Study of Wind Field within Extra-Tropical Cyclones during Hurricane Force Events in the North Pacific using QuikSCAT and ASCAT Scatterometer Measurements

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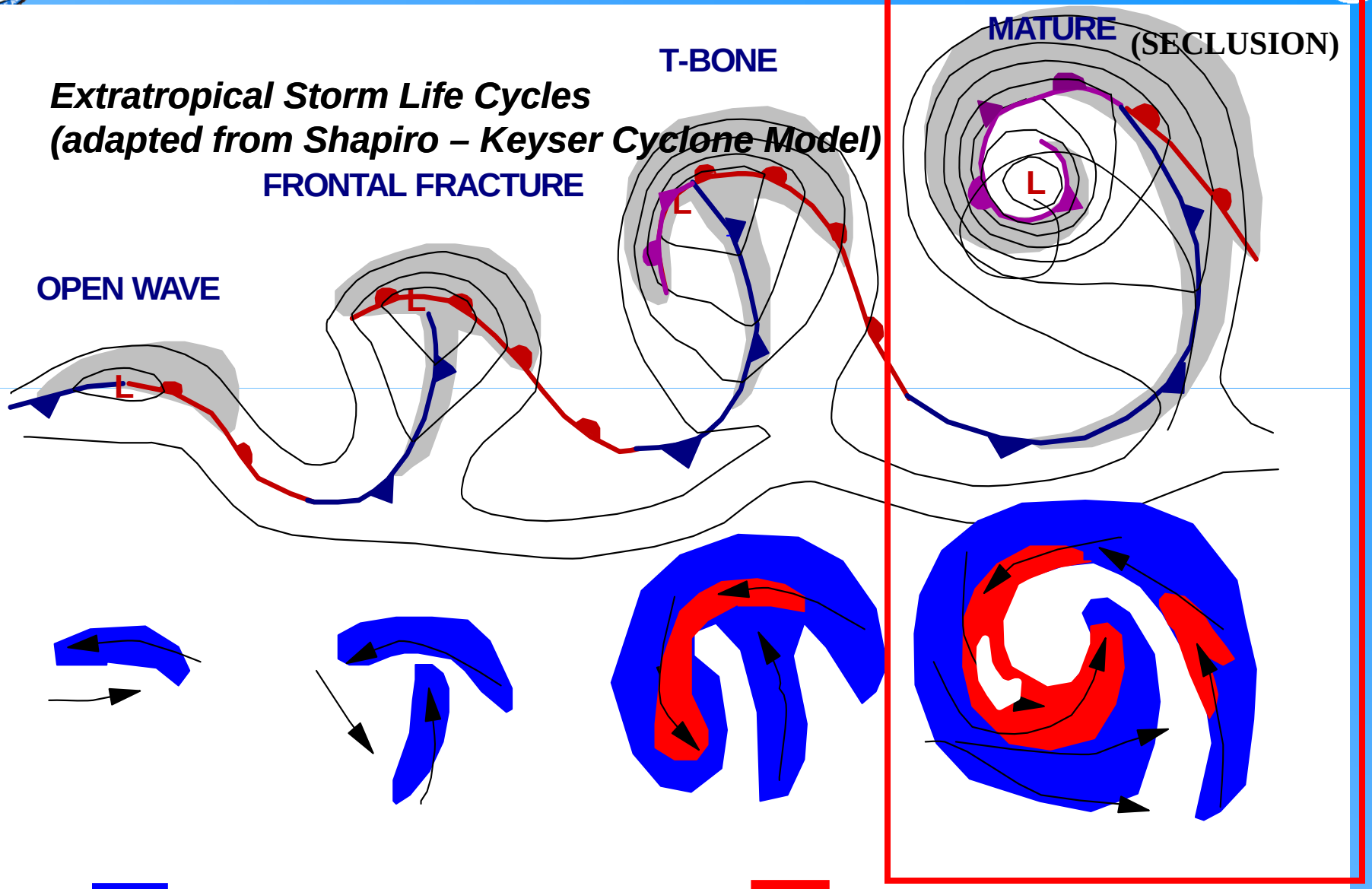
and
Paul S. Chang

What are we Interested at?

Extratropical Storm Life Cycles
(adapted from Shapiro – Keyser Cyclone Model)



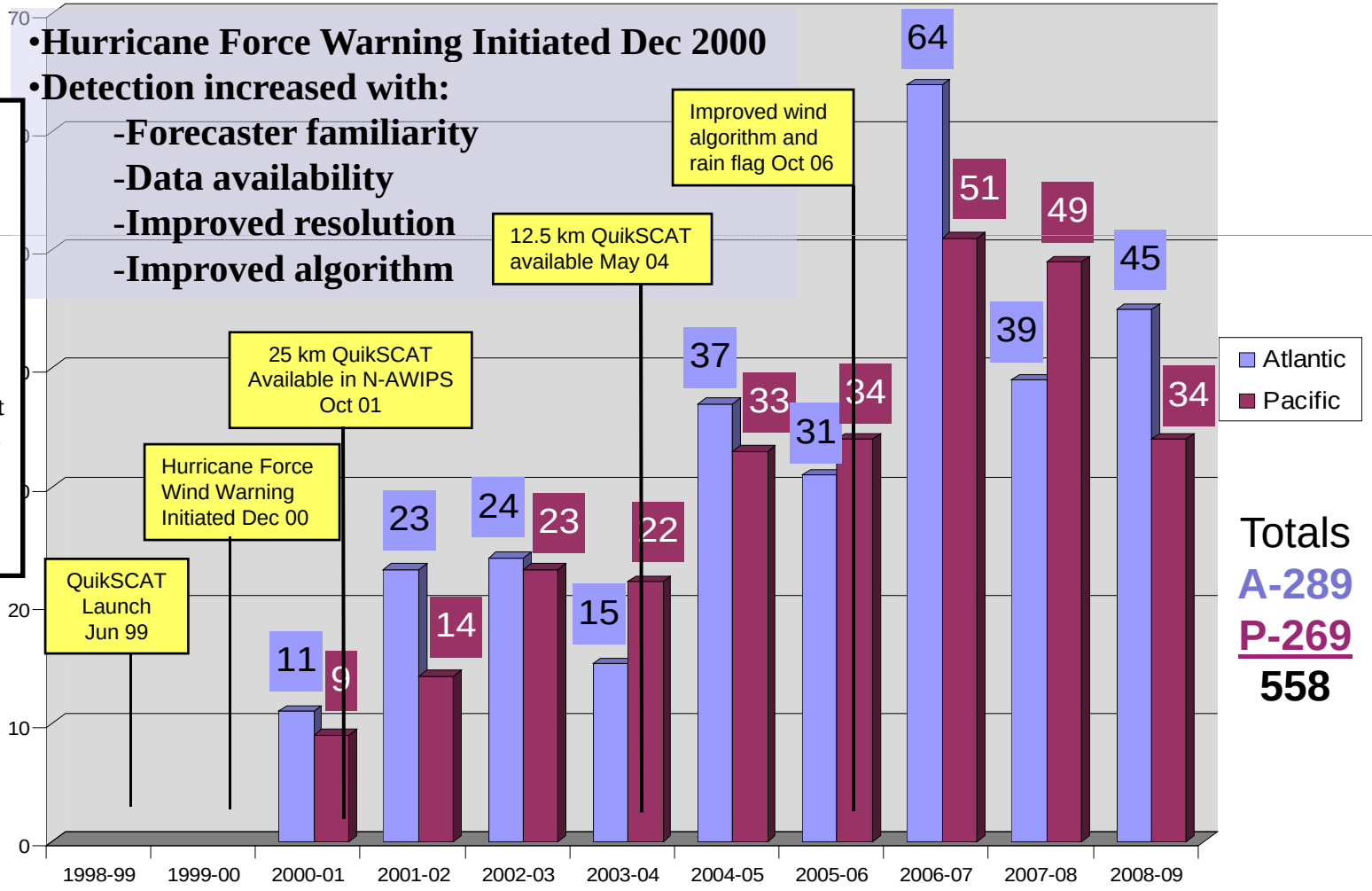
How successful were we so far?

Hurricane Force Extratropical Cyclones from September 2001 to May 2009

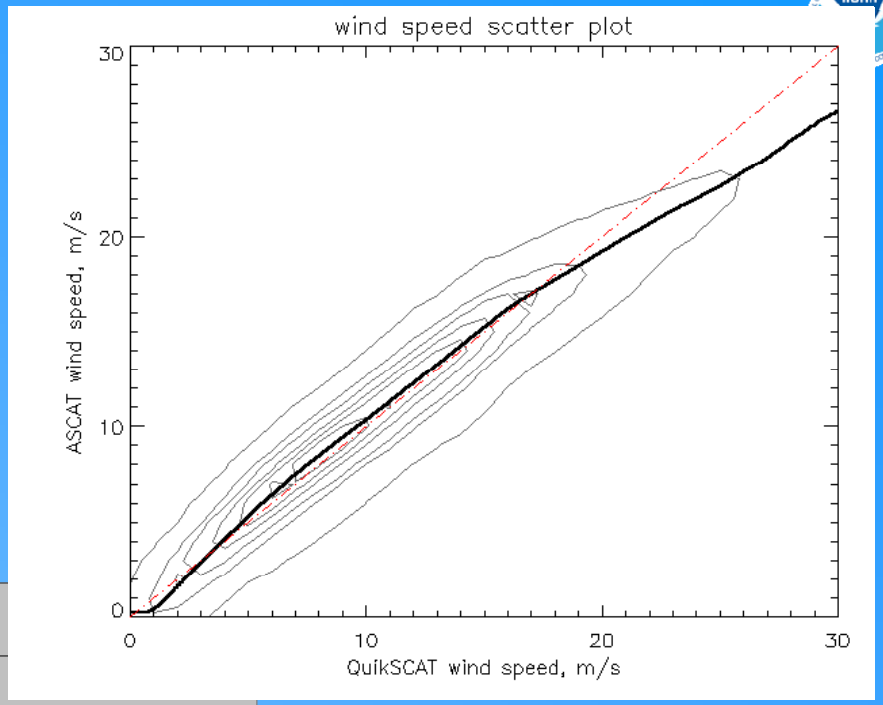
WARNING CATEGORIES

Pre- QSCAT
1. GALE 34-47 kt
2. STORM ≥48

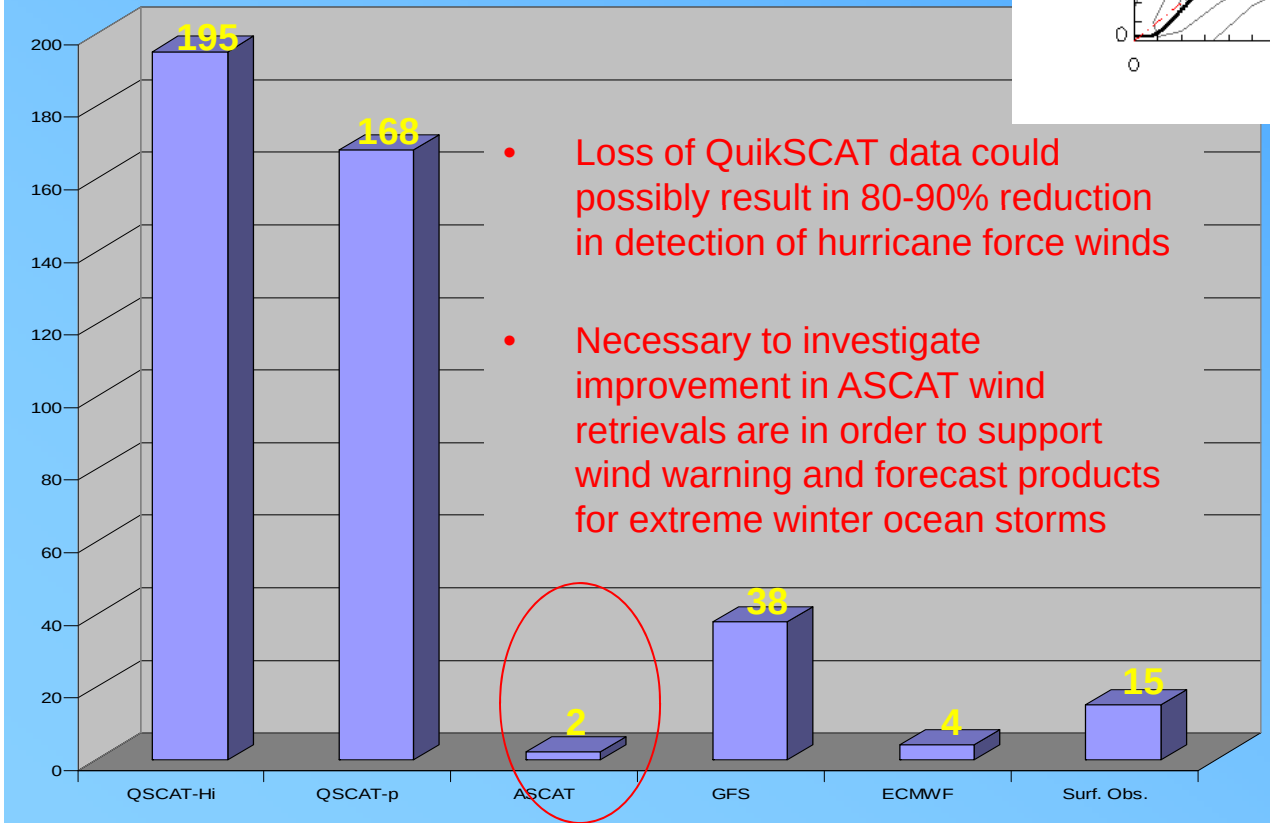
QSCAT ERA
1. GALE 34-47 kt
2. STORM 48 -63 kt
3. HURCN FORCE ≥ 64 kt



Can we Continue HF Detection?



Hurricane Force Observations
Oct'07 ~ May'08



- Loss of QuikSCAT data could possibly result in 80-90% reduction in detection of hurricane force winds
- Necessary to investigate improvement in ASCAT wind retrievals are in order to support wind warning and forecast products for extreme winter ocean storms

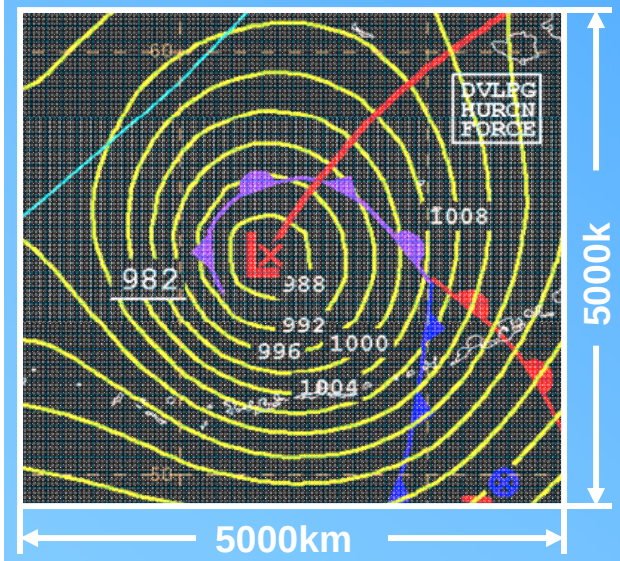
See presentation by

Paul Chang on Wednesday

Wind Field Composites and QuikSCAT - ASCAT Comparisons

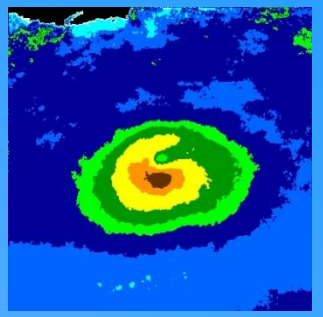
Storm track file

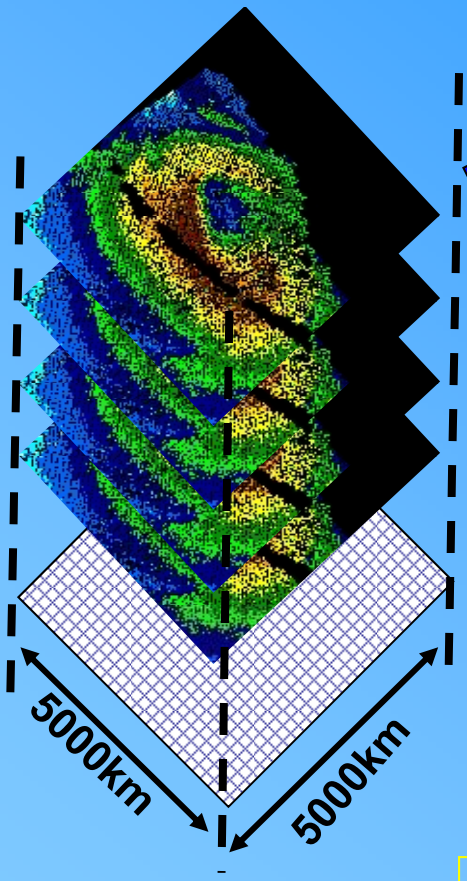
Read HF Cyclone Info.



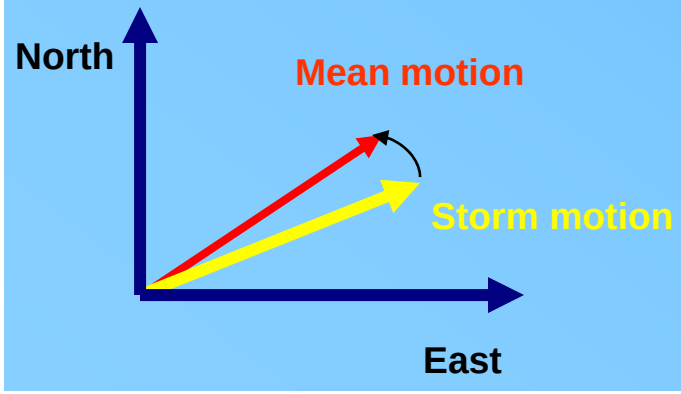
Extract Science QS Data
&
Perform QC
(land, ice, coast, rain) flags

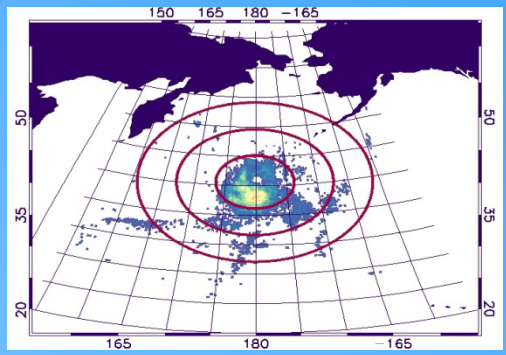
Generate Mean Wind Fields





Estimate speed & Angle
(Heading Vector)

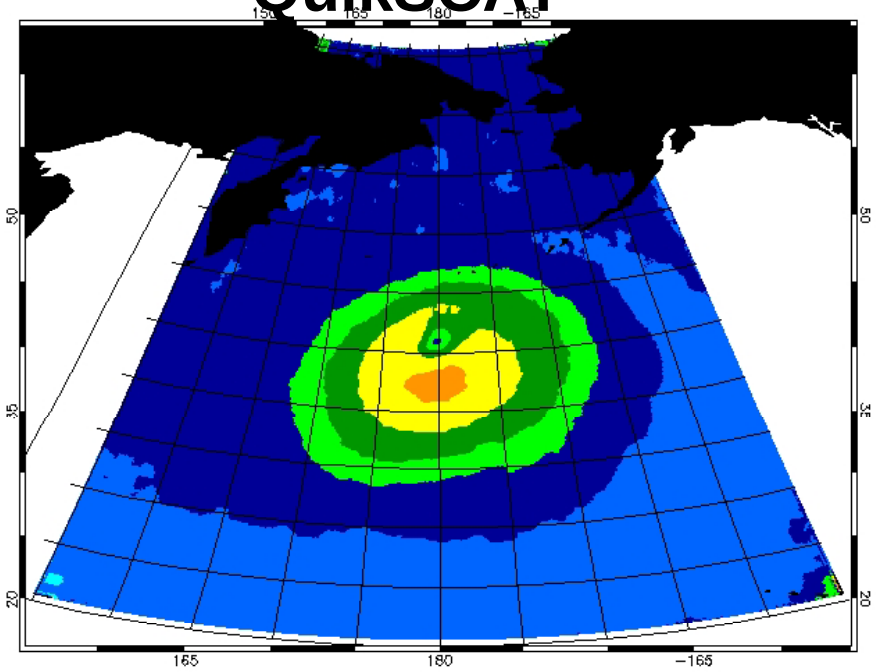




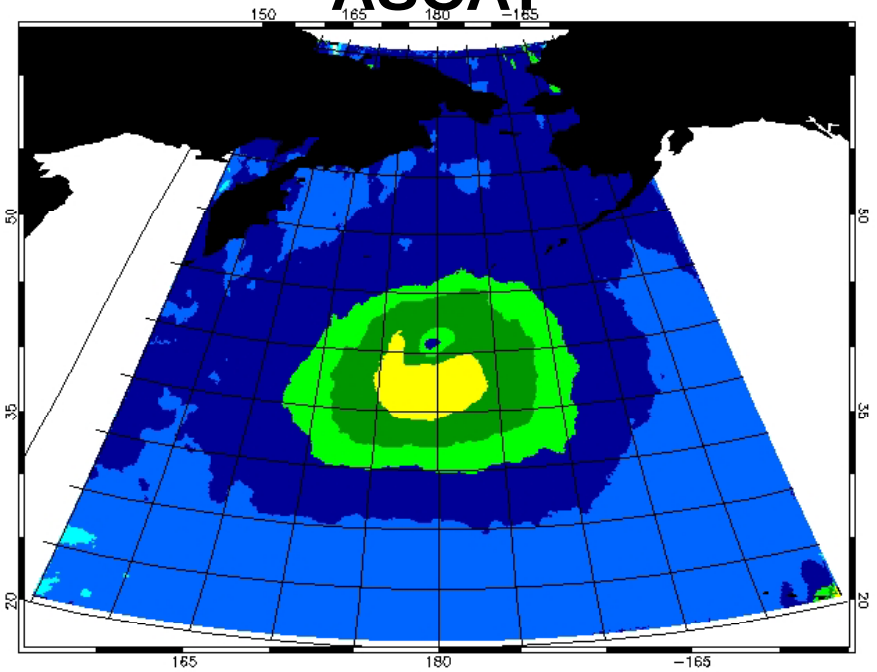
Generate Frequency of HF Occurrence per grid fields

Mean Wind Speed Field
2007-2009 Winter Seasons - North Pacific

QuikSCAT

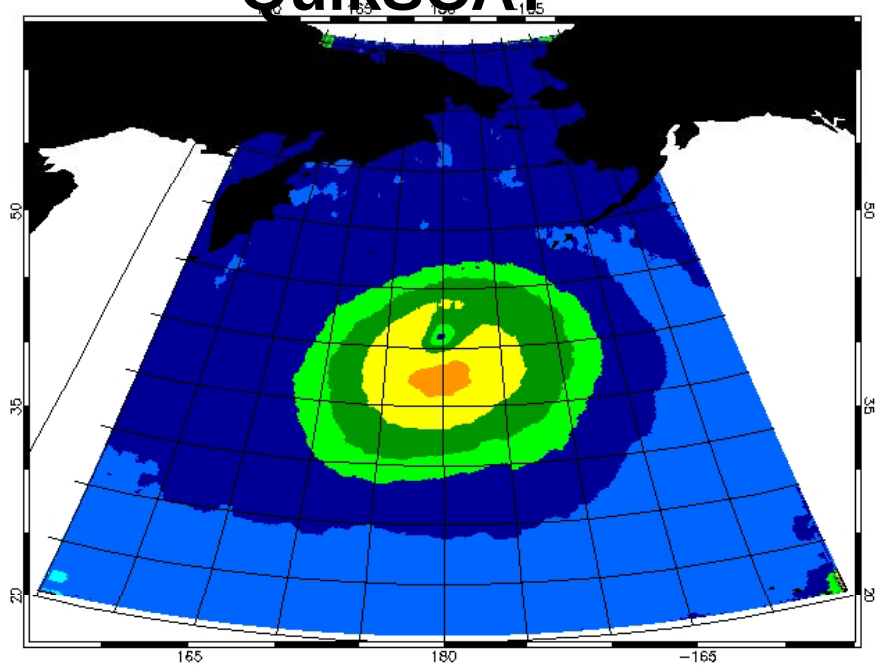


ASCAT

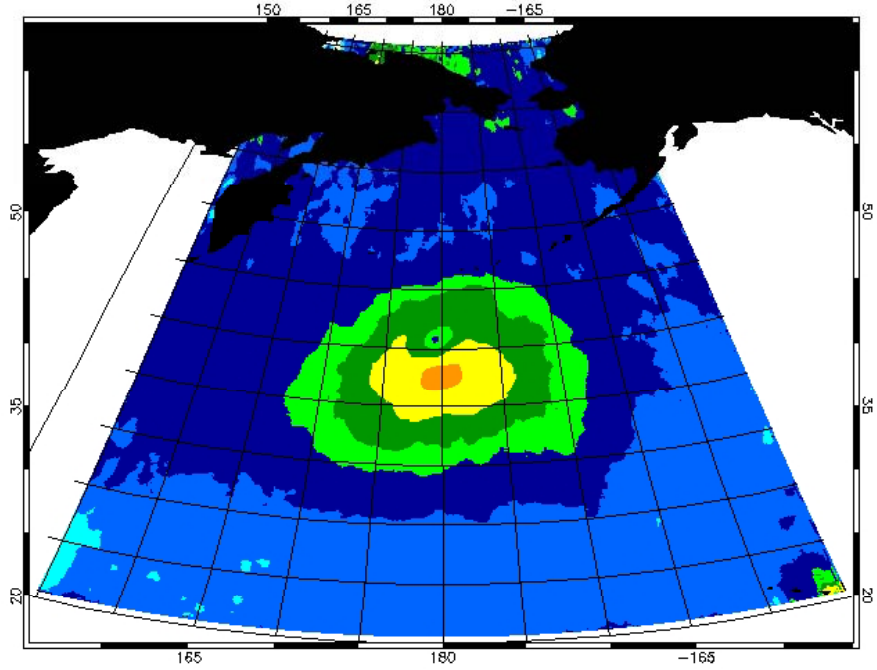


Mean Wind Speed Field
2007-2009 Winter Seasons - North Pacific

QuikSCAT

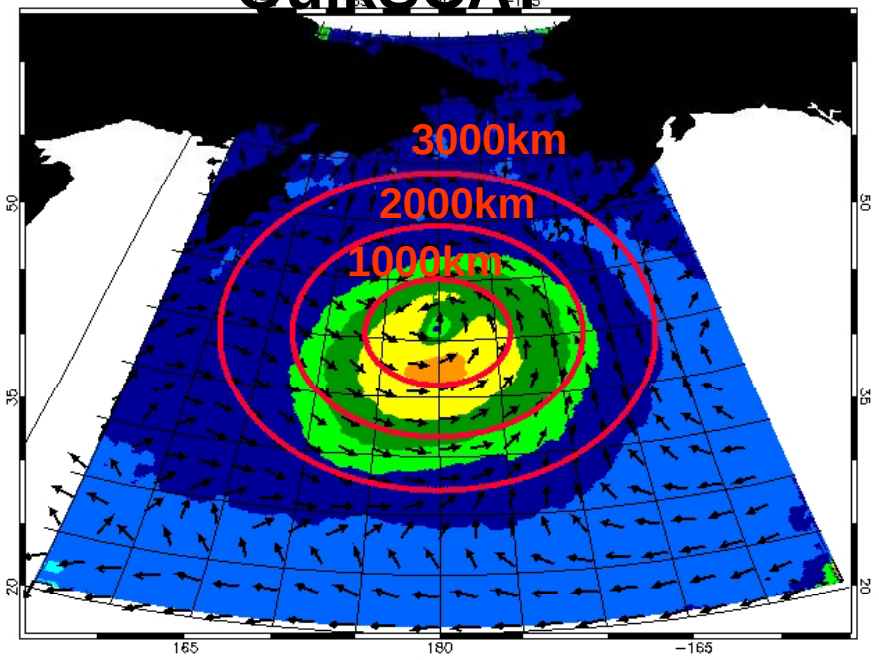


New ASCAT

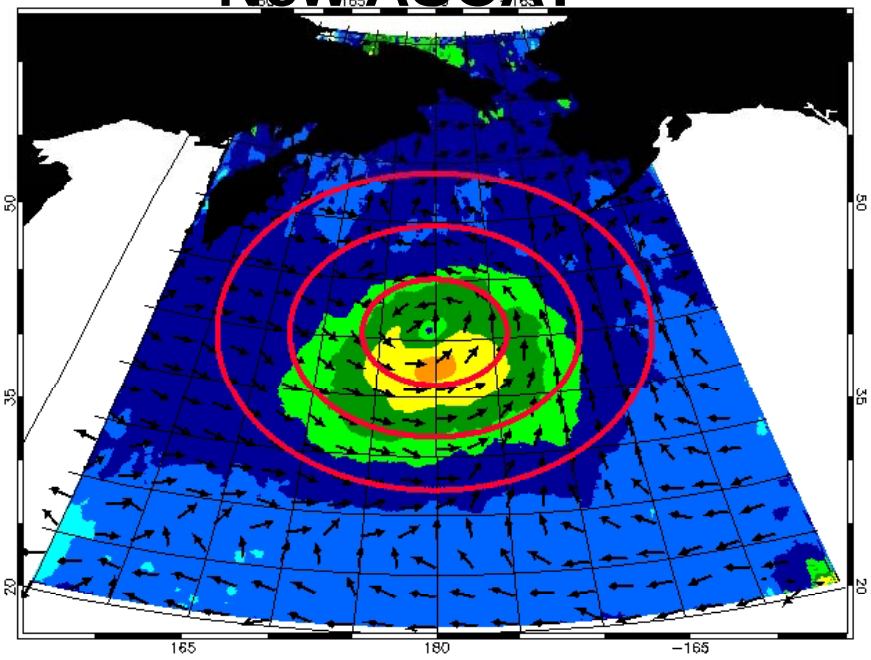


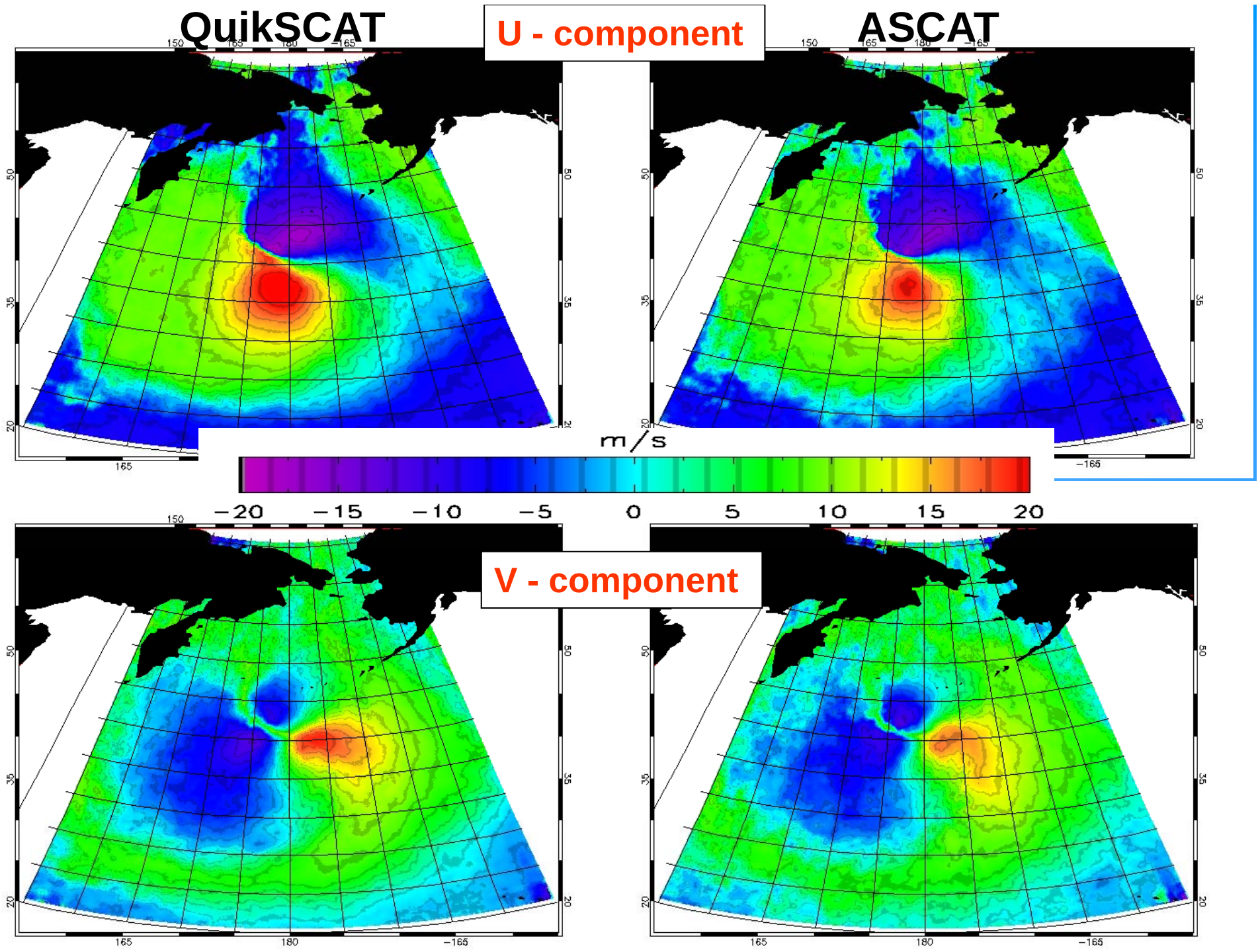
Mean Wind Speed Field
2007-2009 Winter Seasons - North Pacific

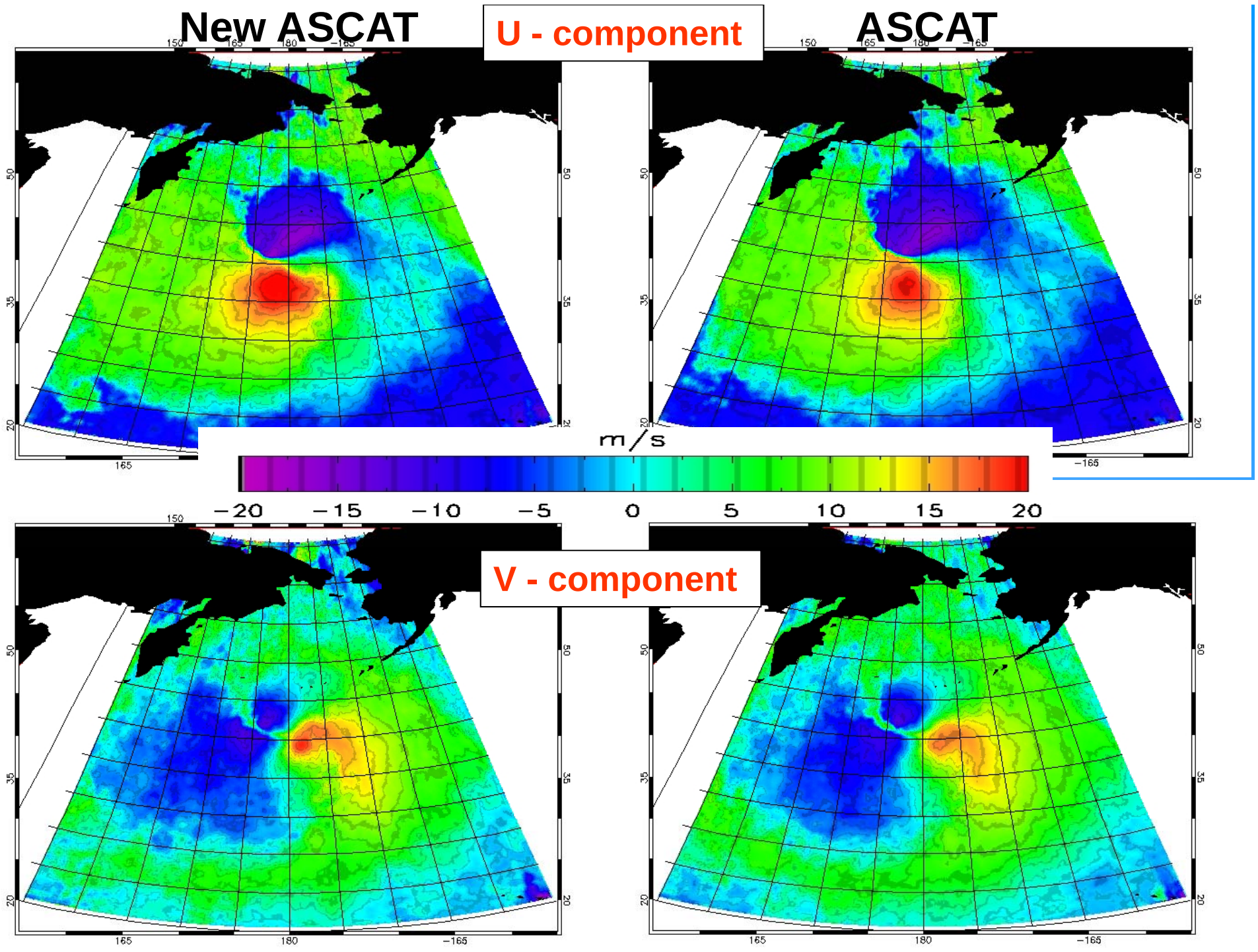
QuikSCAT



New ASCAT




QuikSCAT
U - component
ASCAT
m/s
−20 −15 −10 −5 0 5 10 15 20
V - component


New ASCAT
U - component
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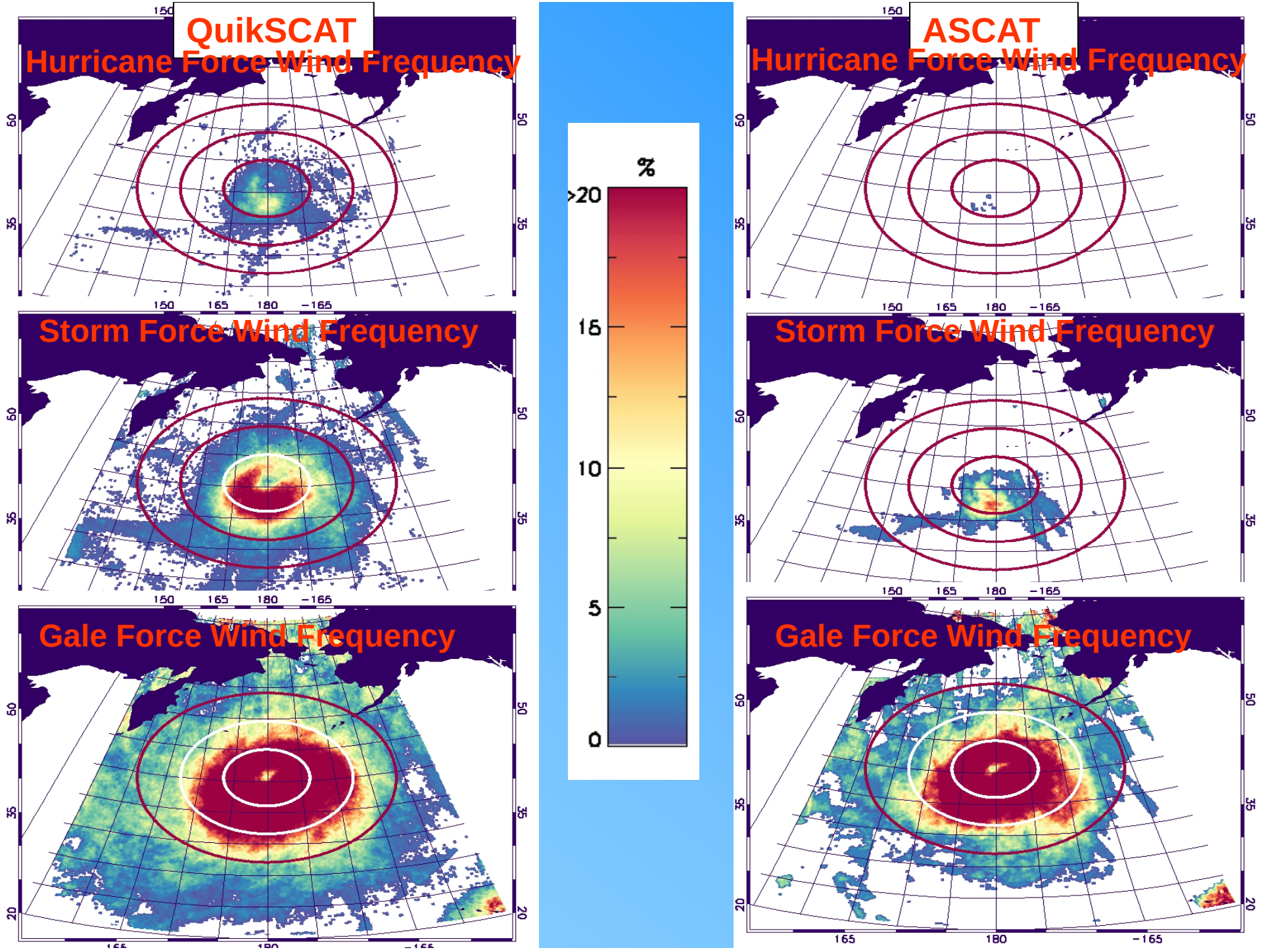
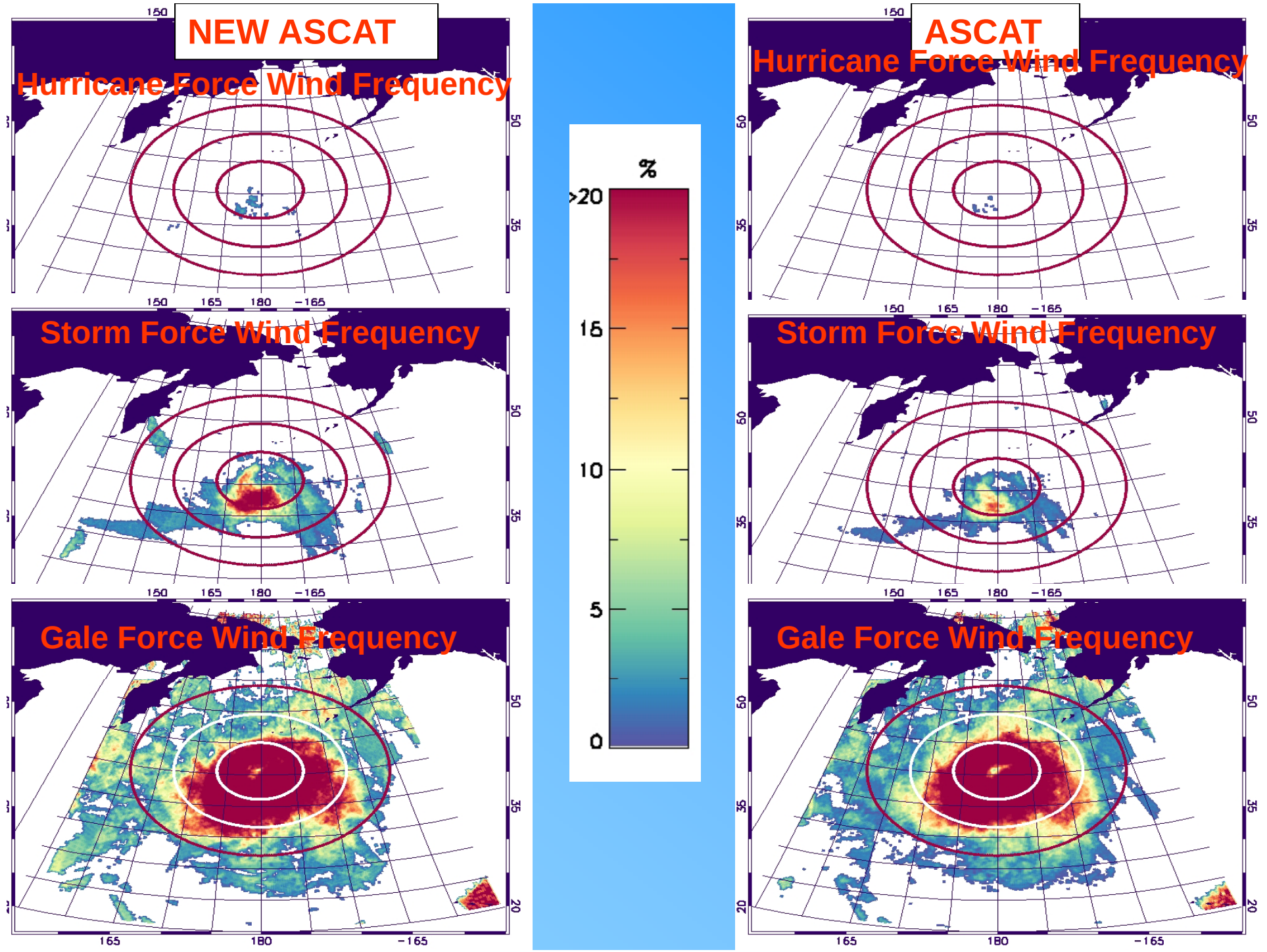
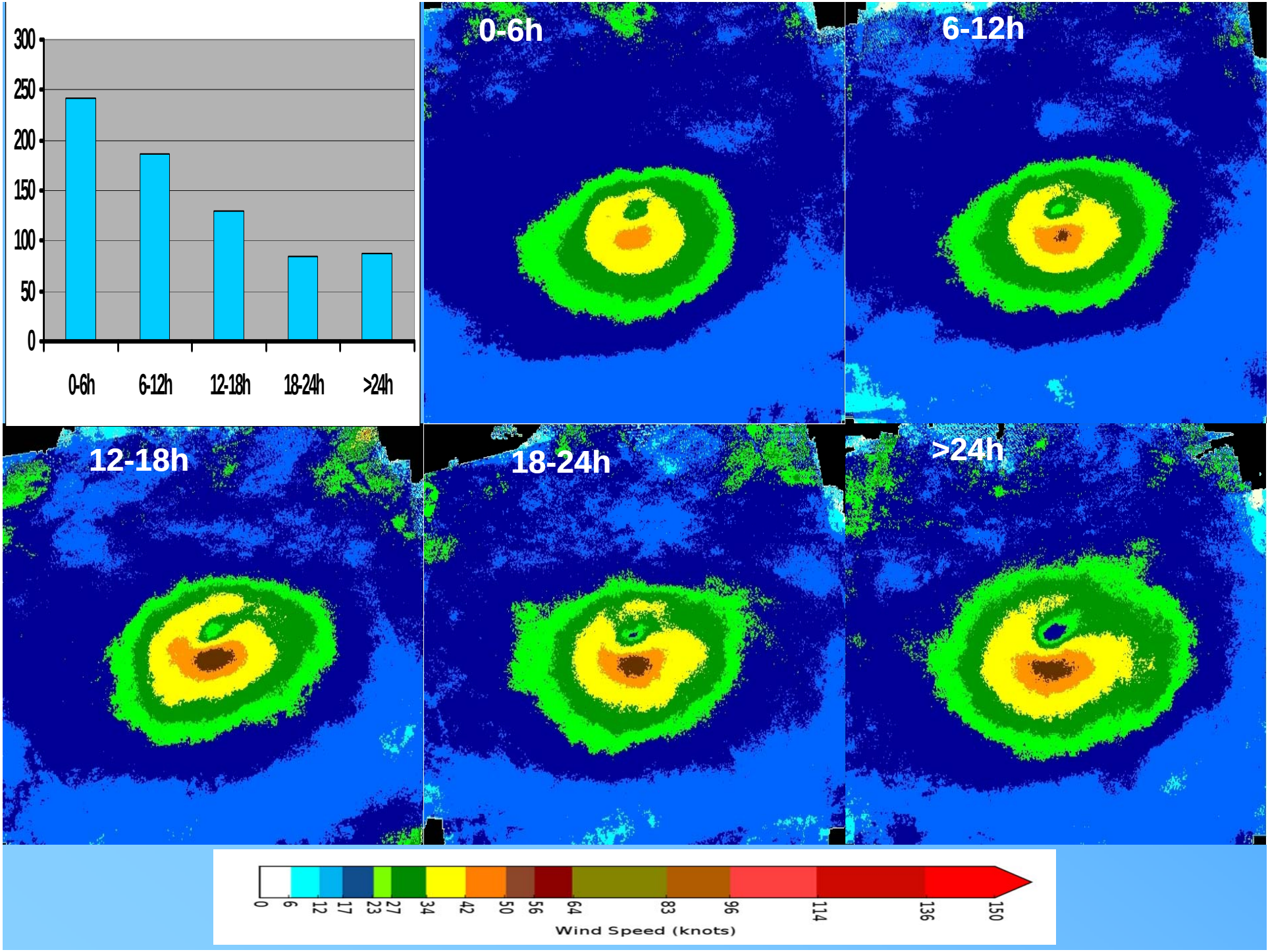
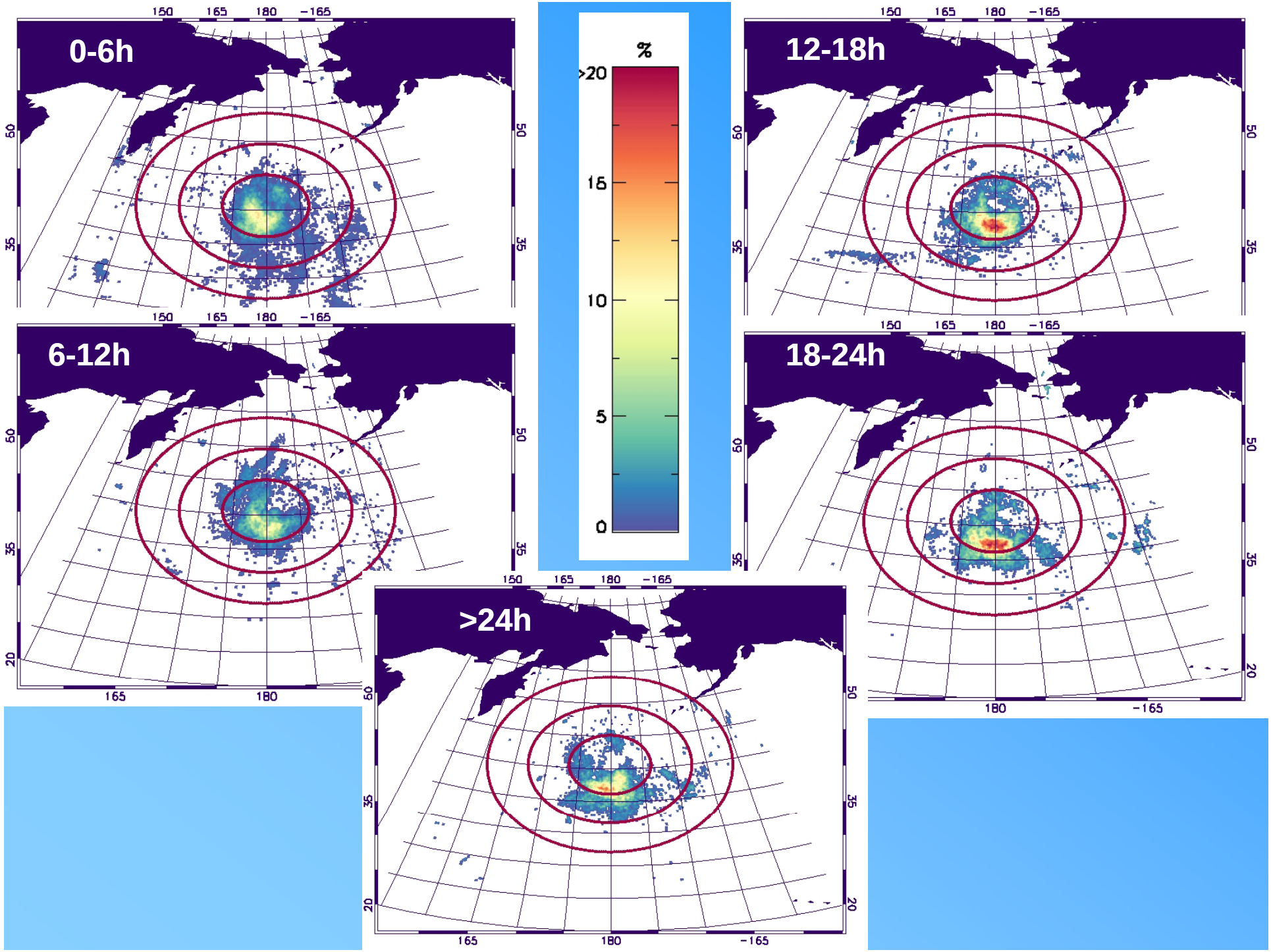
−20 −15 −10 −5 0 5 10 15 20
V - component


QuikSCAT
Hurricane Force Wind Frequency
Storm Force Wind Frequency
Gale Force Wind Frequency
ASCAT
Hurricane Force Wind Frequency
Storm Force Wind Frequency
Gale Force Wind Frequency
%
>20
15
10
5
0
150
165
180
−165
60
50
35
20


NEW ASCAT
Hurricane Force Wind Frequency
Storm Force Wind Frequency
Gale Force Wind Frequency
%
>20
15
10
5
0
ASCAT
Hurricane Force Wind Frequency
Storm Force Wind Frequency
Gale Force Wind Frequency

Monthly Wind Speed Distribution for 8 Consecutive North Pacific Winter Season using QuikSCAT Measurements


300
250
200
150
100
50
0
0-6h
6-12h
12-18h
18-24h
>24h
0-6h
6-12h
12-18h
18-24h
>24h
0
6
12
17
23
27
34
42
50
56
64
83
96
114
136
150
Wind Speed (knots)


0-6h
12-18h
6-12h
18-24h
>24h
%
>20
15
10
5
0
150
165
180
−165
60
50
35
20

HF Cyclone Trend

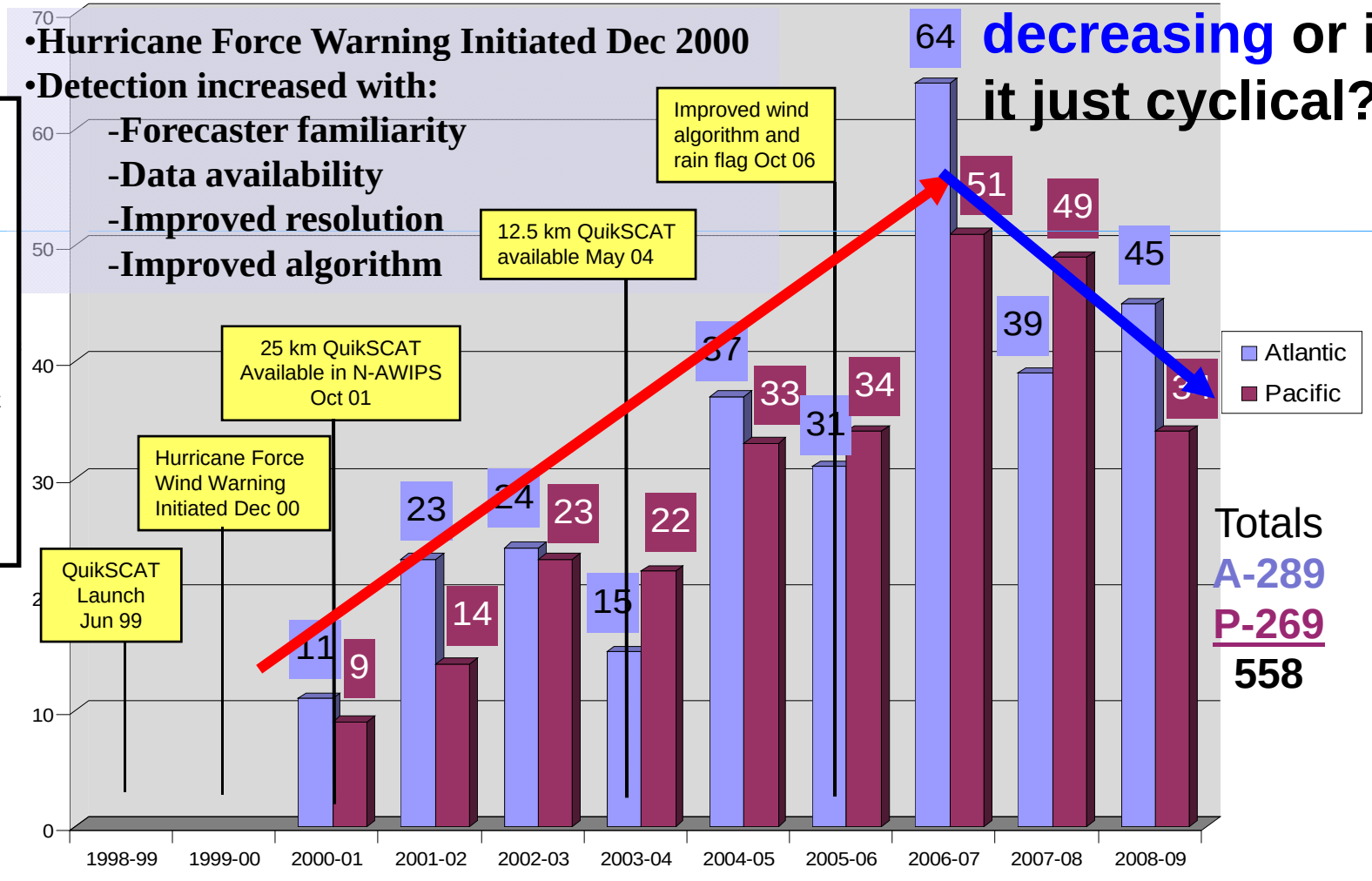
HF Cyclone Trend?

Is trend increasing, decreasing or is it just cyclical?

WARNING CATEGORIES

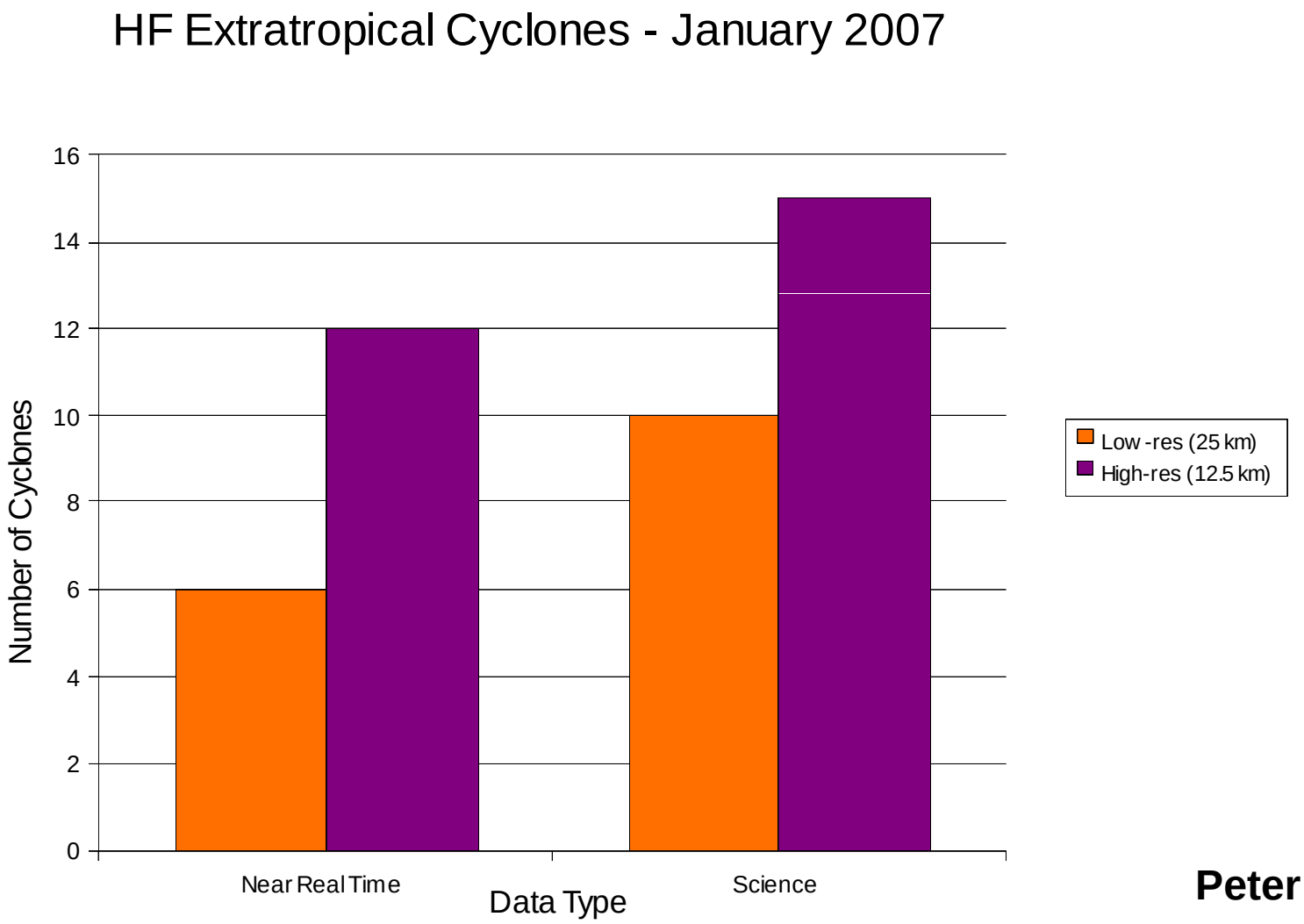
Pre- QSCAT
1. GALE 34-47 kt
2. STORM ≥48

QSCAT ERA
1. GALE 34-47 kt
2. STORM 48 -63 kt
3. HURCN FORCE ≥ 64 kt



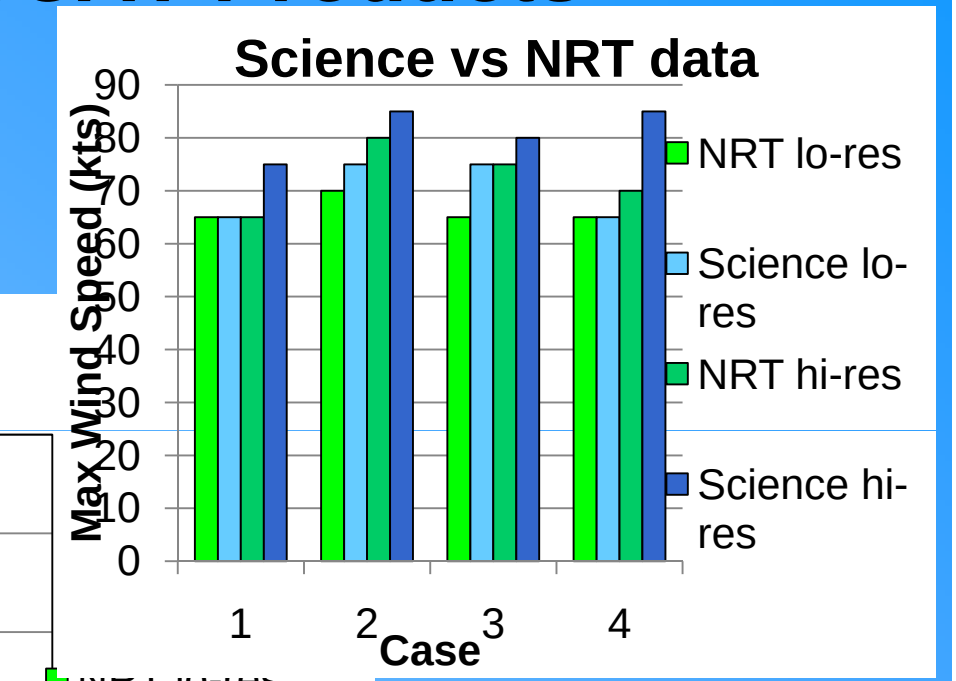
Totals
A-289
P-269
558

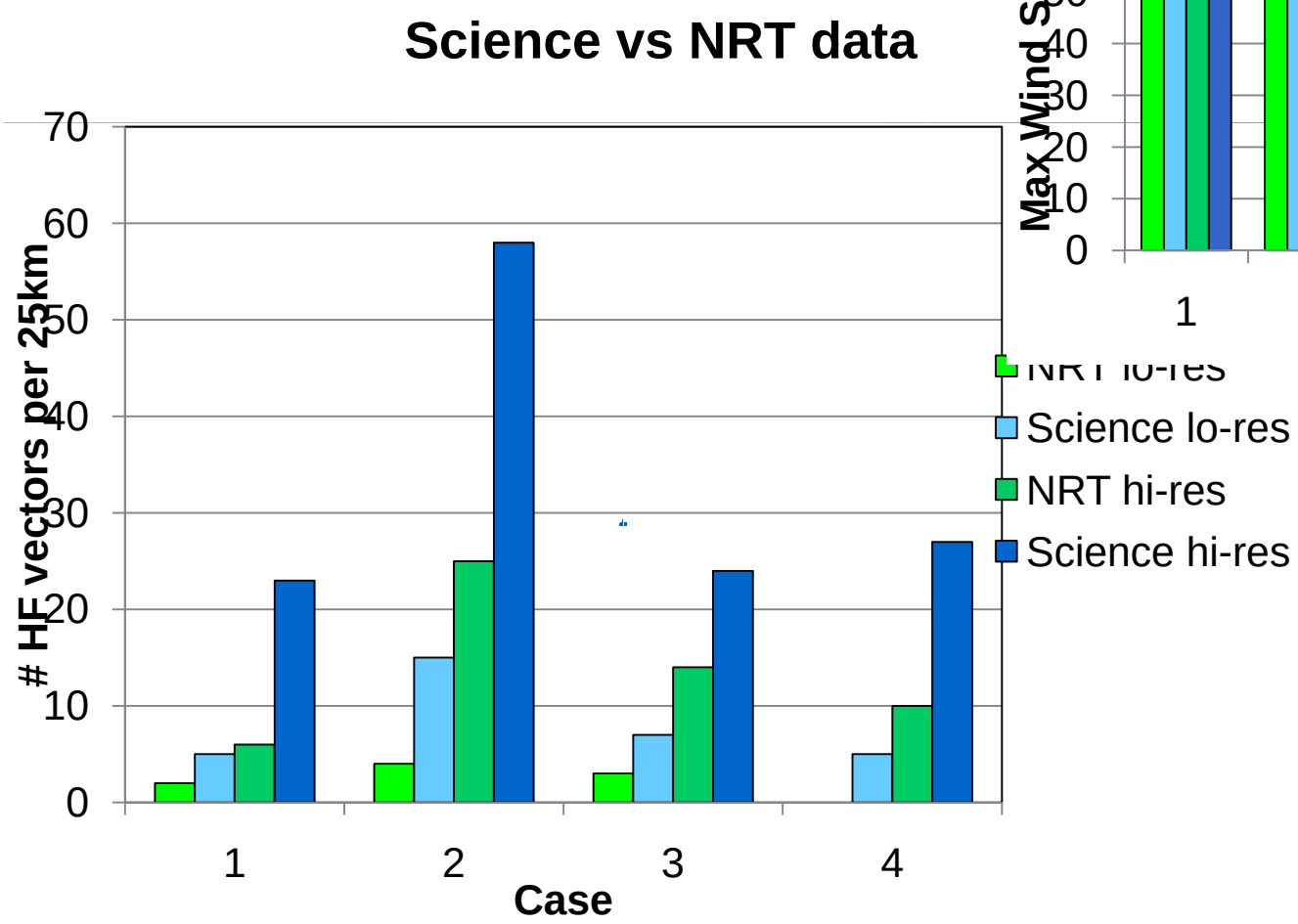
Number of HF Cyclones Using Different QuikSCAT Products – January 2007



Peter Jzyk

Wind Distribution and Maximum Using Different QuikSCAT Products





Peter Jzyk

Conclusions and Future Work

- Model function have significant impact on HF cyclone characteristics, detection and trend
- QuikSCAT directional errors became apparent when looking into zonal and meridional wind component fields
- Looking forward to reprocessed QuikSCAT data set!