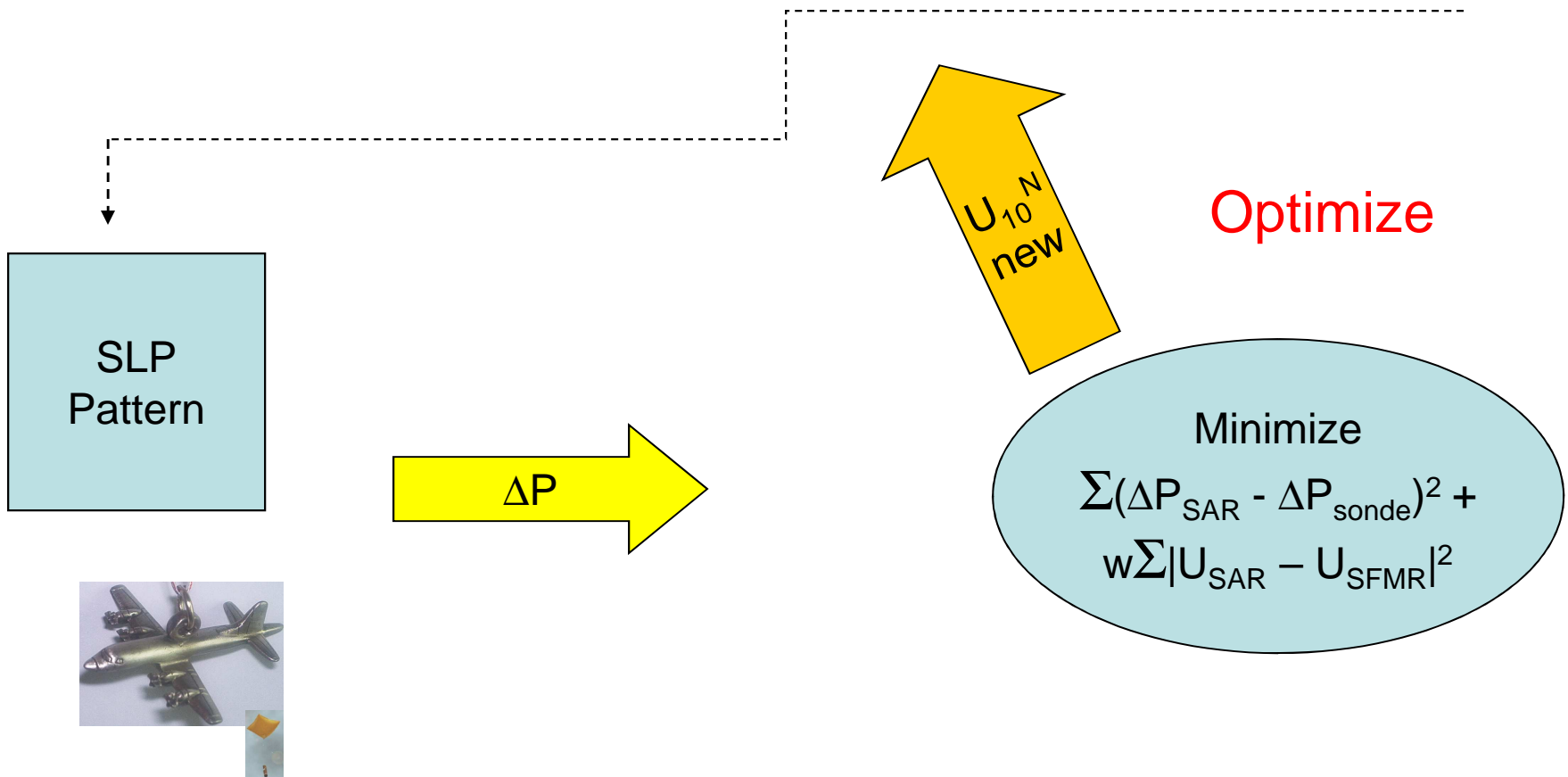
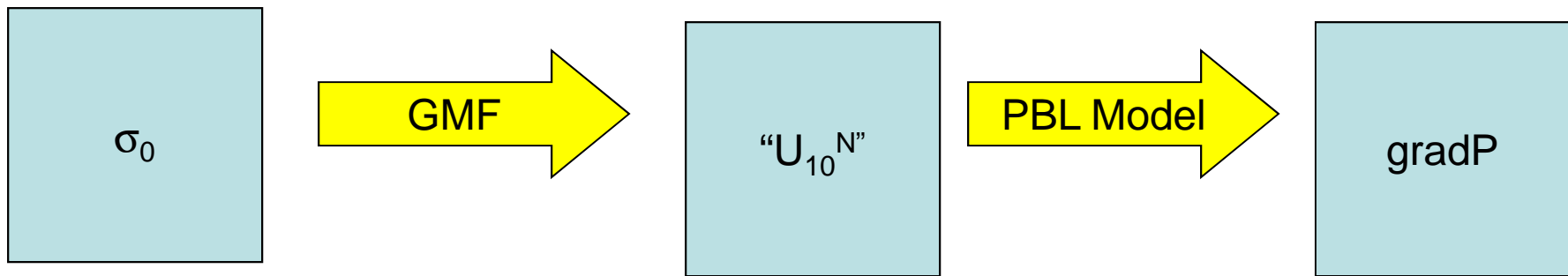


Patoux et al., (2008)

CSA Hurricane Watch

- RadarSAT-1 C-Band SAR (HH-Pol)
- 160 ScanSAR (~450 km wide) images of hurricane or typhoon eyes
 - Data access only, unique opportunity
- Can we retrieve very high winds, surface waves and surface pressure?
- Can we use surface pressure to improve/validate high winds ala Zeng and Brown (1998)





Research Plan

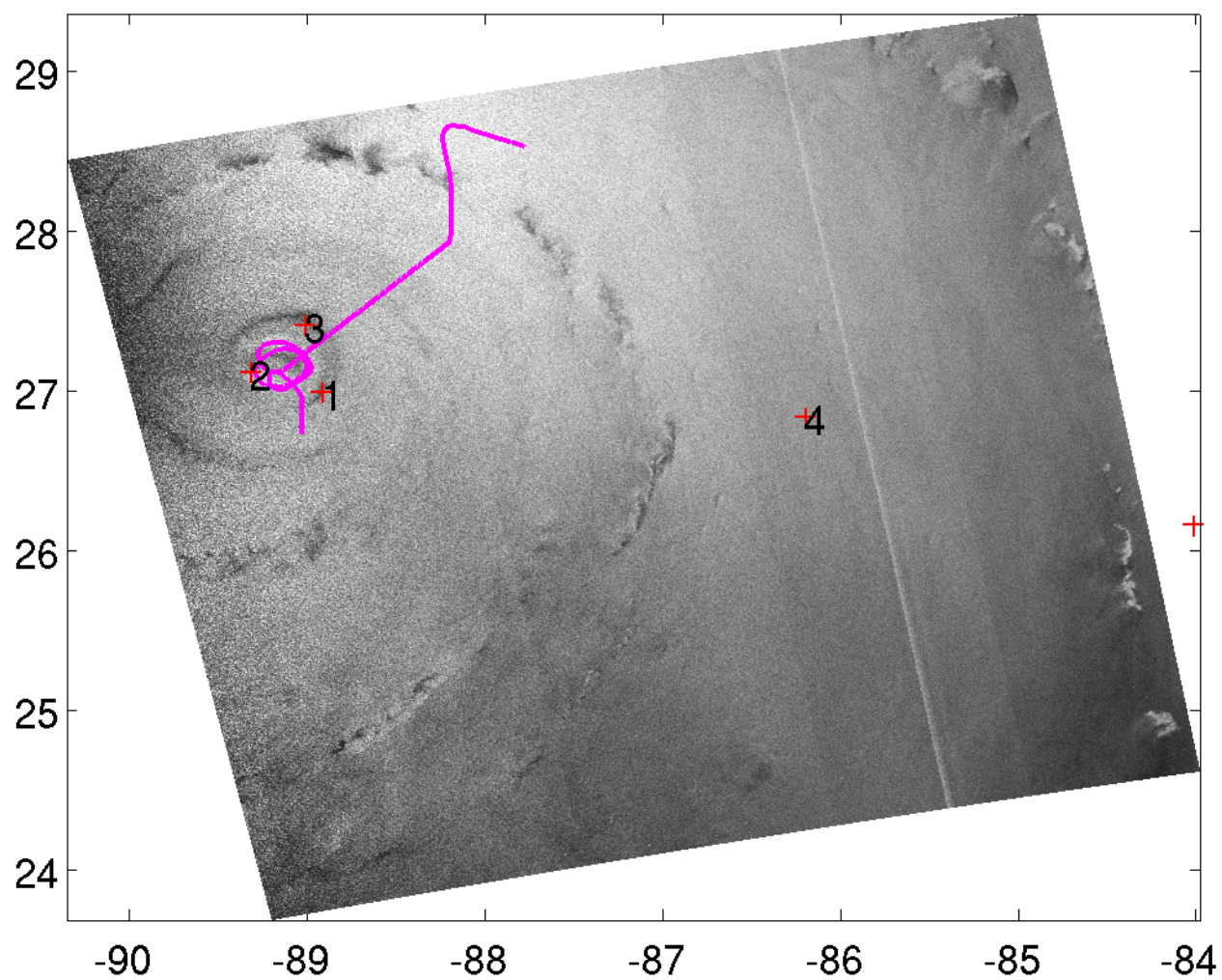
- Choose some well-observed cases
- Estimate SLP pattern from SAR
- PBL model is crucial: $\mathbf{U} \cdot \nabla \mathbf{U}$ is key
 - 1st Existing UW PBL model (+gradient wind correction)
 - 2nd New Hurricane BL model
 - 3rd New generic nonlinear BL model
- Use optimization to LS minimize ΔP bwt SAR and sondes (+ ΔU_{10}^N + smoothness)
 - Vary U,V winds
- No results yet, just a sample of building blocks

Katrina (28 Aug 2005 23:50)

- QS swath close in time
- RAINEX IOP
 - Multi-aircraft
 - Sondes, SFMR, Radar
 - 3-way Atmos/Wave/Ocean km-scale resolution numerical model output (Shuyi Chen, U Miami)

NOAA P3 & GIV data within 1 hour

SAR Quick Look (CMOD w/ const wind dirn)



Note image processing artifacts

Wind Retrievals

- Previously developed Matlab SAR processing system
 - CMOD4
 - CSA- & ASF-Processed images
- Converted for HW/Cstars imagery
 - Calibration
 - Image artifacts
- Incorporate CMOD5
- Need wind directions
 - 1st: Use QS & Hwind
 - 2nd: Use roll directions (collaborate w/ Horstmann NATO/GKSS)

Hurricane Katrina 0000 UTC 29 AUG 2005

Max 1-min sustained surface winds (kt)

Valid for marine exposure over water, open terrain exposure over land

Analysis based on AFREC from 0105 - 0259 z; SFMR43 from 2100 - 0120 z;

CMAN from 2100 - 0300 z; FCMP_TOWER from 2109 - 0255 z;

ASOS from 2105 - 0259 z; BACKGROUND_FIELD from 0000 - 0000 z;

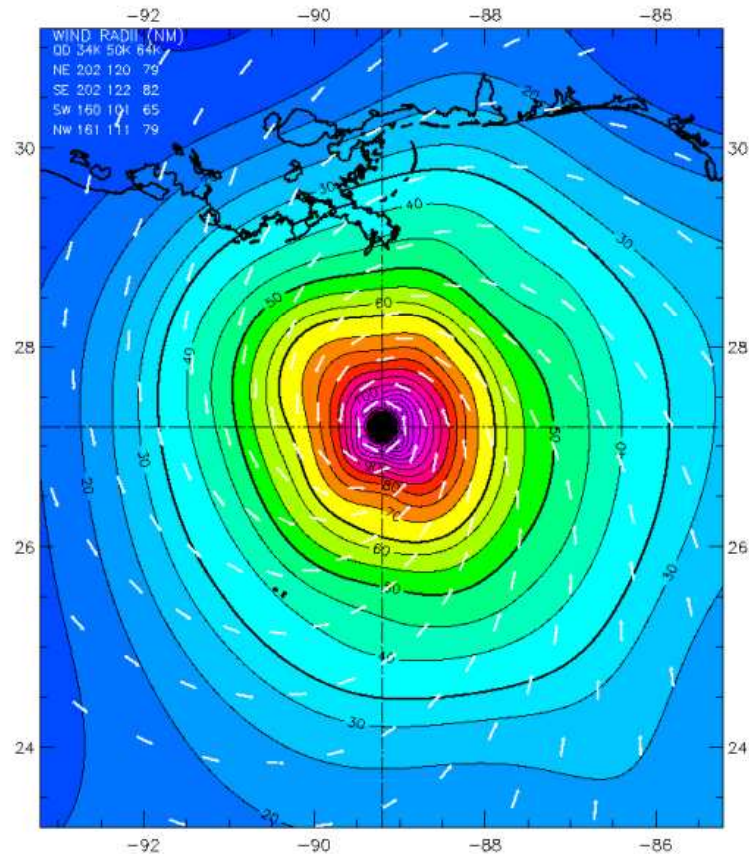
QSCAT from 2349 - 2351 z; SHIP from 2118 - 0300 z;

GPSSONDE_WL150 from 2103 - 0239 z; METAR from 2105 - 0255 z;

MOORED_BUOY from 2100 - 0300 z; TAIL_DOPPLER43 from 2231 - 2326 z;

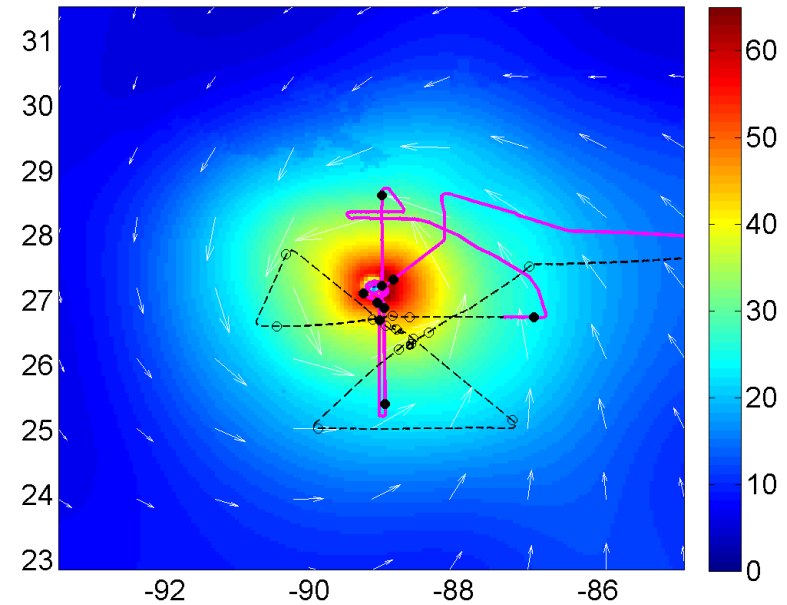
MESONET from 2100 - 0300 z;

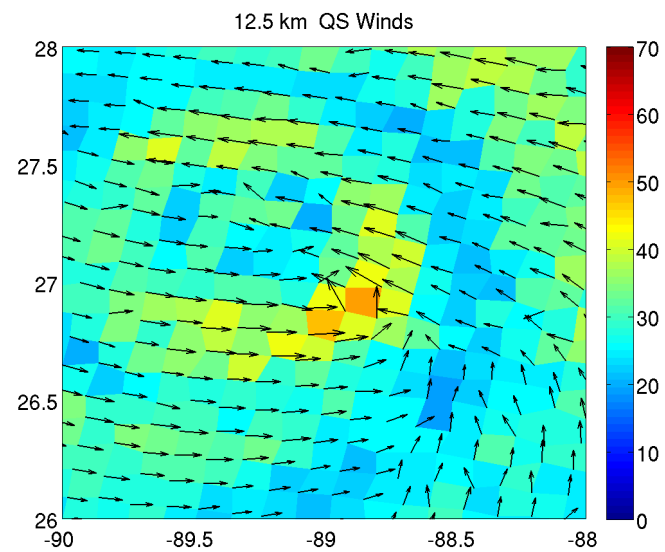
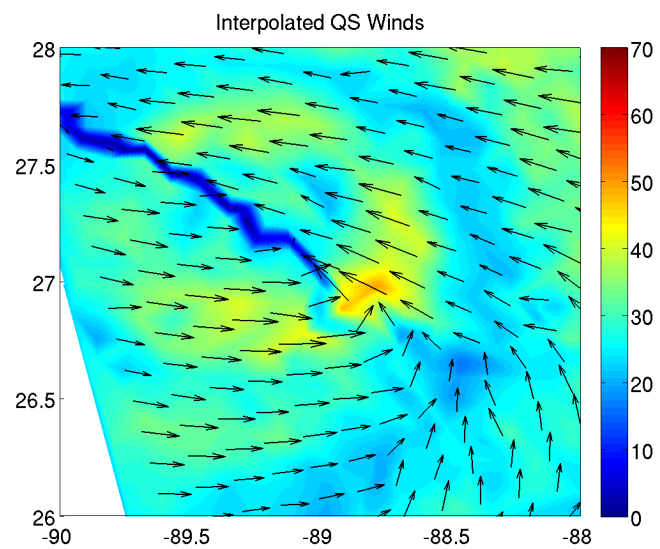
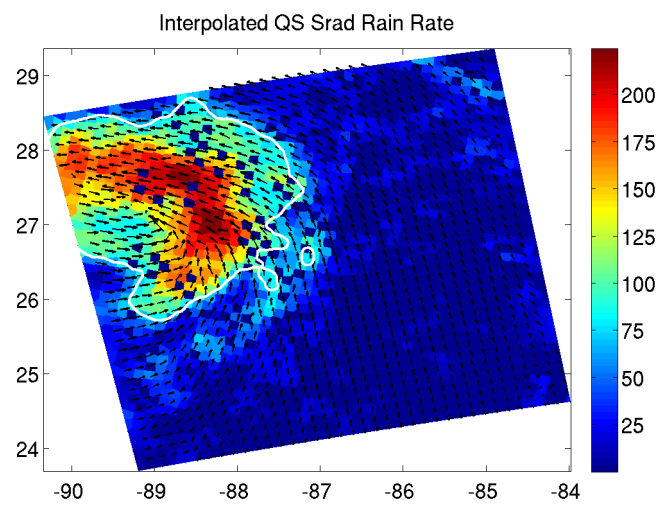
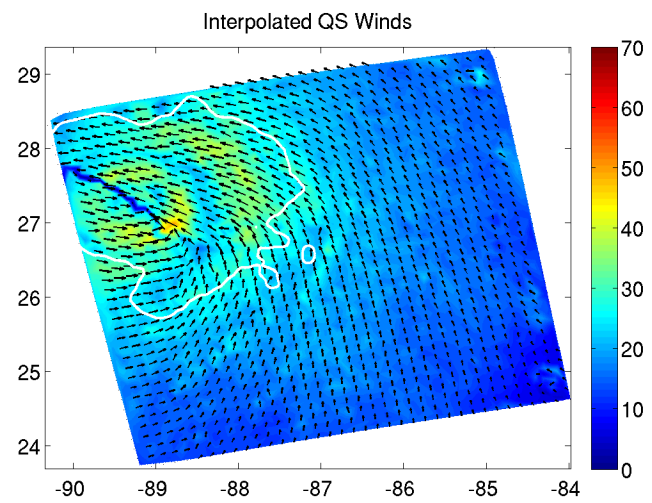
0000 z position interpolated from 2326 Army Corps; mslp = 904.0 mb

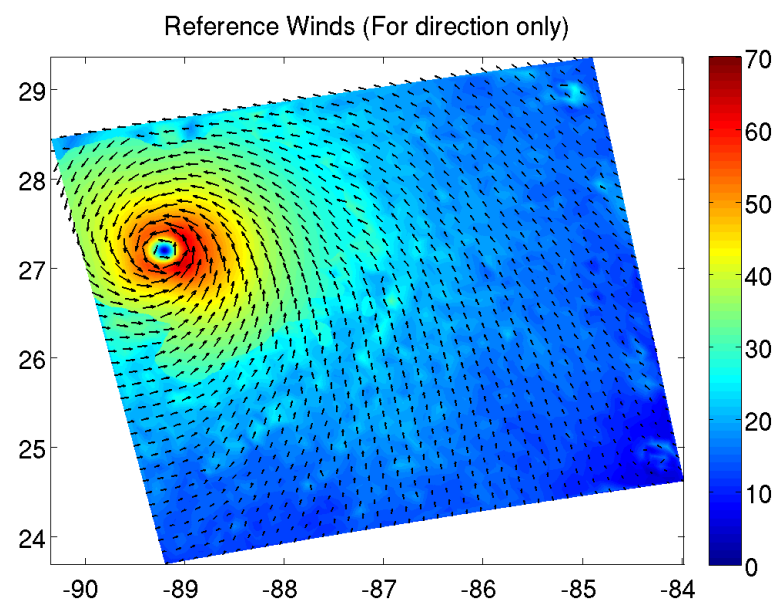
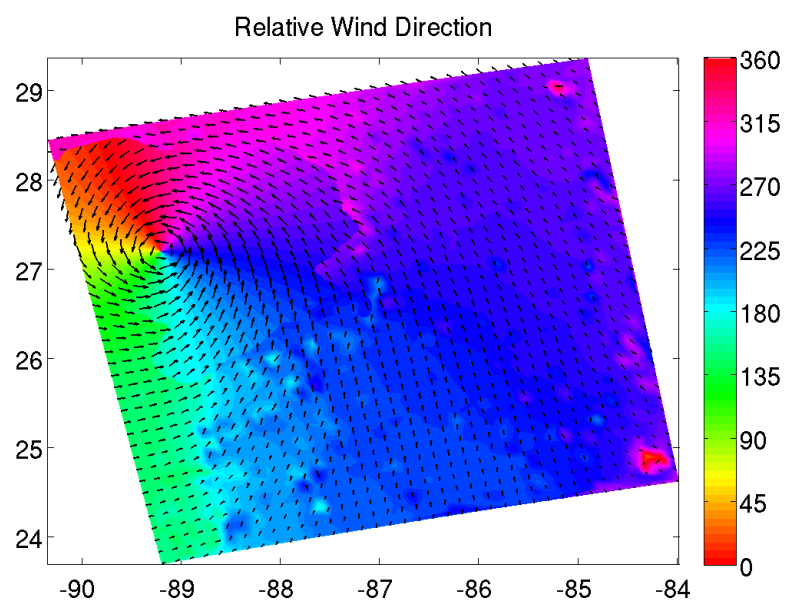


Observed Max. Surface Wind: 124 kts, 14 nm NE of center based on 2326 z TAIL_DOPPLER43 sfc measurement
 Analyzed Max. Wind: 124 kts, 14 nm SE of center

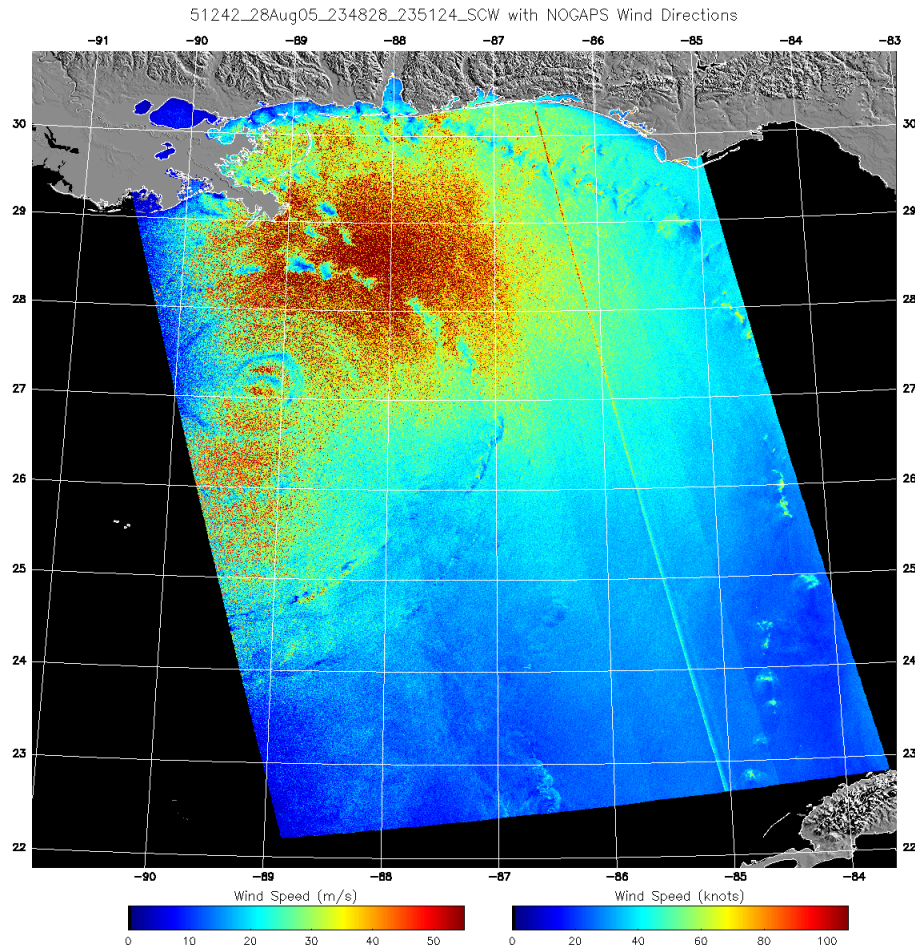
Hwind & P3 data 2100 to 0200





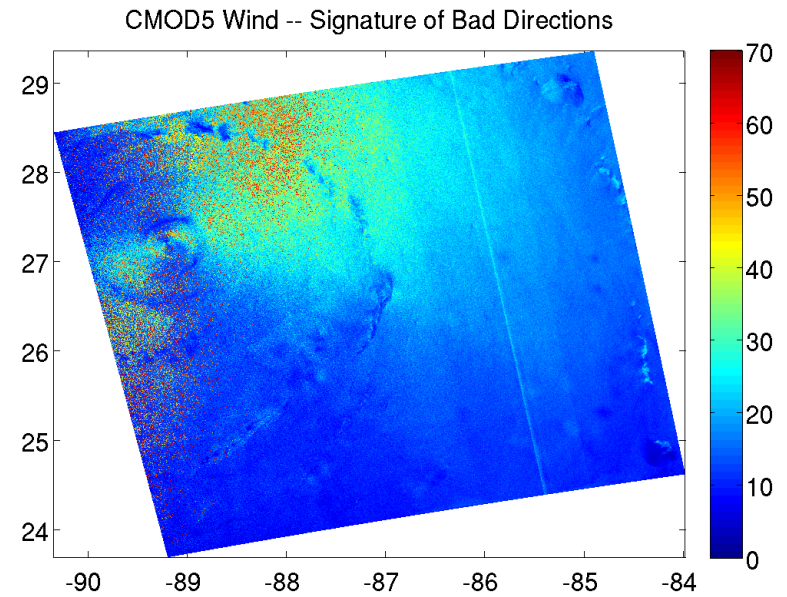


JHU processing



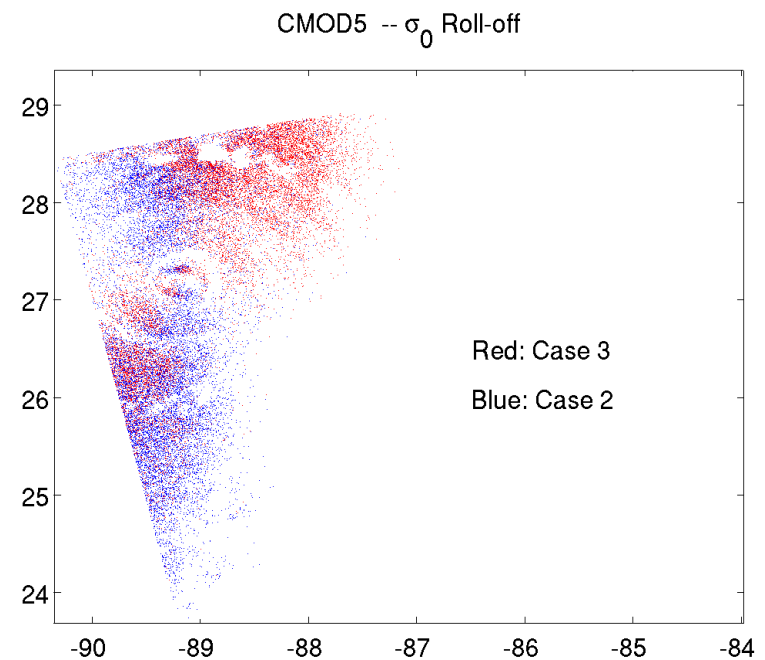
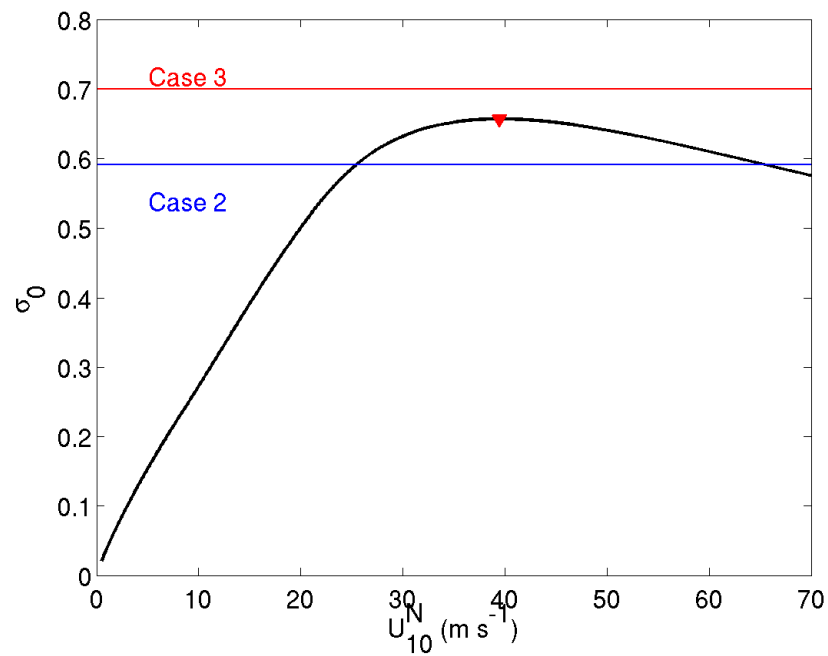
CMOD4?

Note “hourglassing”

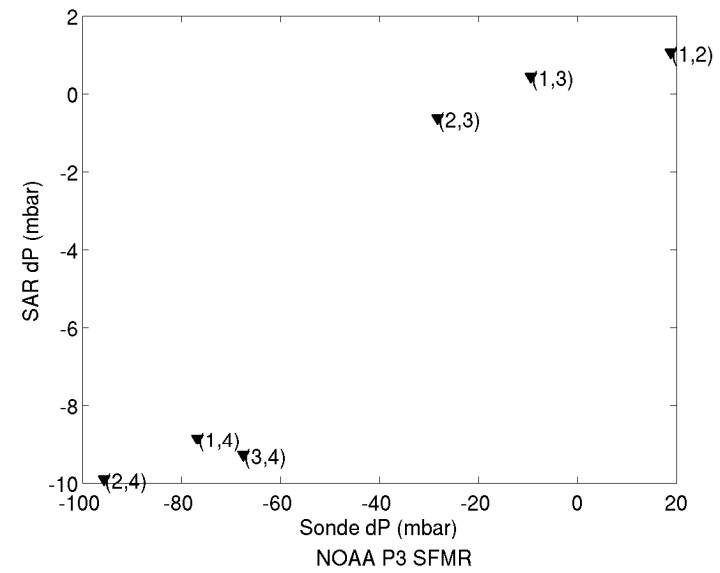
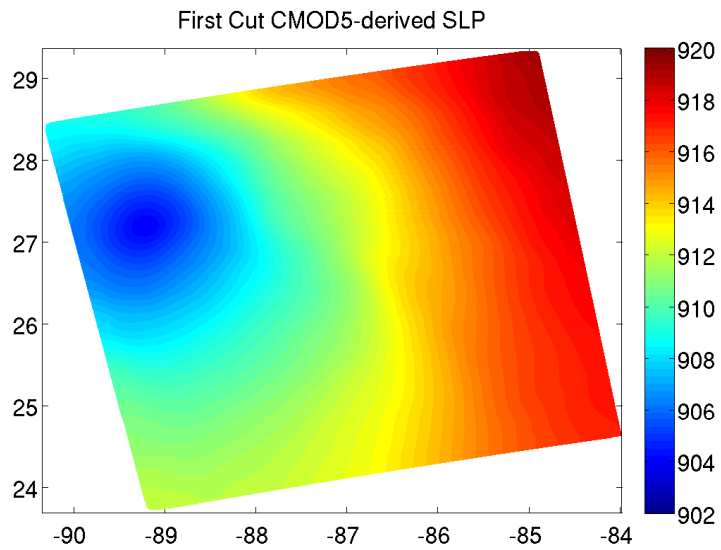


Likely problem with direction,
But possibly errors in new wind
Retrieval code – debugging continues

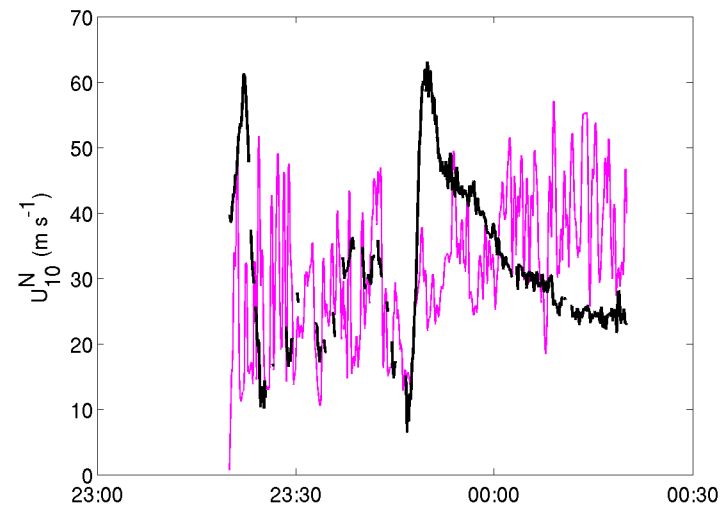
Calibration?
VV/HH conversion?
Wind direction?
High winds in low incidence
Probably all 3(4) contribute



Not close enough for 1st guess
(GIGO)



May need to tune std. model
parameters



Progress

- Amazing computer issues (incompatible compilers, link libraries, OS)
 - Need to upgrade OS & compiler (~1 year old!)
- Need to assess calibration
 - Need reasonable 1st guess winds or optimization will stray too far from “correct” combined wind/SLP
 - First guess directions are important
- Gradient wind correction may be inadequate.
 - Move to new BL models sooner
- Hope to report some results at next annual meeting (in 6 months?)