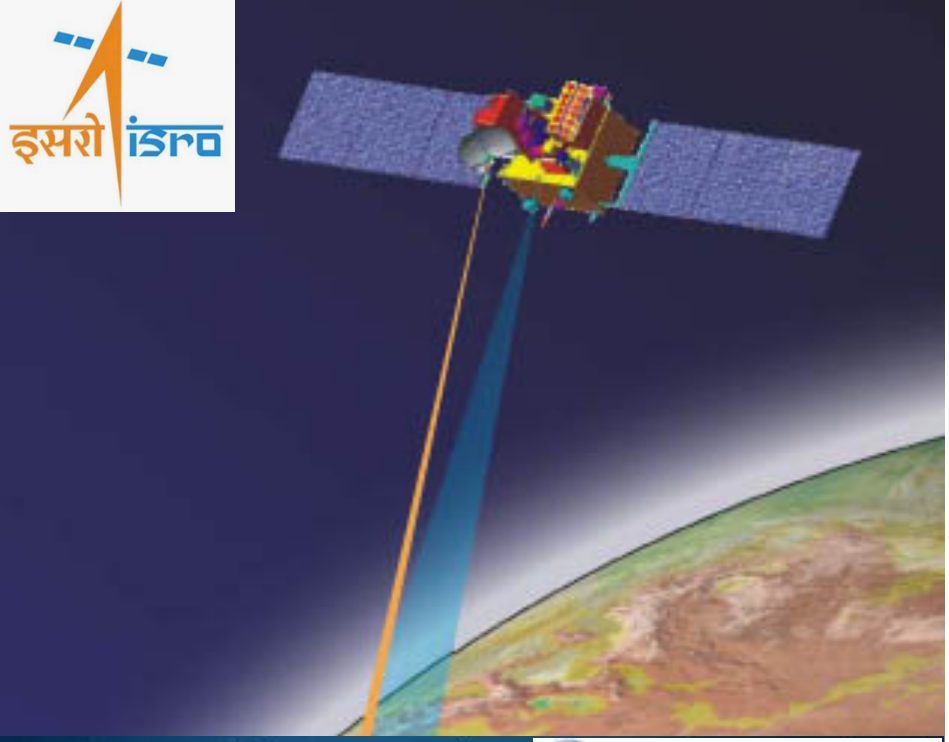


ASCAT and OSCAT Scatterometer Wind Products

Ad Stoffelen

KNMI scat group

scat@knmi.nl

OSI SAF
Ocean and Sea Ice

NWP SAF
Numerical Weather Prediction

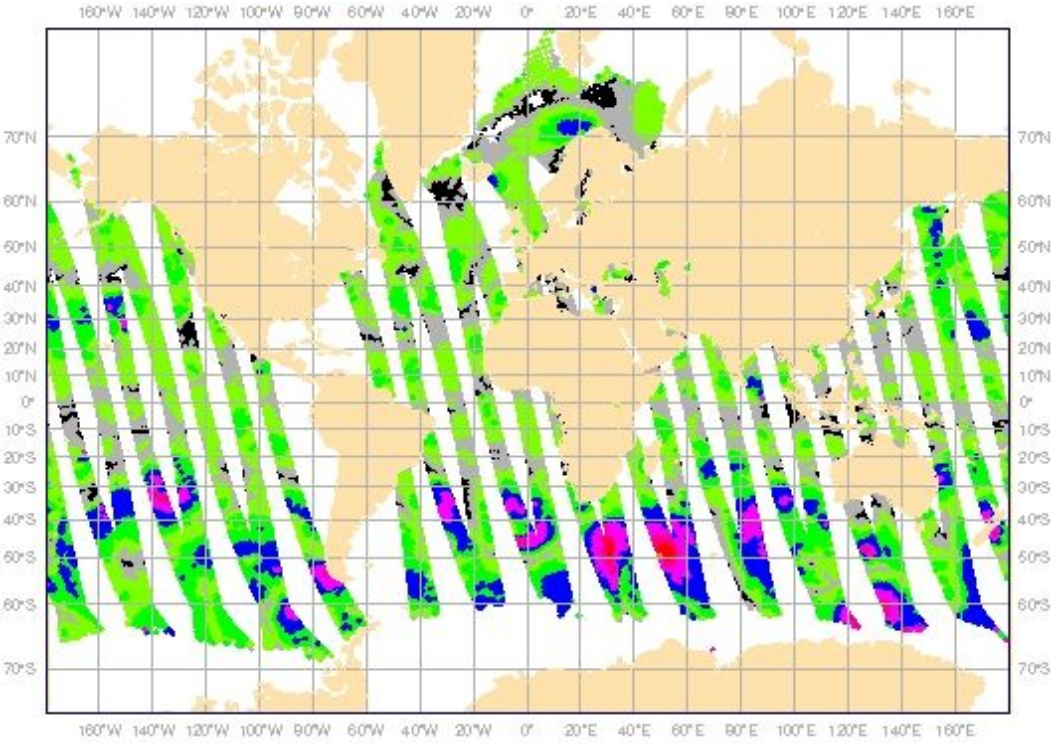
Updated @ 2011-10-27 07:03 utc

OSI SAF ASCAT Coastal product viewer

ASCAT12+, status: pre-operational

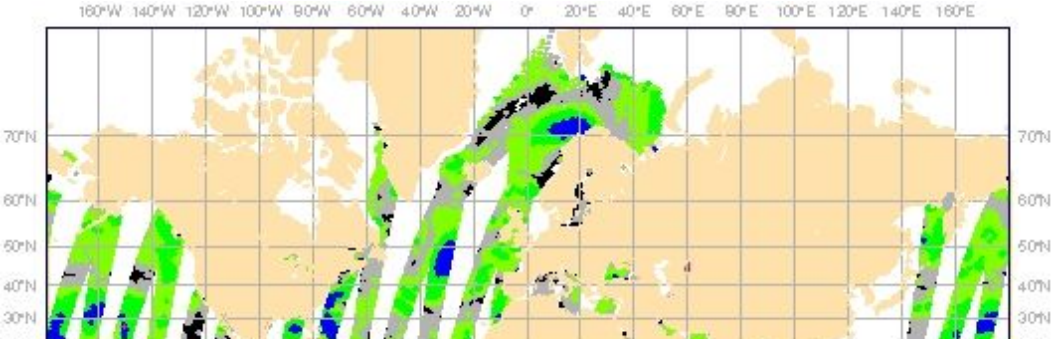
Ascending passes

Click in the map to zoom in



Descending passes

Click in the map to zoom in



Select view
- Monitoring information
- Buoy validations
- Data from previous day

Background information
- Modifications/anomalies
- Description of plots
- Access to products
- Acknowledgements
- ASCAT Product User Manual
- ASCAT Coastal Validation report
- Home OSI SAF Wind Centre

OSI SAF Wind Products
- ASCAT 25-km winds
  Operational status
- ASCAT 12.5-km winds
  Operational status
- Oceansat-2 winds
  Development status
- QuikSCAT winds
  Discontinued status
- Wind Products Processing Status

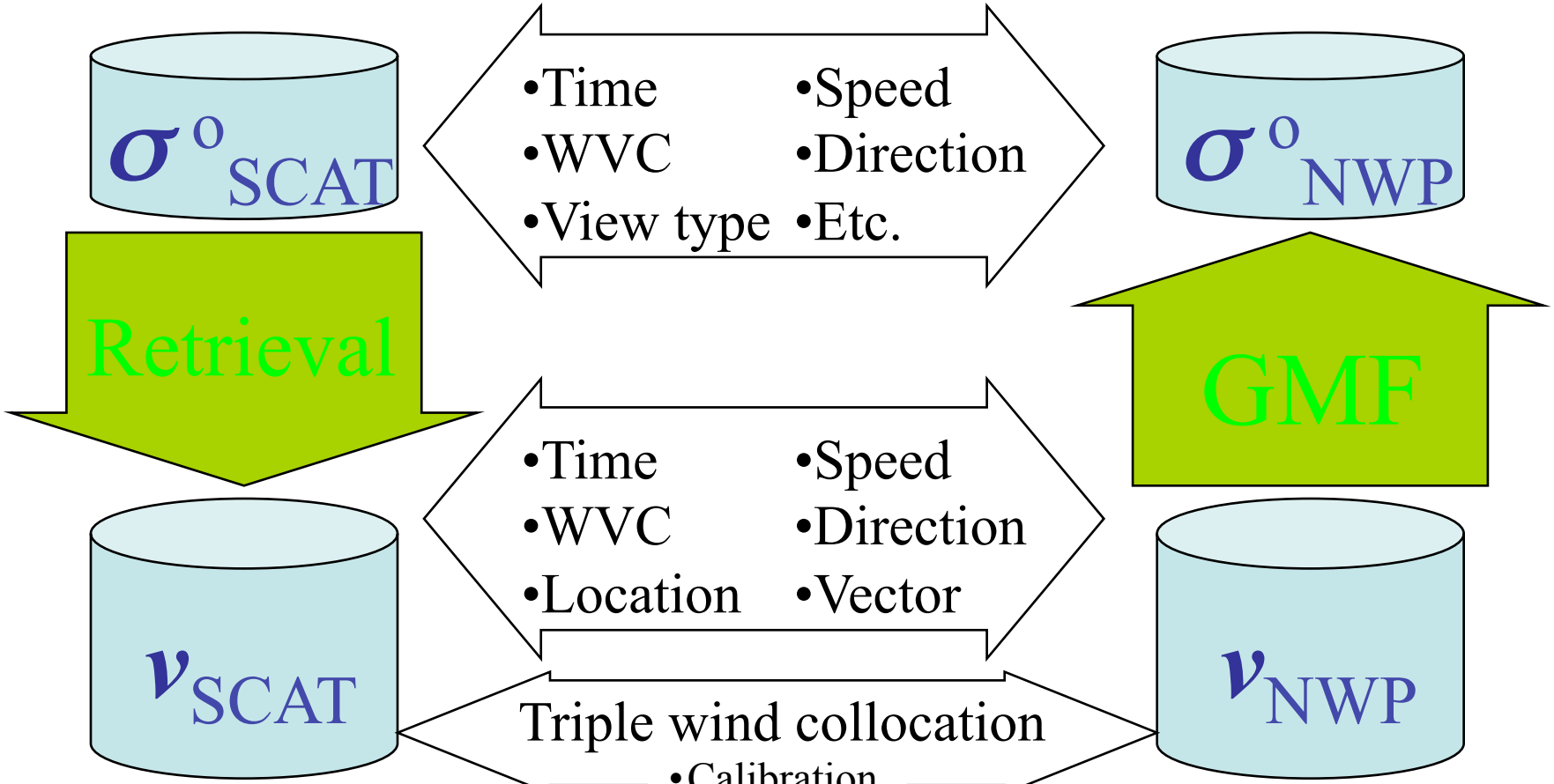
Other Wind Services at KNMI
- ASCAT 25-km winds (EARS)
  Operational status
- **ASCAT 12.5-km winds (EARS)**
  Operational status
- ERS-2 winds (EARS)
  Discontinued status
- Scatterometer work at KNMI

Software
- BUFR reader

Related links
- EUMETSAT
- Ocean and Sea Ice SAF
- EUMETSAT EARS system
- Numerical Weather Prediction SA
- Description of ASCAT instrument a
- ASCAT archived data at the EUME
- ASCAT archived NetCDF data at P

www.knmi.nl/scatterometer

Generic approach

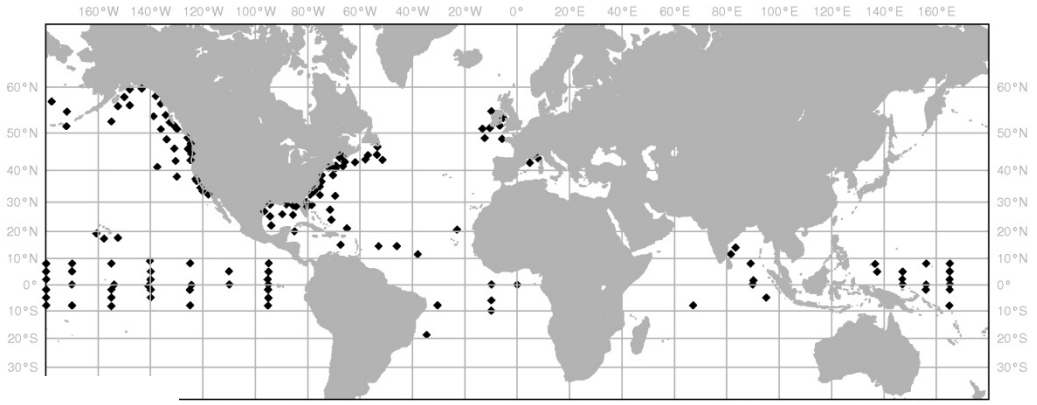


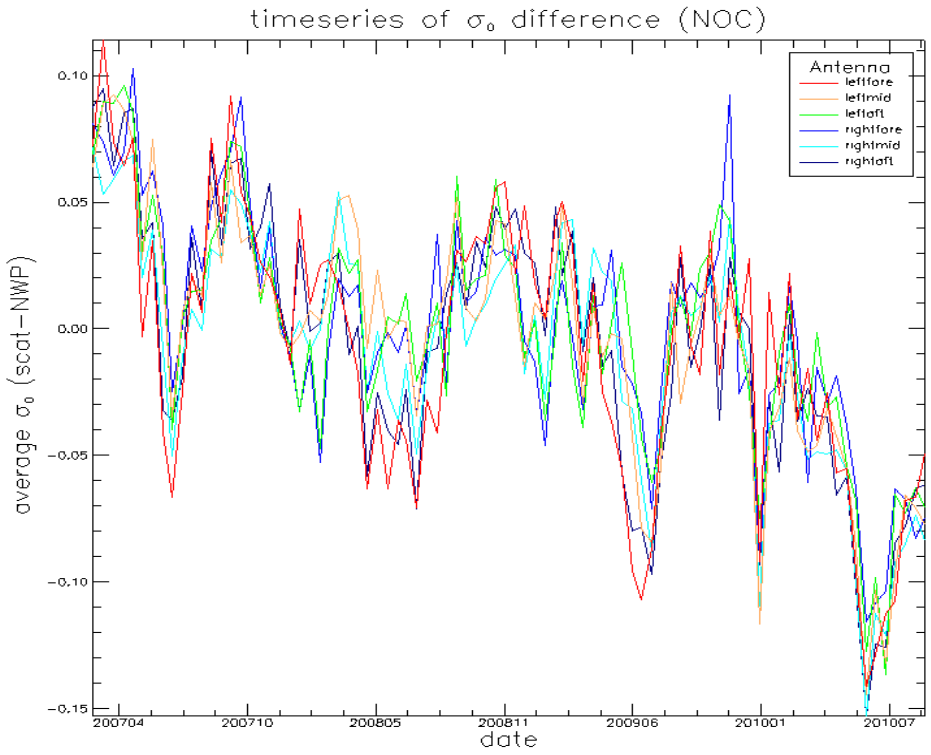
- Improvement of:
  - σ^o calibration
  - Retrieval
  - GMF
- Absolute reference

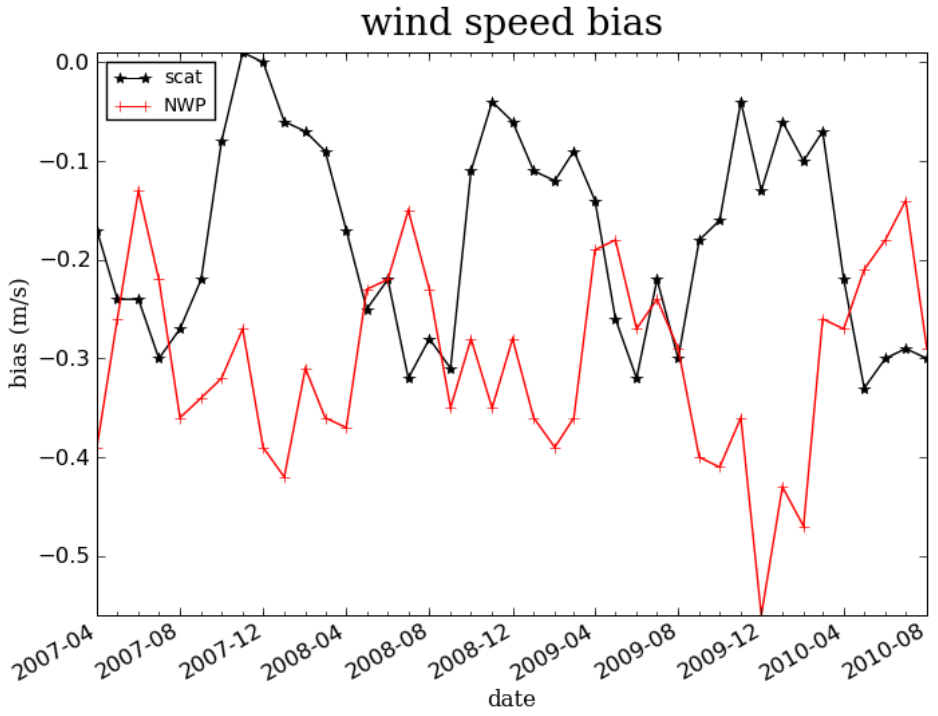
ASCAT stability – Ocean calibration

- Trends of 0.1 m/s just visible (10 year ECV req.)
- Global sampling error to be accounted for (buoy)

Verspeek et al., TGRS 2011, accepted







Triple collocation result

Scatterometer Scale Error SD	U m/s	V m/s
Buoy	1.21±0.02	1.23±0.02
ASCAT	0.69±0.02	0.82±0.02
ECMWF	1.54±0.02	1.55±0.02
Representativeness	0.63±0.02	1.00±0.02
ECMWF Scale Error SD	**U m/s**	**V m/s**
Buoy	1.44±0.02	1.59±0.02
ASCAT	1.05±0.02	1.29±0.02
ECMWF	1.32±0.02	1.18±0.02

Trend	U m/s	V m/s
ASCAT	0.99	0.99
ECMWF	0.97	0.96

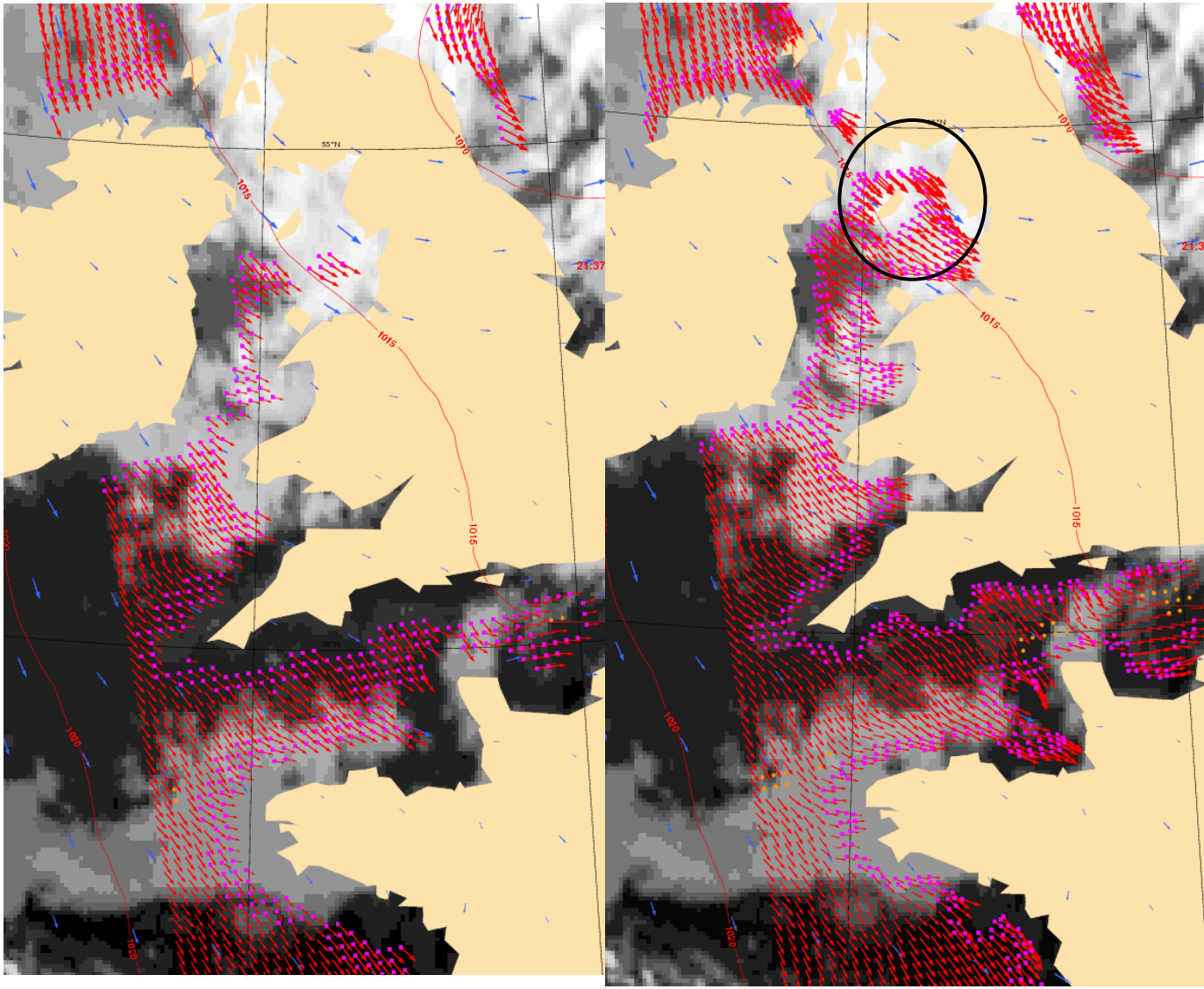
- ASCAT winds are very accurate
- ASCAT error SD is smaller than representativeness vector error SD
- Buoy errors appear large (current, wind variability)
- ECMWF winds appear smooth and biased low on average
- In extreme weather much larger deviations will occur

See also Vogelzang et al., JGR, 2011

ASCAT coastal, 12.5 km

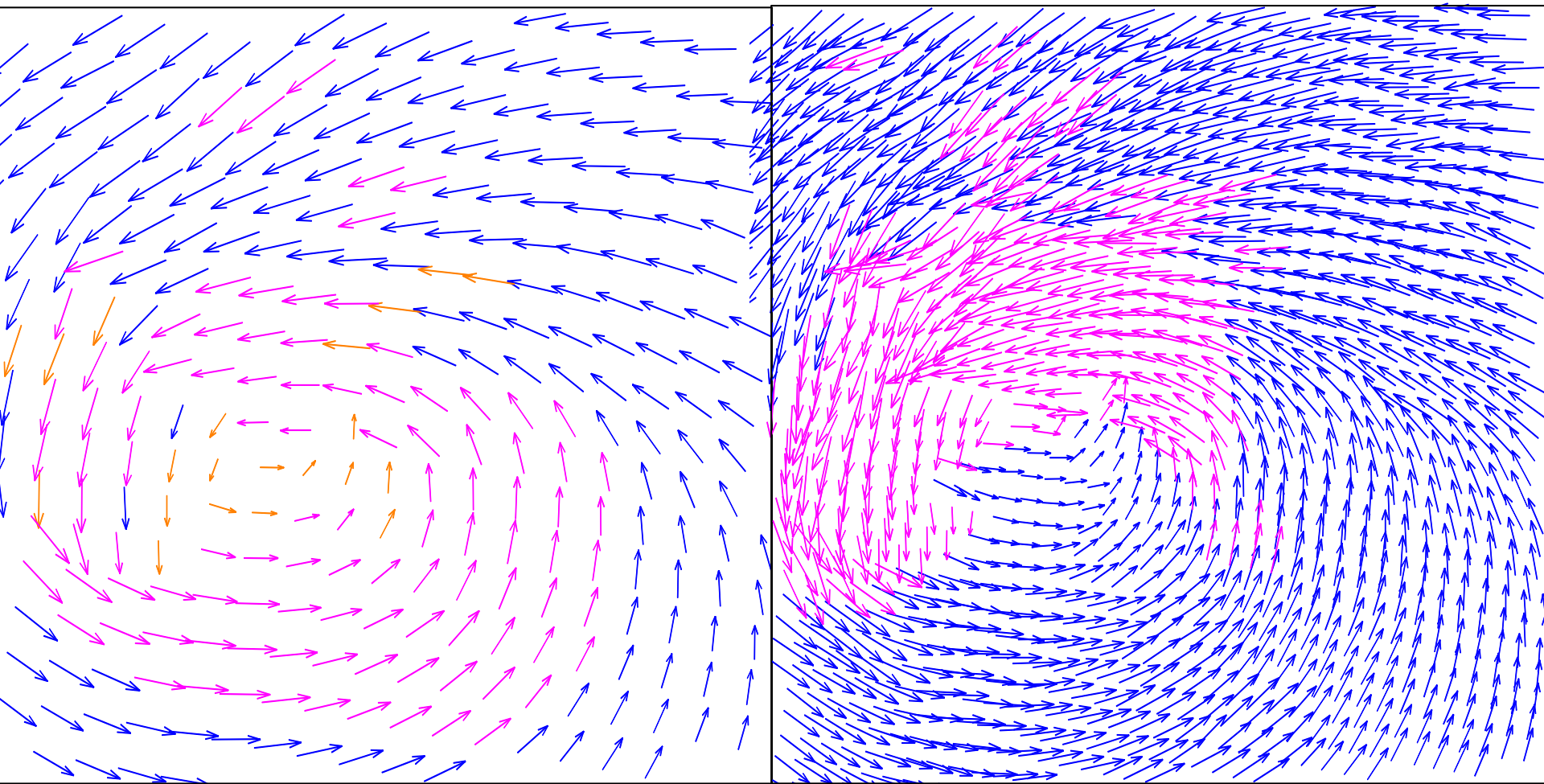
- Winds approach the coasts as close as 15-20 km vs. ~35 km for the operational product
- Winds near the coast look consistent and are they of good quality

➢ Operations waits for L1b updates



6.25 km WVCs

- Left: coastal product at 12.5 km grid size, right: ultra high resolution product at 6.25 km grid size
- Product still looks consistent but data quality not yet assigned



Rain cell surface winds

- Rain cell is smaller than surface wind burst

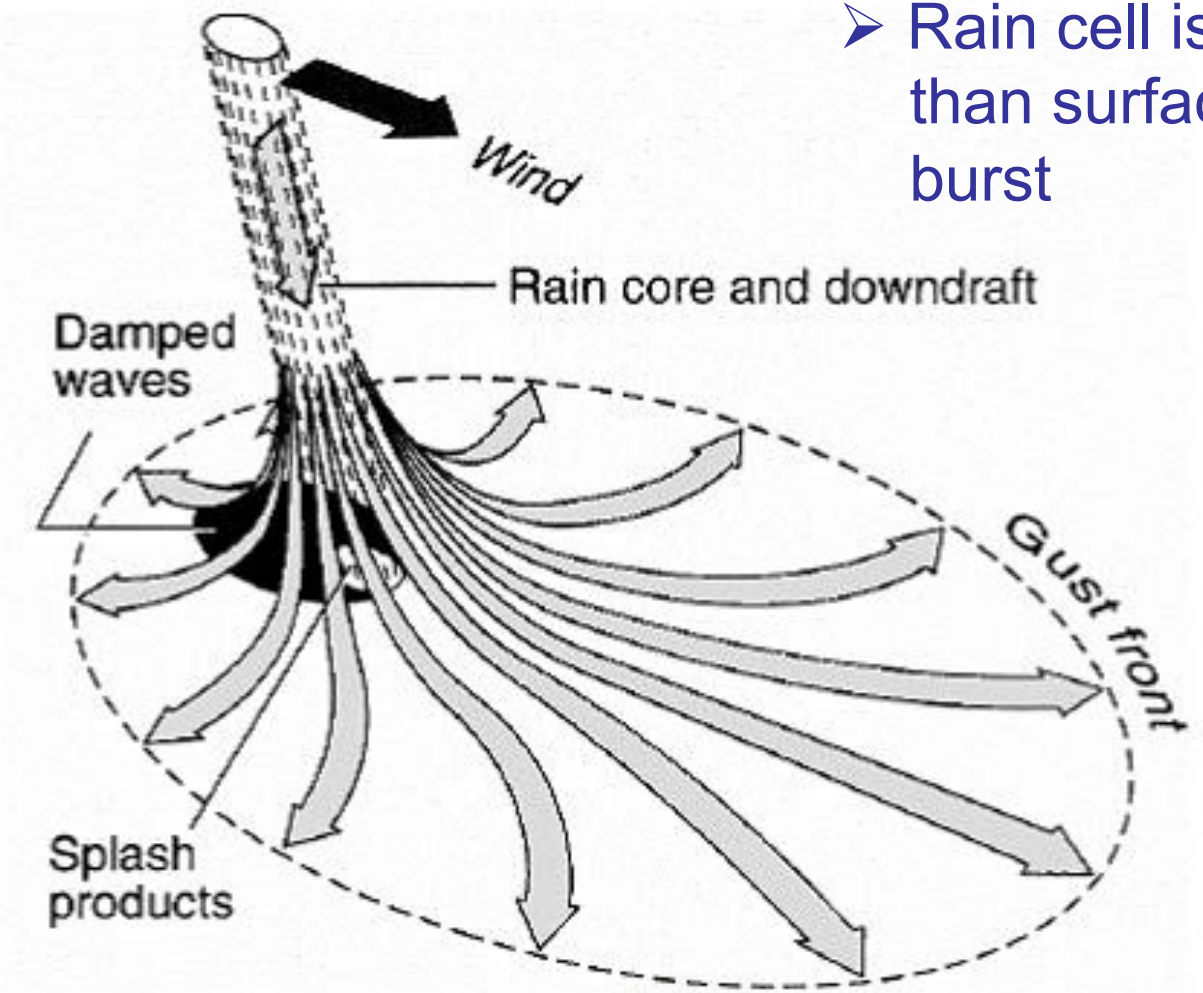
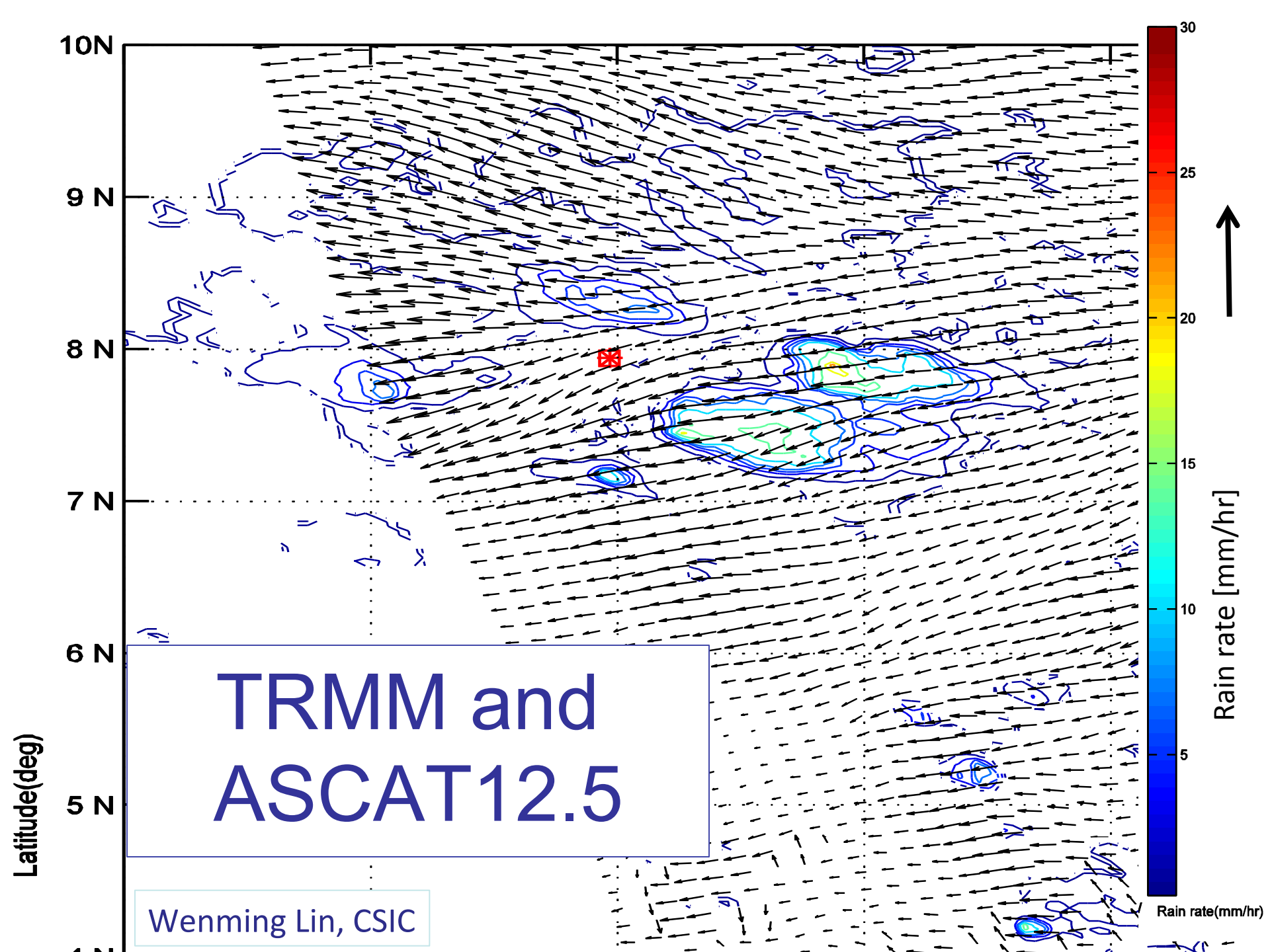
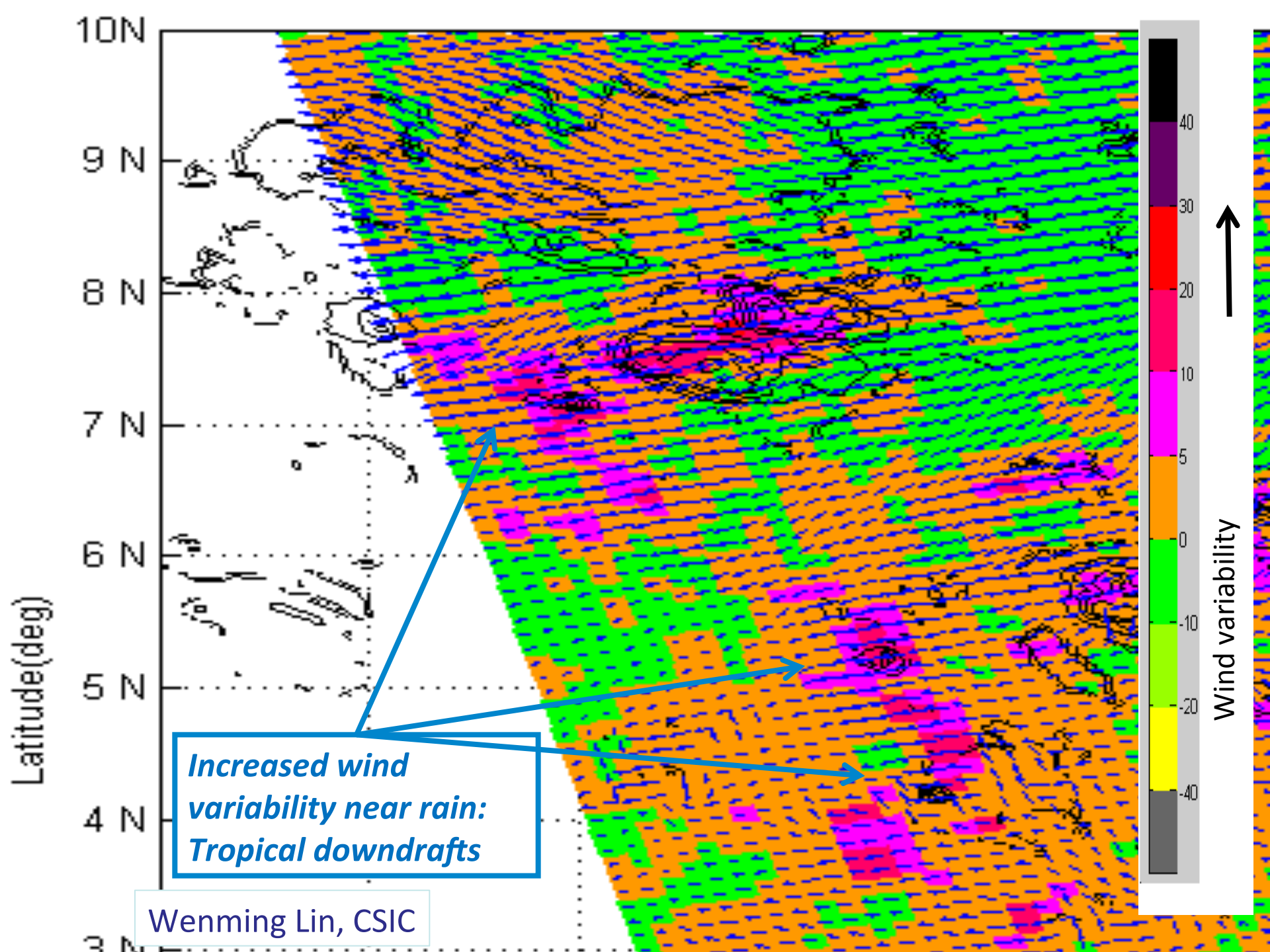
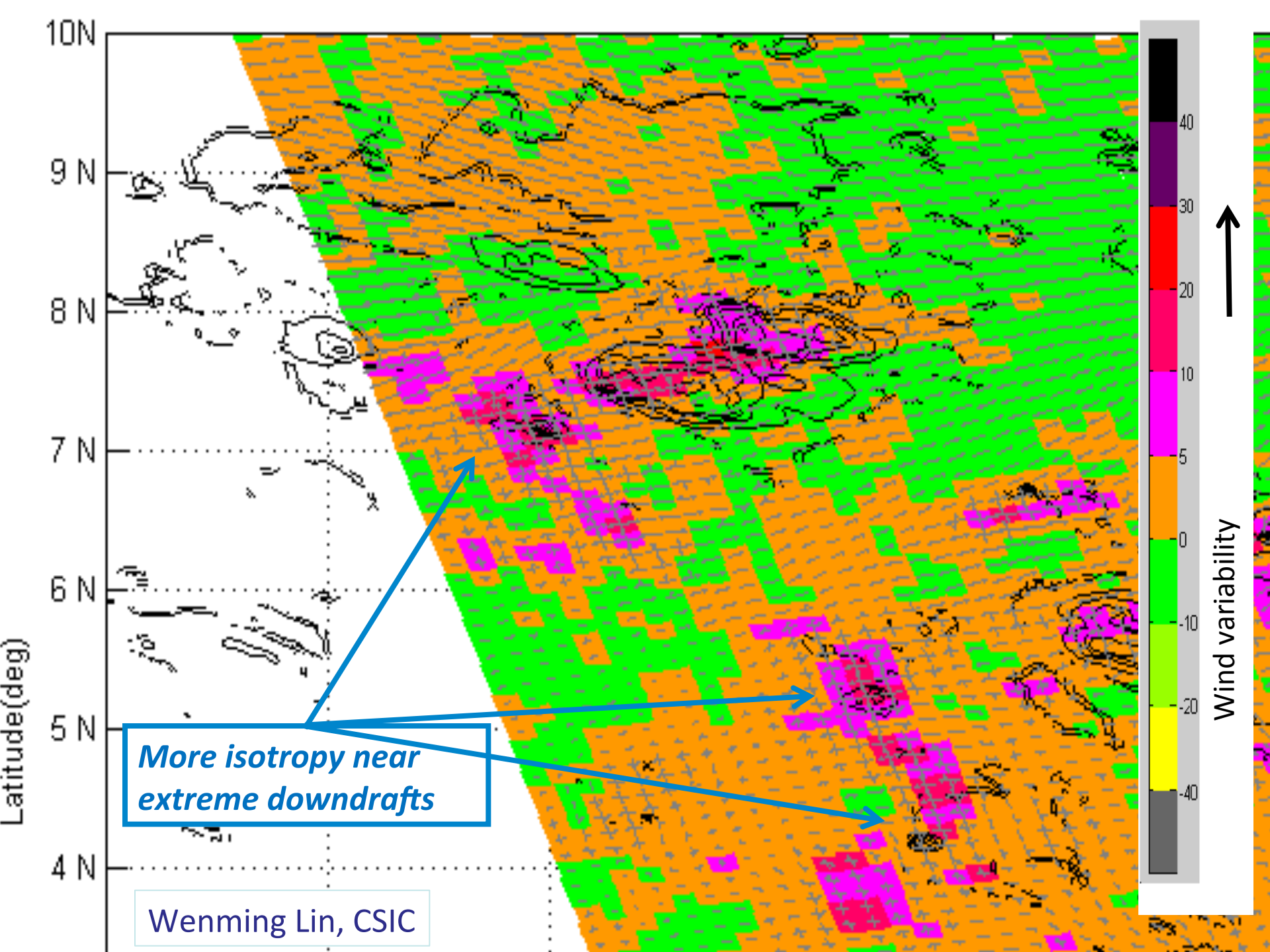


Figure 17.1. Schematic sketch of the downdraft associated with a rain cell. The downdraft spreads over the sea surface, causing and enhanced roughening of the sea surface and, thus, an increase in the backscattered radar power [After *Atlas*, 1994b].


10N
9 N
8 N
7 N
6 N
5 N
Latitude(deg)
30
25
20
15
10
5
Rain rate [mm/hr]
Rain rate(mm/hr)
TRMM and
ASCAT12.5
Wenming Lin, CSIC

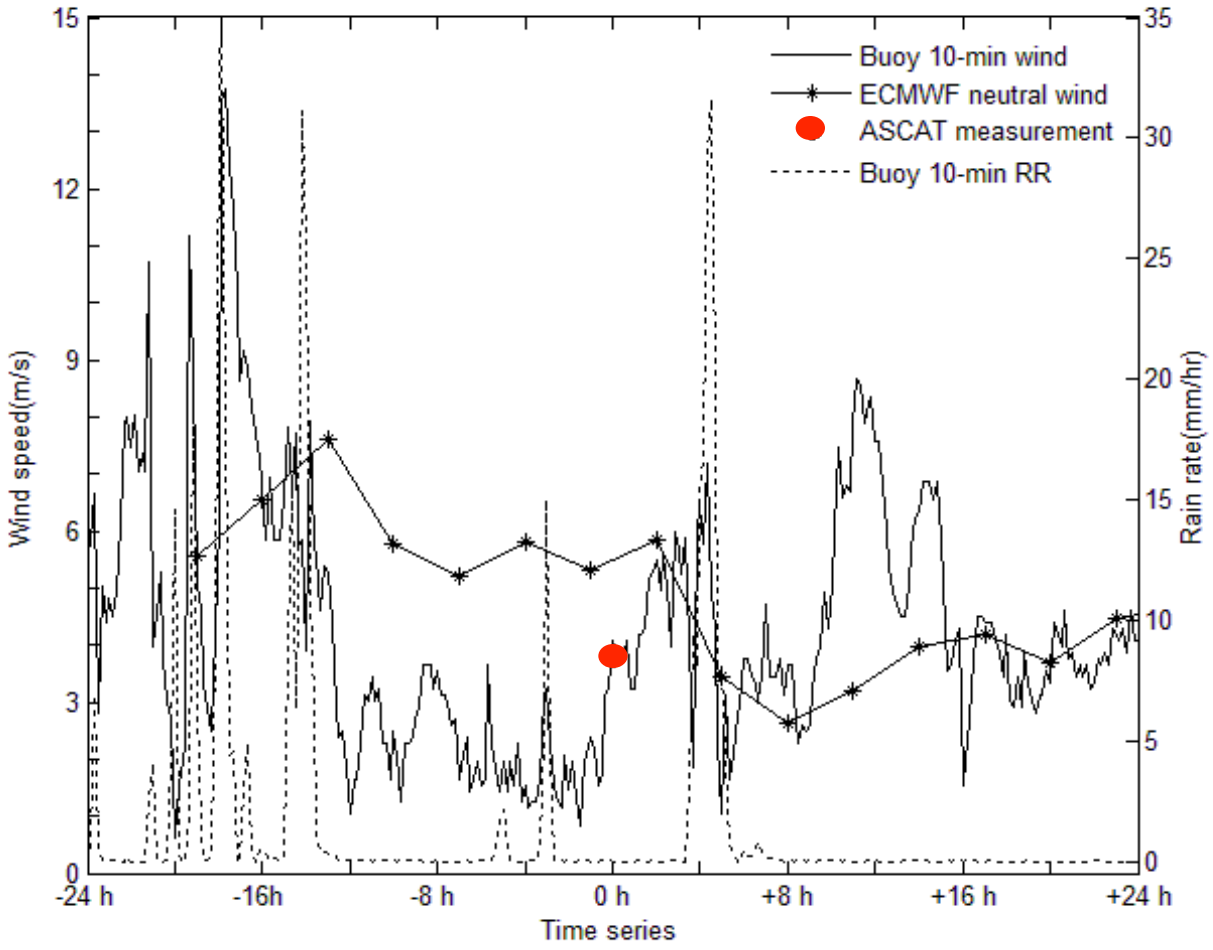

10N
9 N
8 N
7 N
6 N
5 N
4 N
Latitude(deg)
40
30
20
10
5
0
-10
-20
-40
Wind variability
Increased wind variability near rain: Tropical downdrafts
Wenming Lin, CSIC

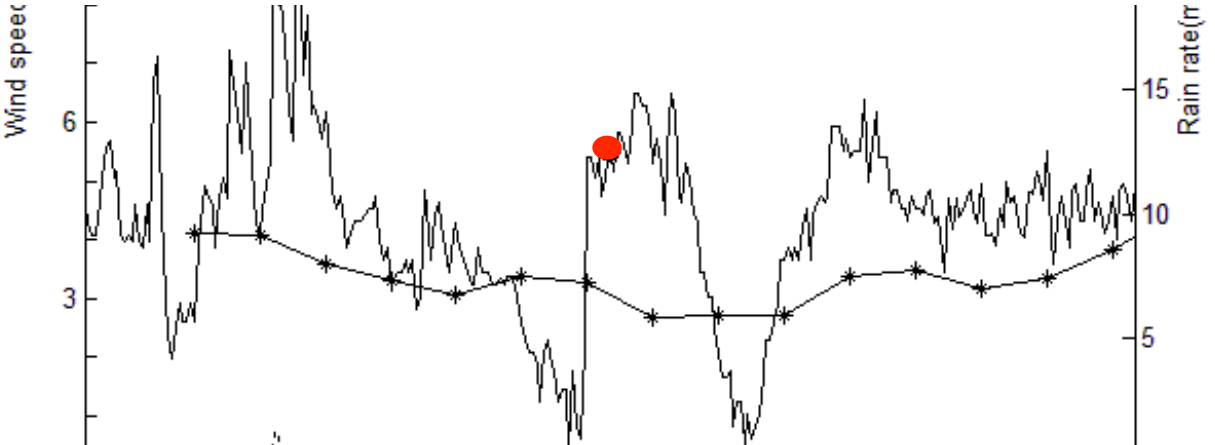

10N
9 N
8 N
7 N
6 N
5 N
4 N
Latitude(deg)
40
30
20
10
5
0
-10
-20
-40
Wind variability
More isotropy near extreme downdrafts
Wenming Lin, CSIC

OSI SAF
Ocean and Sea Ice

Tropical variability

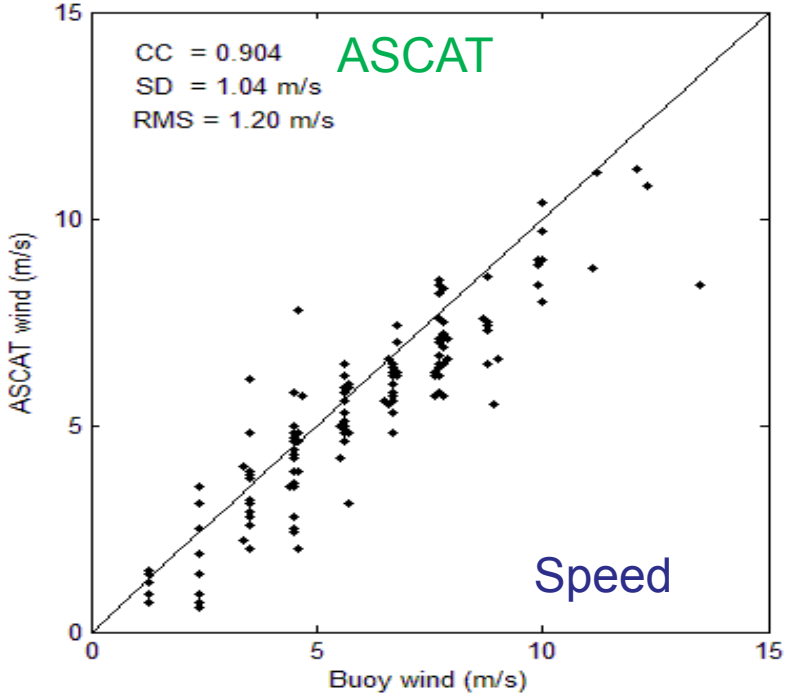
- Dry areas reasonable in NWP models
- NWP models lack air-sea interaction in convective areas
- ERS and ASCAT scatterometers do a good job near rain

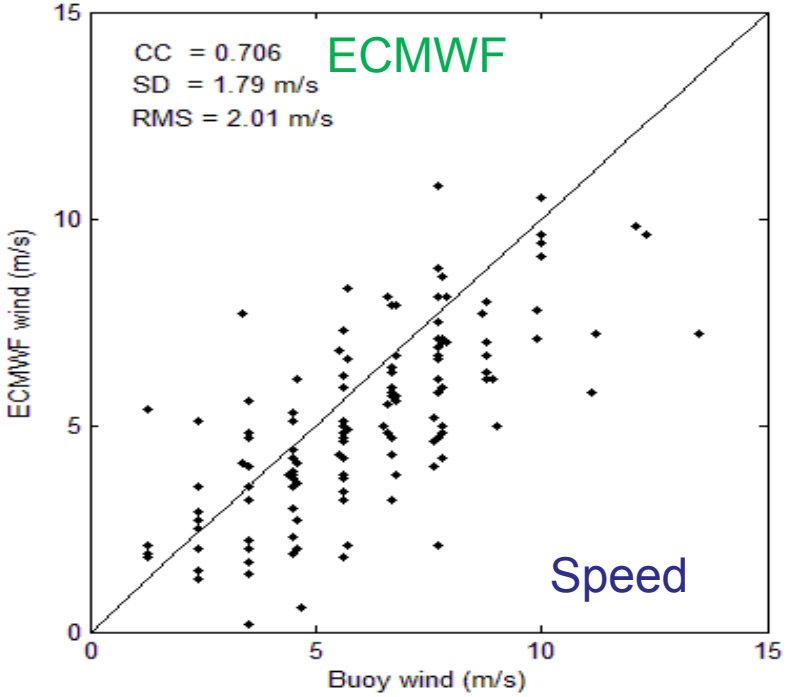


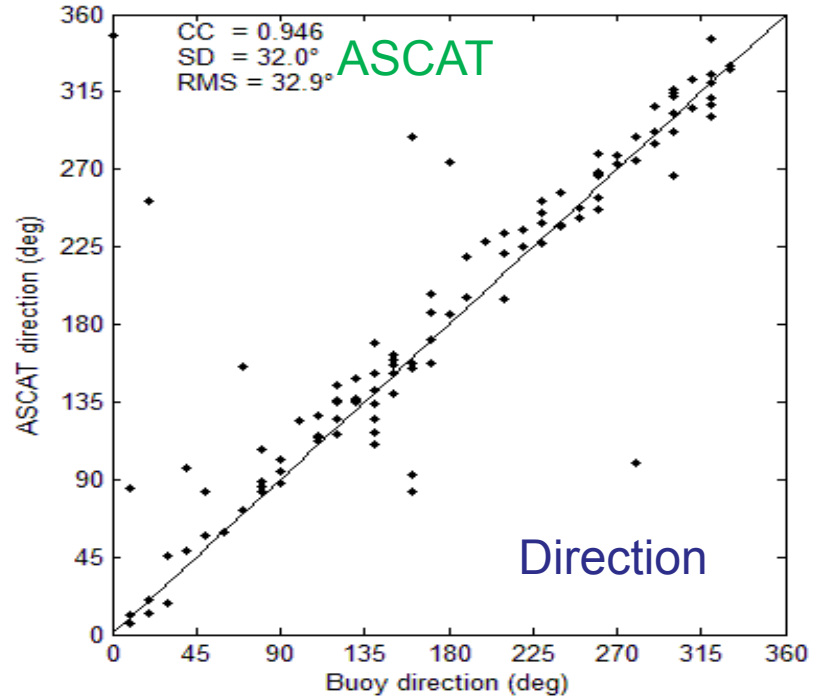


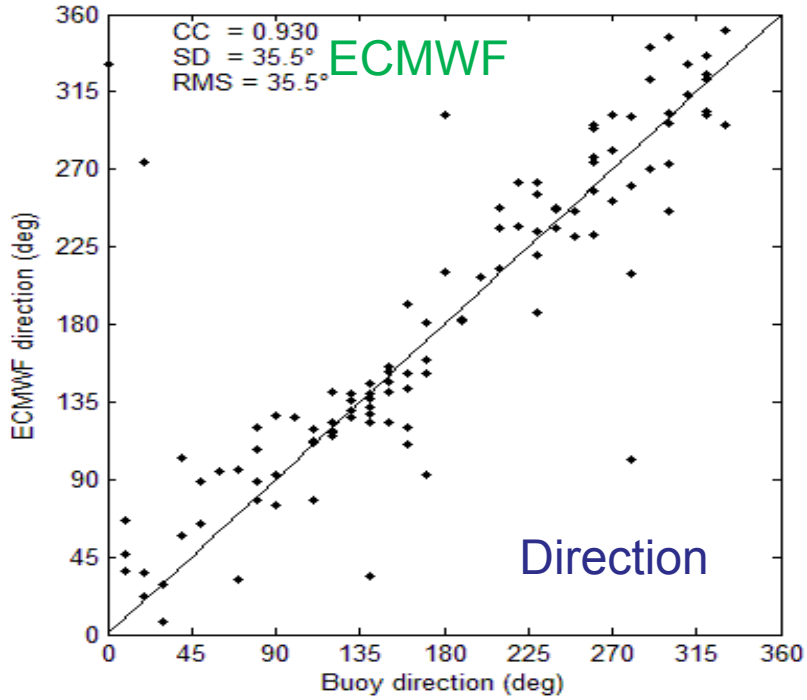
Portabella et al., TGRS

Validation near Rain

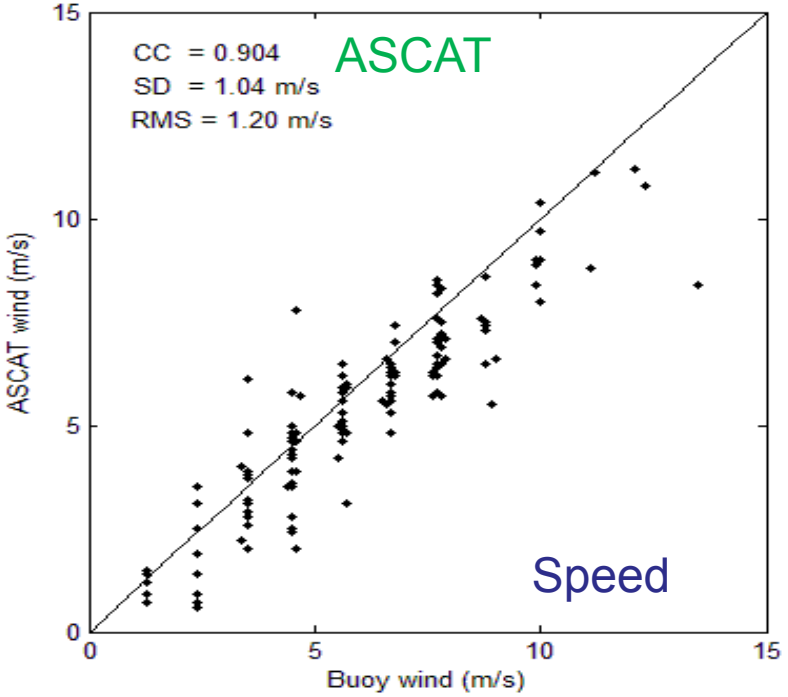


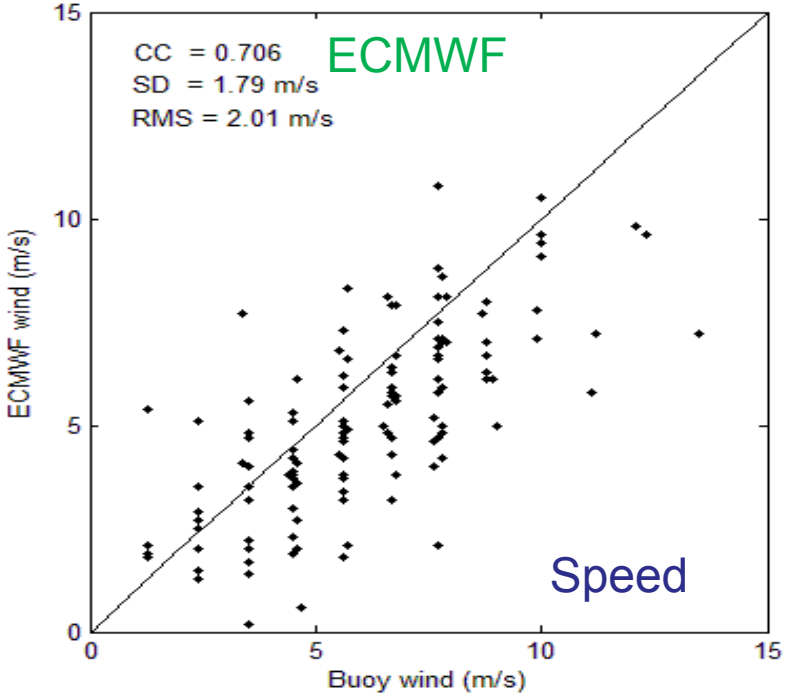


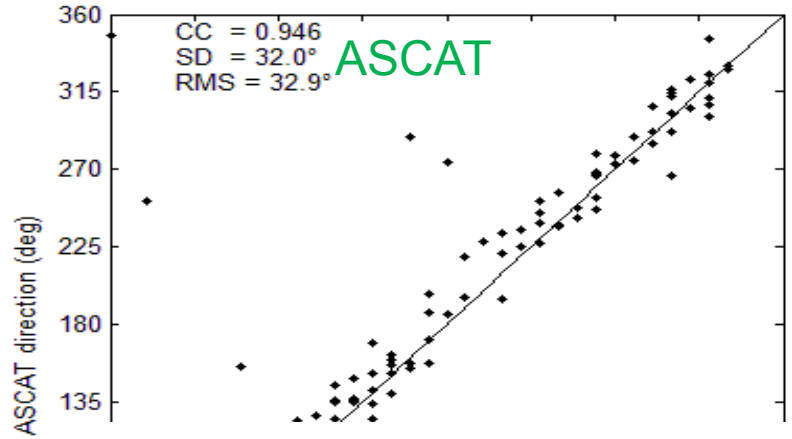


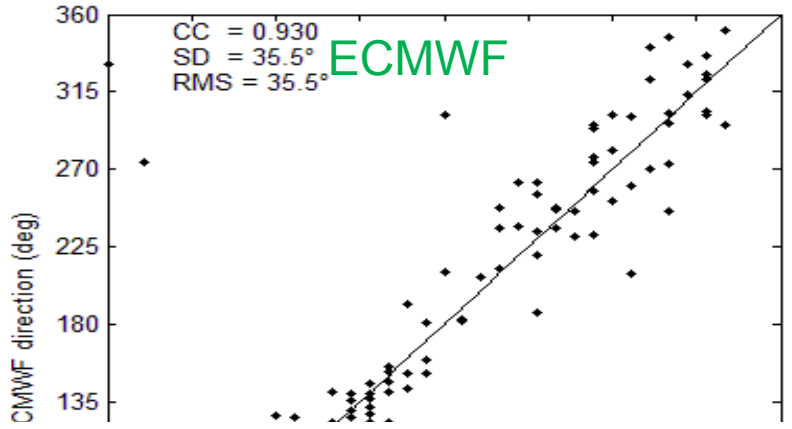


Validation near Rain





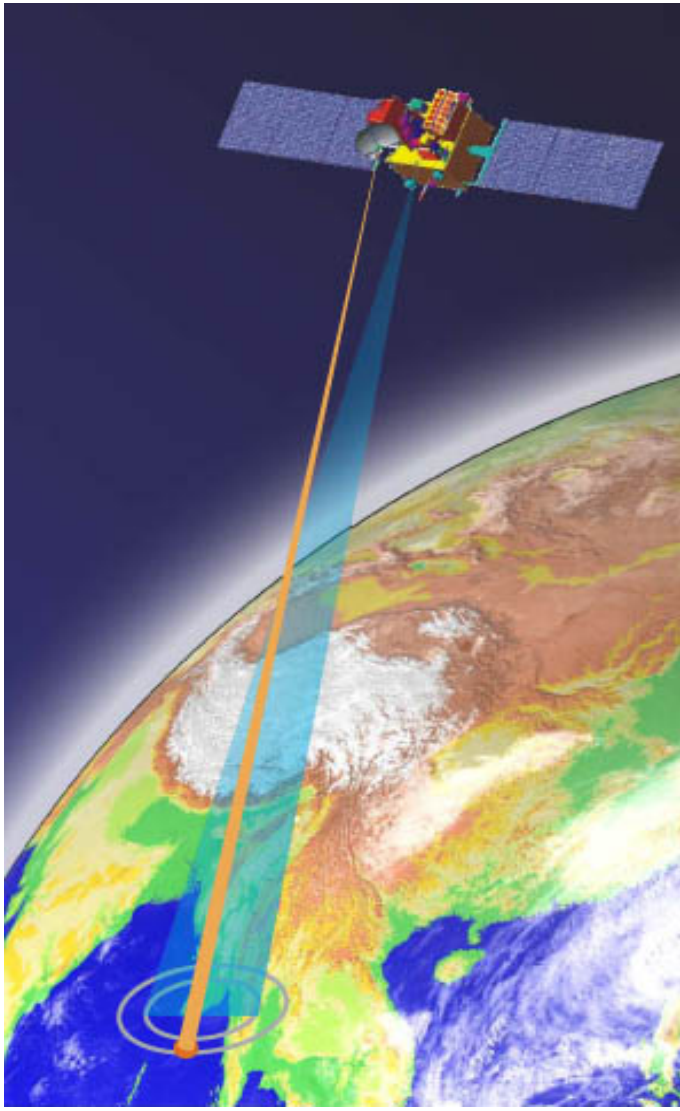




ASCAT 12.5 km (selected) winds closer to buoy winds than ECMWF winds in the vicinity of rainy areas (**buoy rain data**).

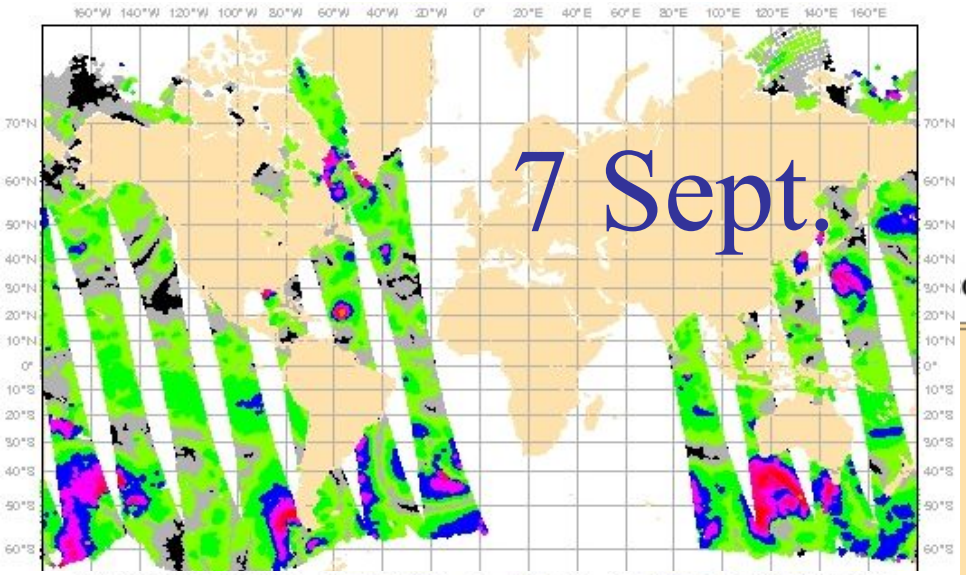
European Involvement OSCAT

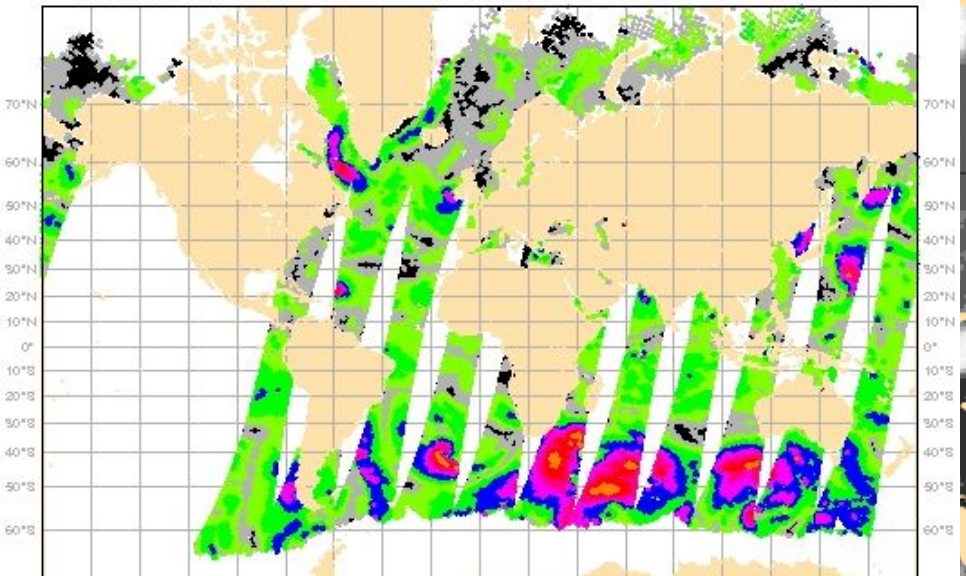
- OceanSat-2 AO project:
  - KNMI (PI), ECMWF, UK Met.Office, Meteo France, IFREMER, CMIMA, DWD, ...
  - KNMI contribution in context of EUMETSAT Ocean and Sea Ice SAF and NWP SAF
  - Cal/Val uses European QuikScat heritage
  - OWDP: OSCAT Wind Data Processor (clone SDP)
  - Experimental NRT OWDP at KNMI ; see www.knmi.nl/scatterometer for nice pictures
- MoUs EUMETSAT-ISRO-NOAA targetting:
  - Global orbit dumps at Svalbard
  - L0 and L1/2 processing in India and at EUMETSAT (backup)
  - Dump, processing and distribution trial ongoing
  - Timeliness within 1 hour through EUMETCAST

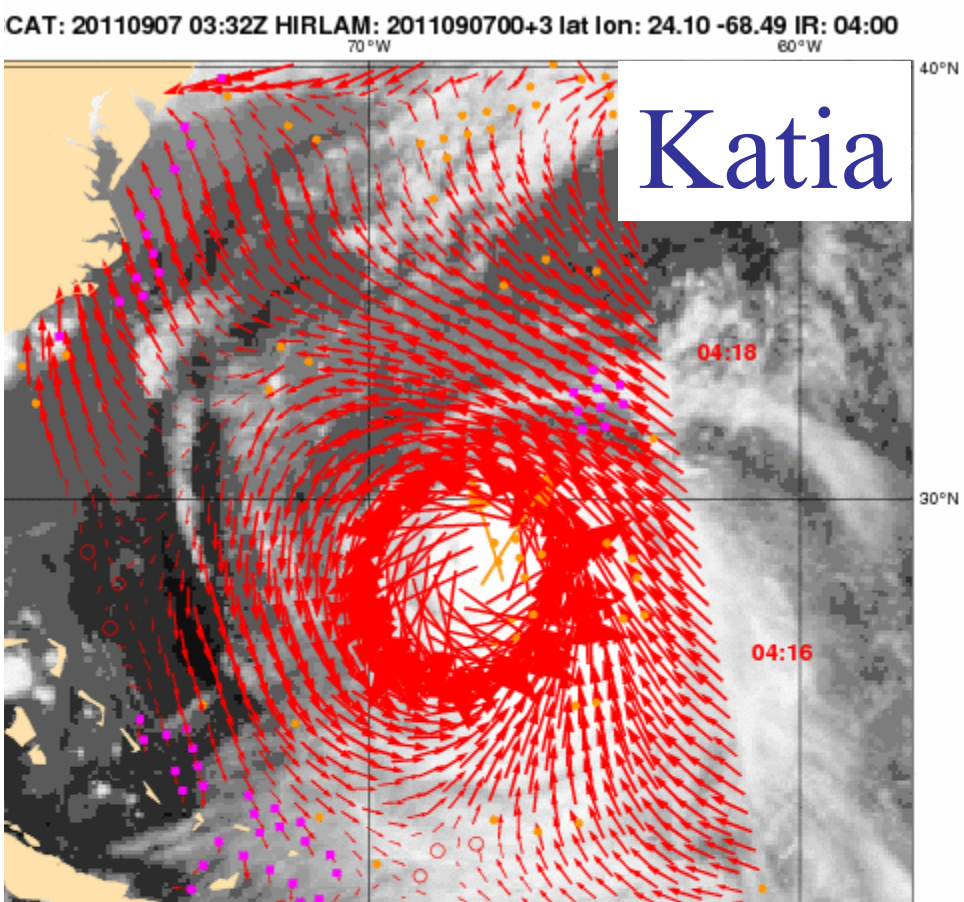


OWDP at KNMI

- Very grateful for NRT data since mid March
- Experimental suite







OSCAT AO project principle

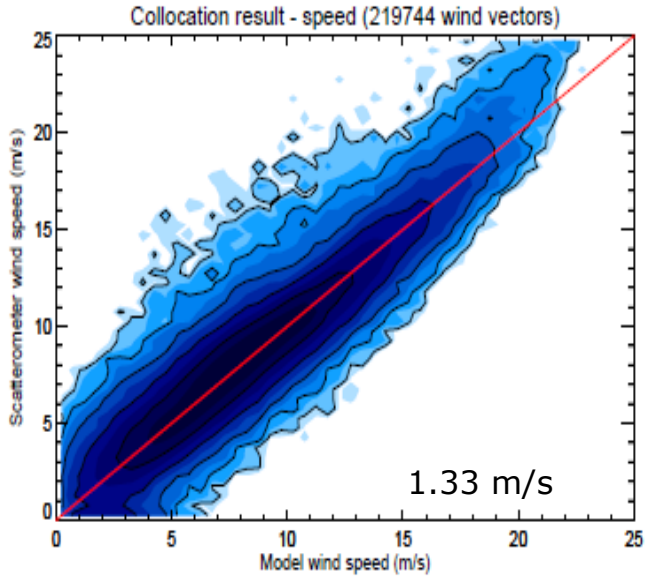
- OSCAT provides Ku band Normalized Radar Cross Section, NRCS, or σ^0
- σ^0 is a geophysical quantity with a given true PDF over the world oceans
- All instruments should provide a similar σ^0 PDF
- Ku-band VV and HH provided by SeaSat, NSCAT, SeaWinds and OSCAT
- KNMI's SeaWinds Data Processor (SDP) uses NSCAT GMF
- Since the instruments are similar, we expect that the SeaWinds (QSCAT) wind processing applied to OSCAT σ^0 data produces a PDF similar to the SeaWinds wind PDF
- This would imply intercalibration of OSCAT and QSCAT, a requirement to establish a QSCAT/OSCAT FCDR

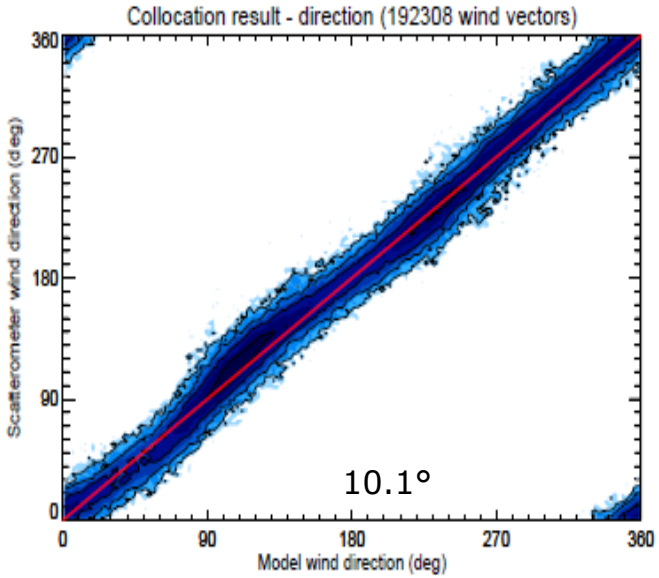
➢ Are the OSCAT σ^0 and wind PDFs similar to the QSCAT σ^0 and wind PDFs ?

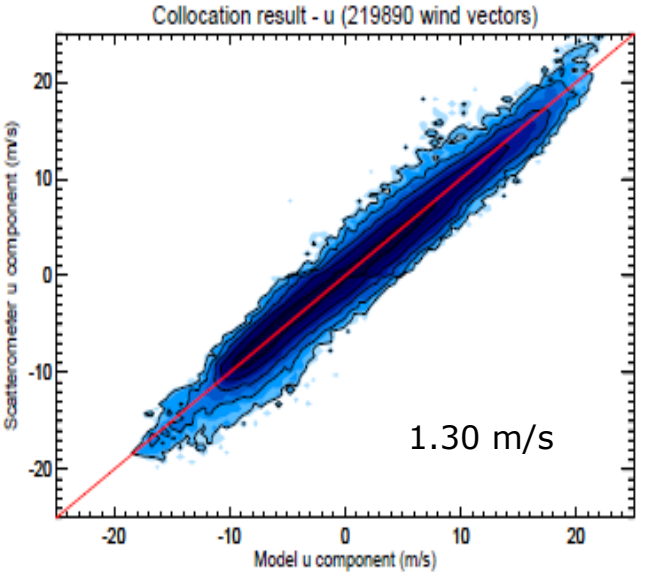
OWDP winds vs. ECMWF

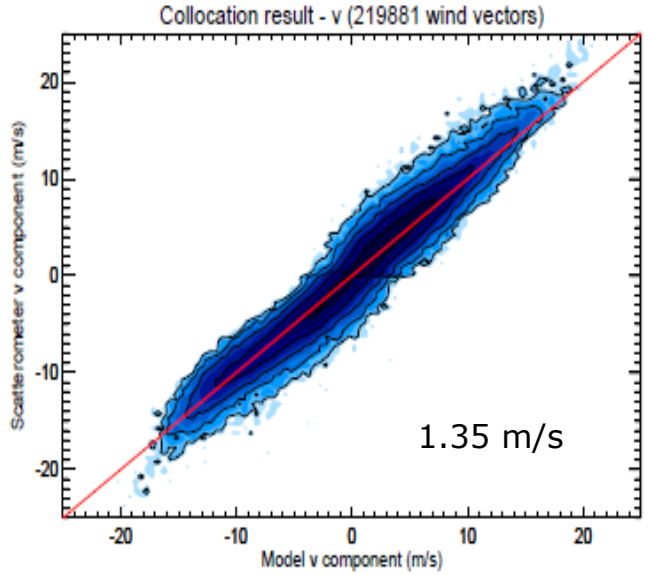
- Plots are based on Level 2A data version summer 2011
- Earlier version σ^0 corrections in OWDP have been deactivated
- Low speeds are improved
- Buoy verifications are favourable as well

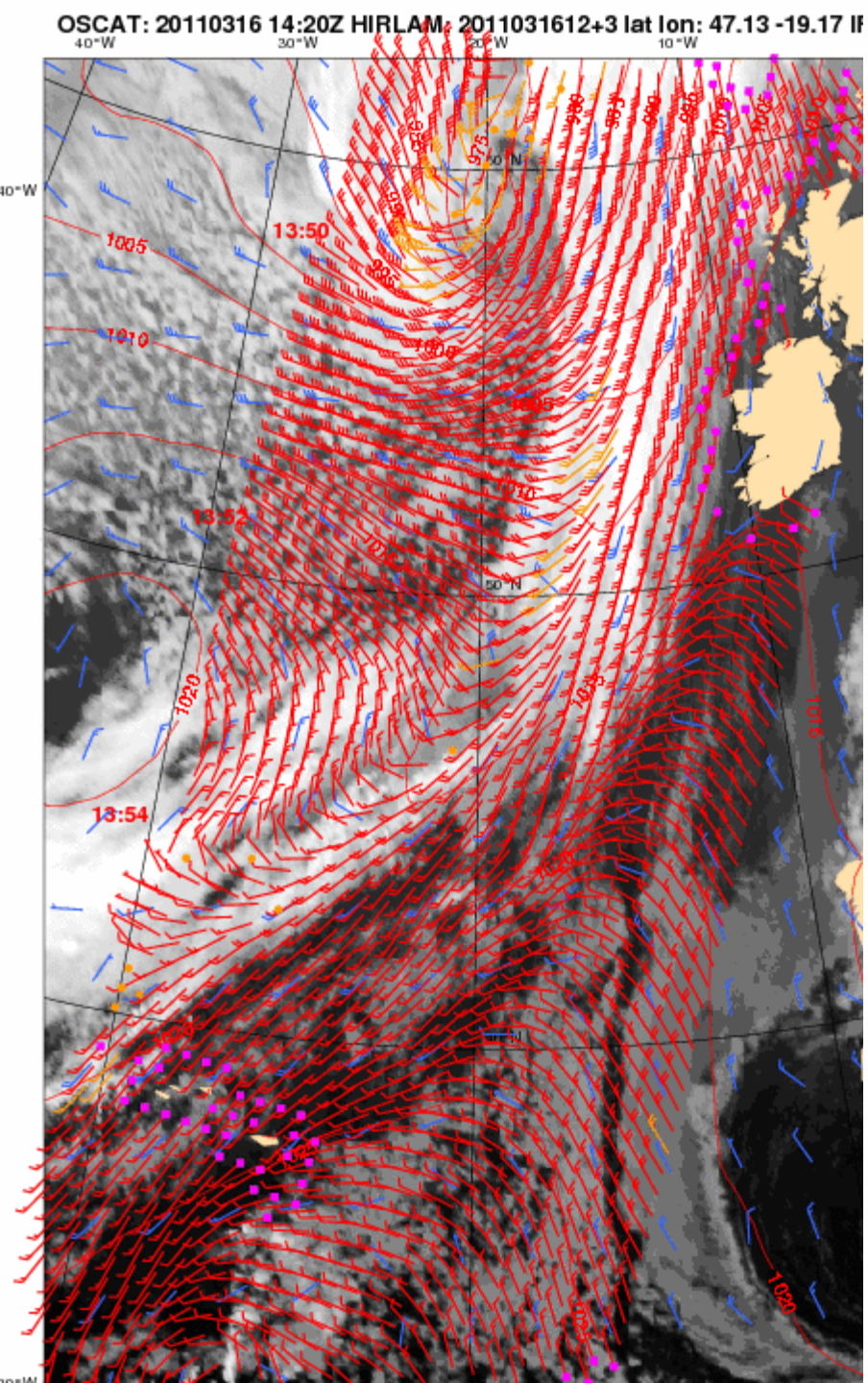
➢ Wind quality well within OSI SAF requirements

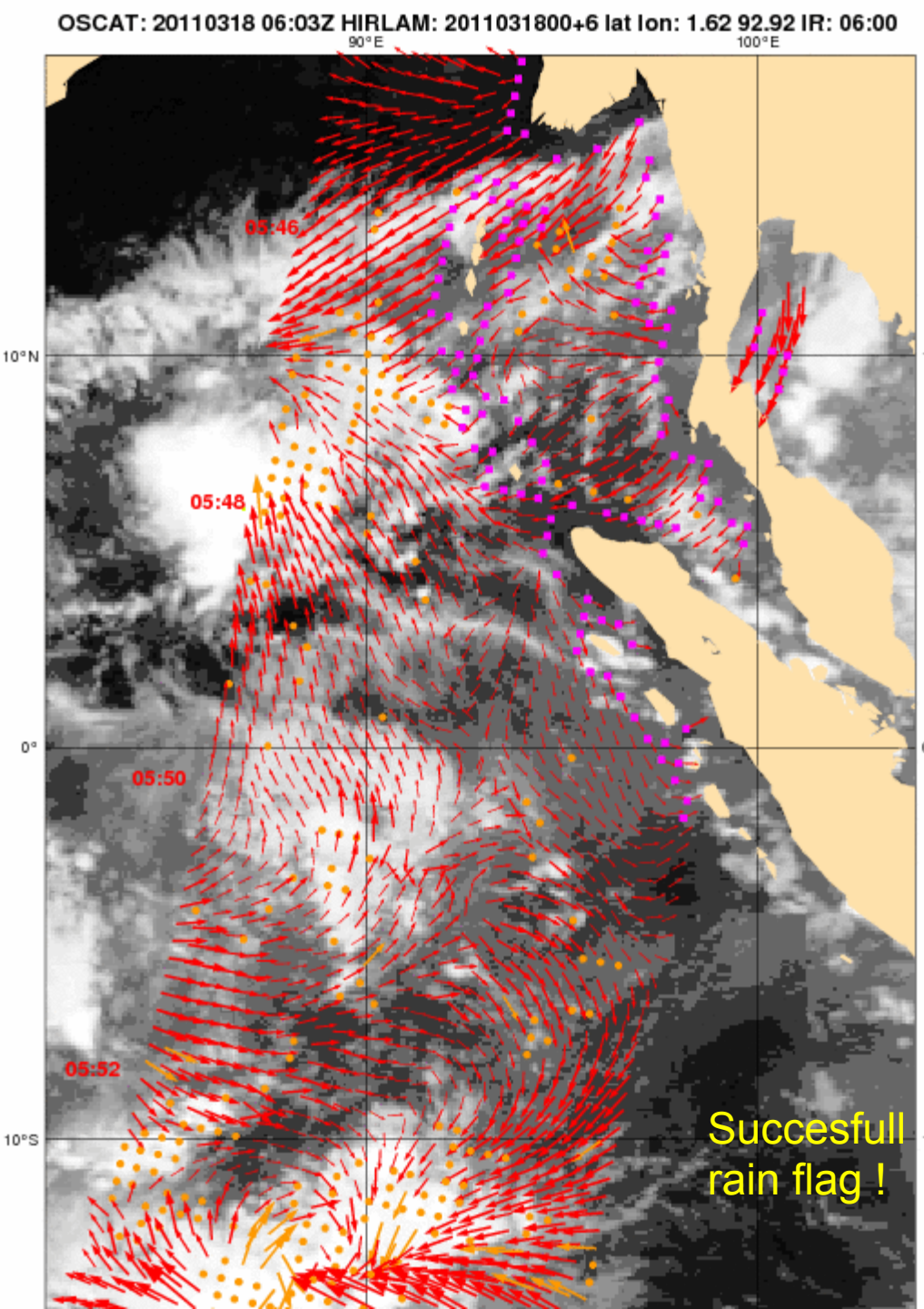






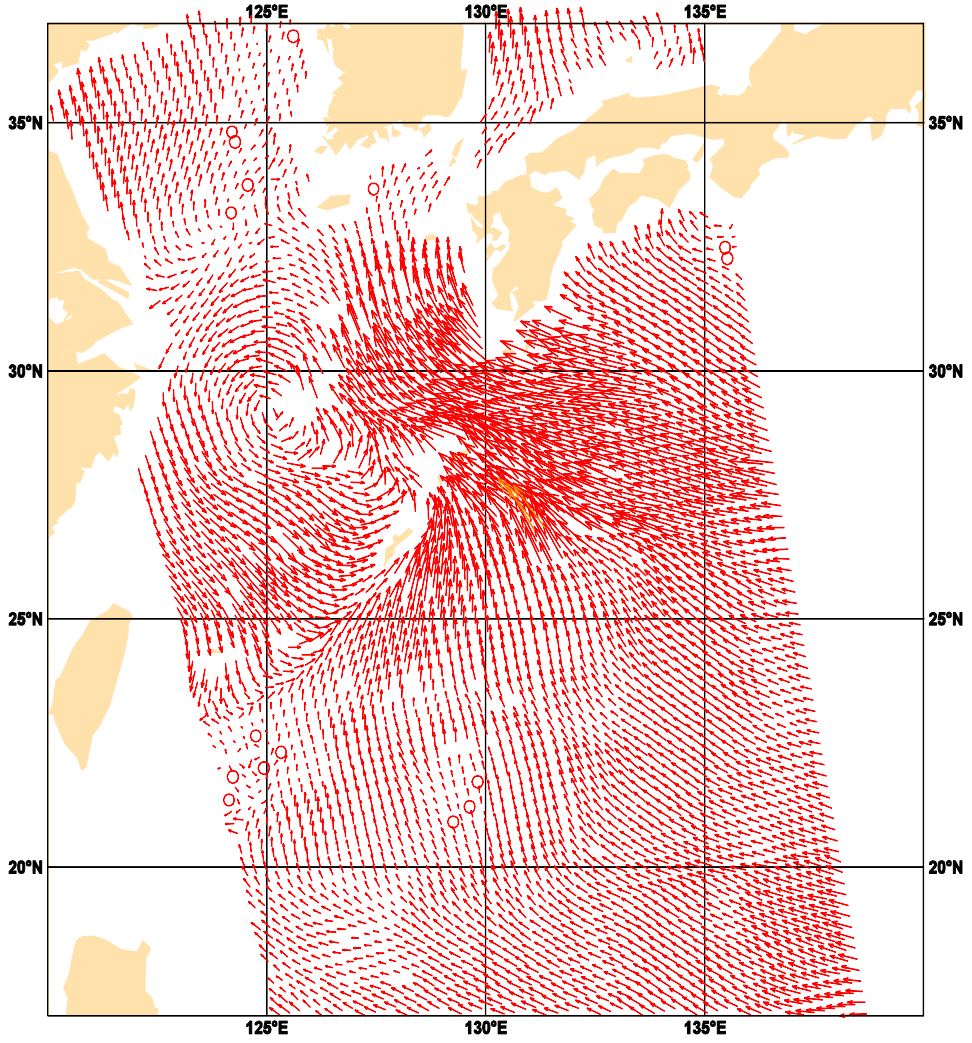



OSCAT: 20110316 14:20Z HIRLAM: 2011031612+3 lat lon: 47.13 -19.17 IR
40°W
30°W
20°W
10°W
40°N
50°N
13:50
13:52
13:54
1005
1010
1015
1020


OSCAT: 20110318 06:03Z HIRLAM: 2011031800+6 lat lon: 1.62 92.92 IR: 06:00
90°E
100°E
10°N
0°
10°S
05:46
05:48
05:50
05:52
Succesfull rain flag !

Next steps

- Development of 25 km product based on Level 1B from ISRO (cooperation with NOAA for L2A)
- Improvement of backscatter calibration and quality control
- Improvement of ice screening model
- Release of OWDP software in the NWP SAF



HY2A 微波散射计海面风场反演结果图

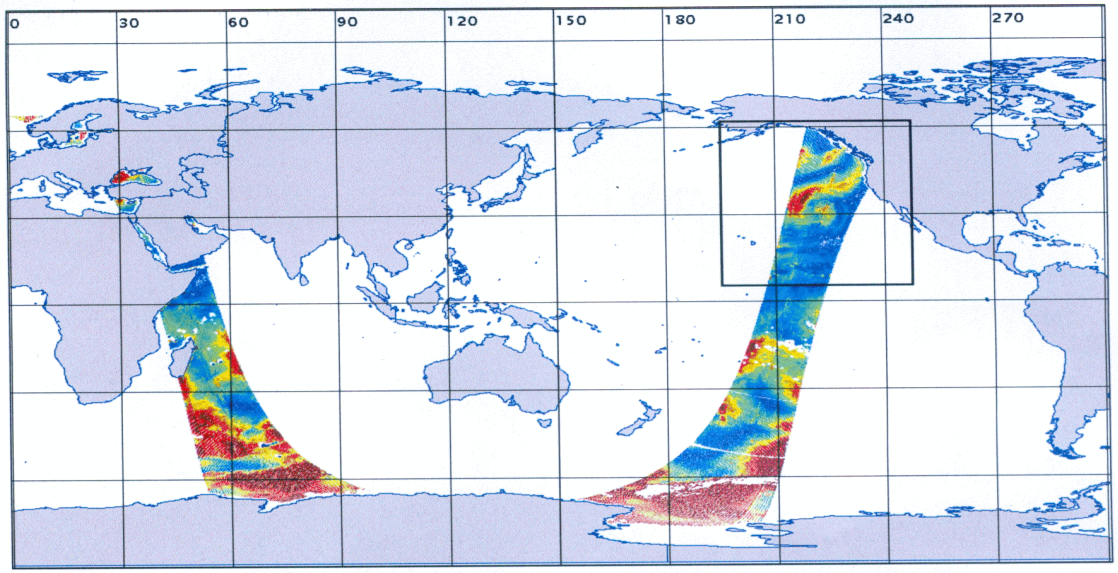


图 1 HY2A 微波散射计风场图(数据获取时间:2011.10.16)

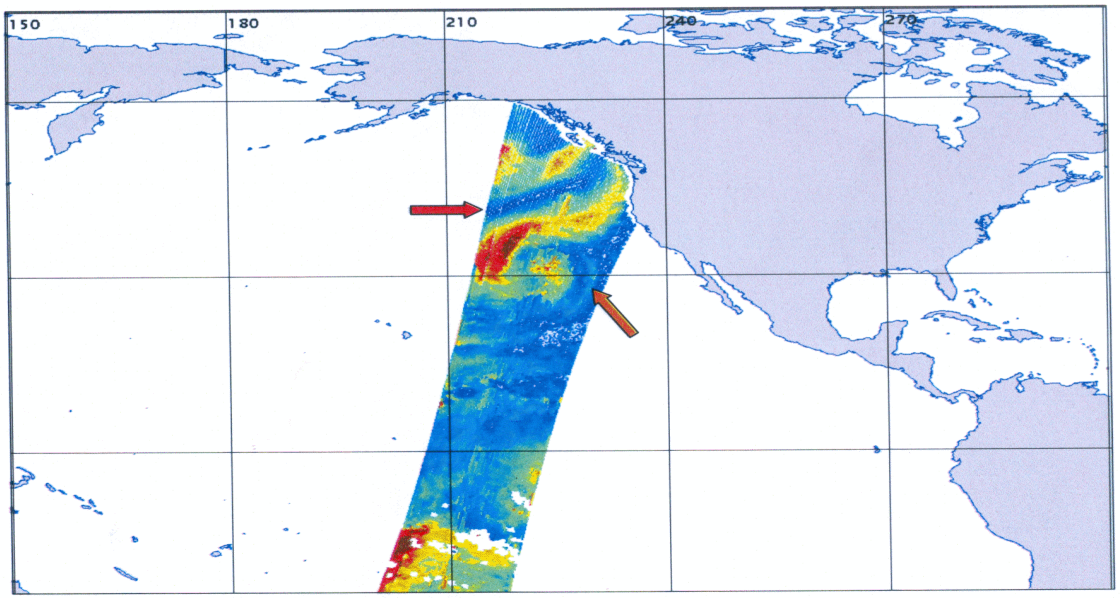


图 2 HY2A 微波散射计对气旋、锋面等海洋现象的捕捉

Launched !

- August 2011
- Stable
- First winds

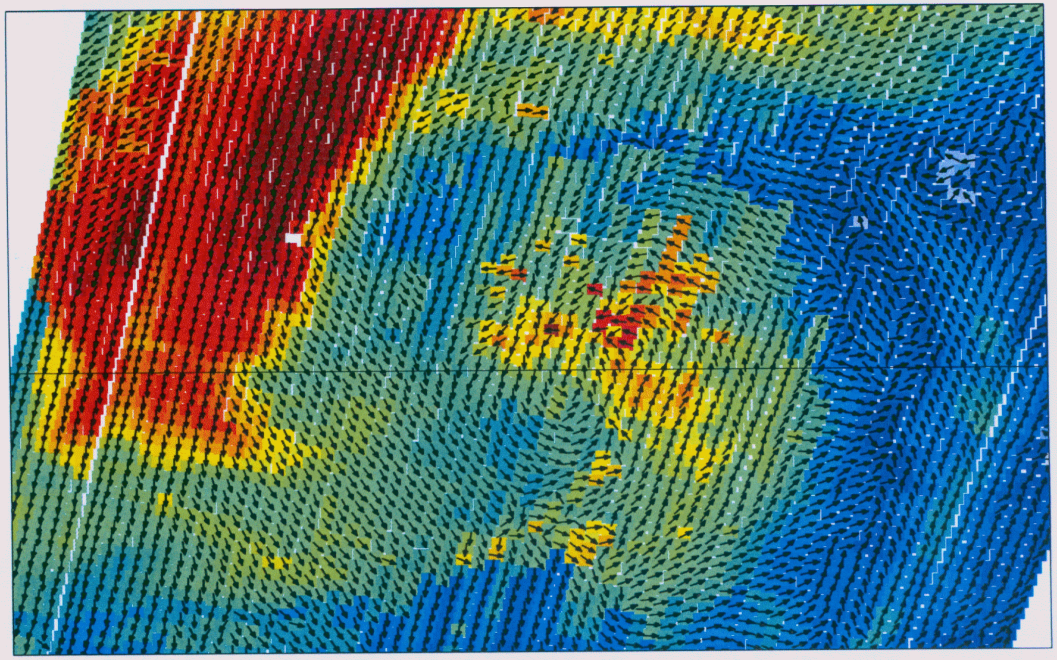


图 6 气旋结构图

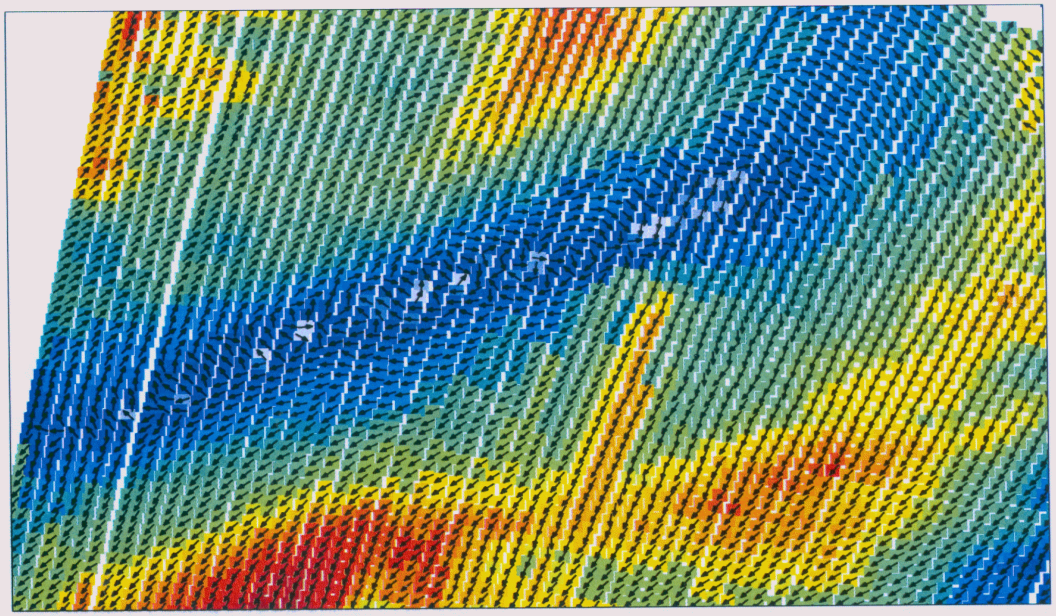


图 7 锋面结构图

NWP SAF
Numerical Weather Prediction

Visited NSOA

- Suggested scientific collaboration for Cal/Val
- Following success with OSCAT
- HWDP and NOC by YUN Risheng (now comparing OSCAT vs QSCAT NOC)
- Extend organizing committee IOVWST with NSOA scientist
- EUMETSAT letter positively received at NSOA
- Data release by 2012, but policy TBD

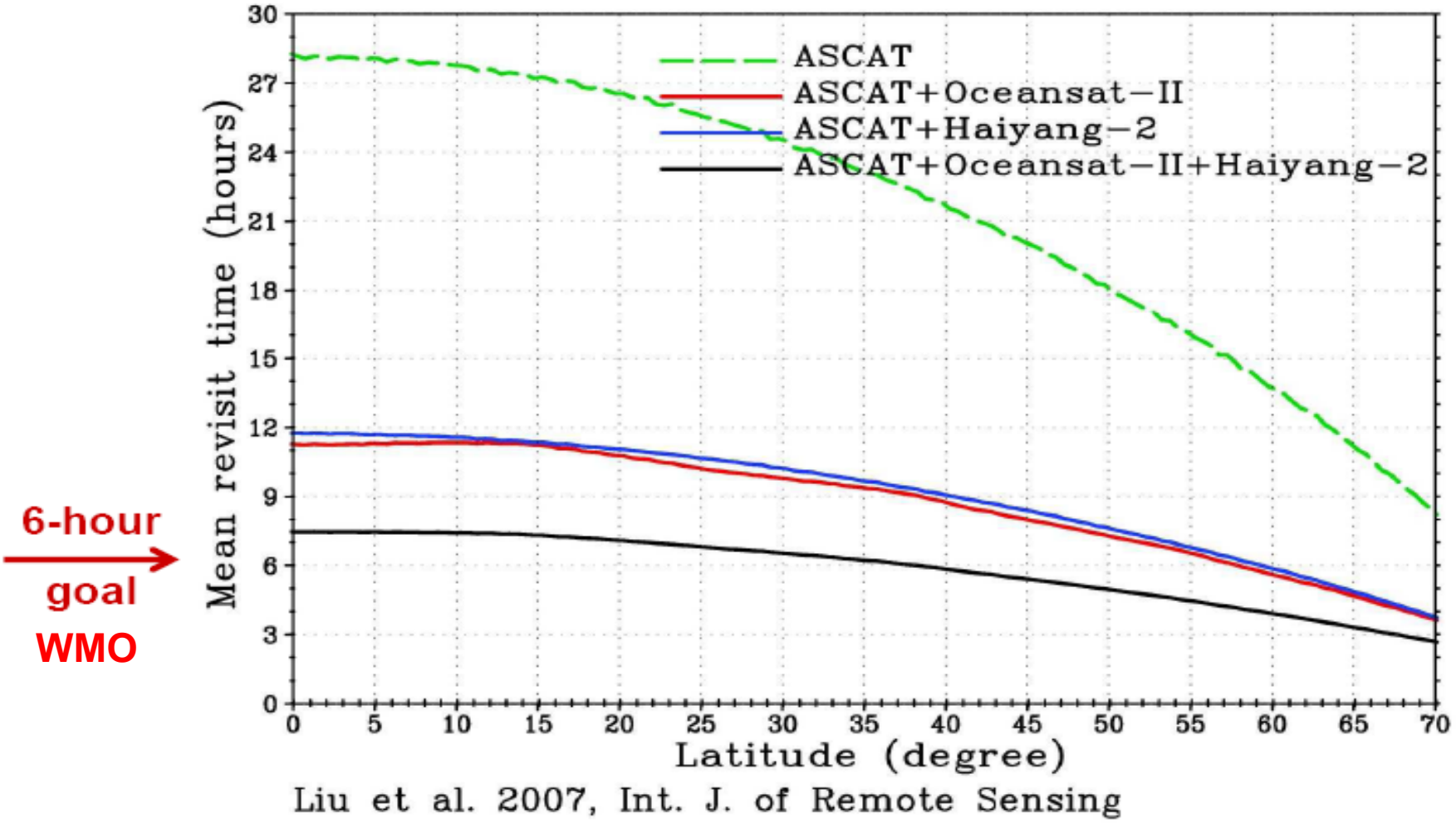
HY2A

- HY2A looks stable and geophysically plausible (TBC)
- 6 pm LT Equator Ascending time very complementary to ASCAT/OSCAT
- Scientific Cal/Val support suggested in CEOS WGCV and at NSOA; confirmed (off-line) data access for KNMI through YUN Richeng
- Data policy under construction
- EUMETSAT initiative to be further encouraged

International collaboration is essential

Ocean Surface Vector Wind Science Team Meeting
November 20, 2008, Seattle, WA

Timely sharing of data enables a significant reduction in revisit time



Liu et al. 2007, Int. J. of Remote Sensing

OSI SAF
Ocean and Sea Ice

Summary

NWP SAF
Numerical Weather Prediction

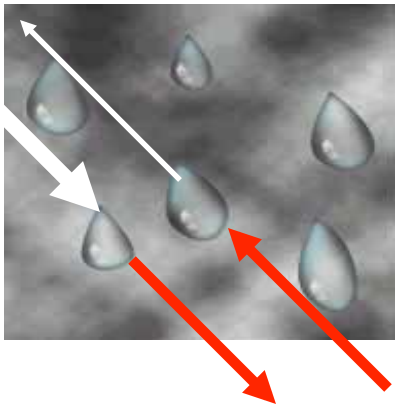
- Scatterometers provide the only source of temporally frequent high-quality all-weather mesoscale wind vectors over the sea
- Users want standard templates, instrument intercalibration of backscatter and geophysical products, quality standards, quality monitoring, validation and guidance
- An international expert core science team speeds up cal/val, gets the most out of your instrument and opens the way for international standardization and data exchange (IOVWST)
- China's HY2A in 6pm/6am orbit would be a fantastic complement for NRT users
- Intercalibration efforts are ongoing
- MetOp-B in June 2012 in tandem with MetOp-A
- CEOS OVW VC coordinates scatterometer instruments among agencies
- 12-14 June 2012, IOVWST in Utrecht, the Netherlands

Thanks !

ASCAT plans in CDOP2

- Converge to one operational 25-km product and one 12.5-km product
- MetOp-B Cal/Val; NWP ocean calibration; production parallel to ASCAT-A
- Update coastal 12.5-km product to new EUMETSAT full resolution product and Kp formulation
- Validation of coastal product with SAR backscatter and Doppler (Marivi Tello)
- ASCAT performance in rain (LIN Wenming; Marcos Portabella)
- CMOD6; CMOD5na + MLE optimization
- ASCAT reprocessing
- ASCAT L3 now being verified in EU MyOcean ==> MyOcean2
- EU MyWave
- ESA eSurge

Rain Effects



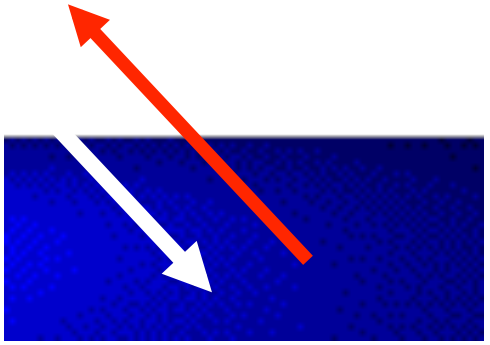
The radar signal is attenuated by the rain as it travels to and from the Earth's surface → σ^0 ↓

Retrieved wind speed ↓ (Ku)

The radar signal is scattered by the raindrops. Some of this scattered energy returns to the instrument → σ^0 ↑

Retrieved wind speed ↑ (to ~ 15 m/s for Ku)

Directional information can be lost



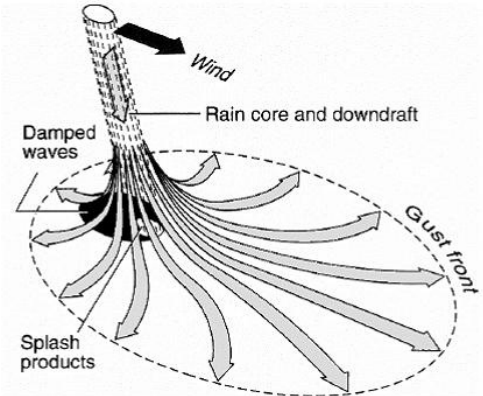
The roughness of the sea surface is increased because of the splashing due to raindrops → σ^0 ↑

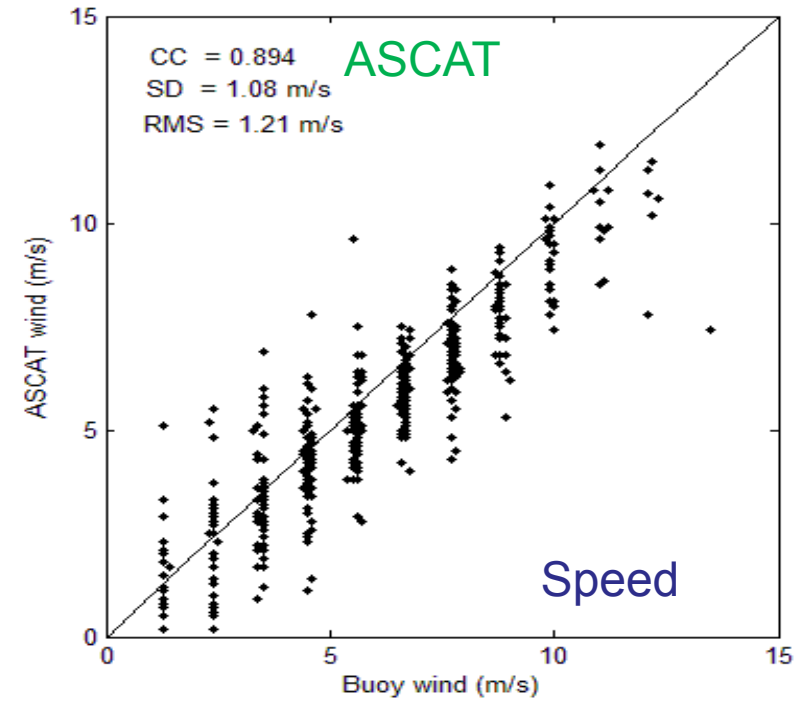
Retrieved wind speed ↑ (at low winds, both Ku/C)

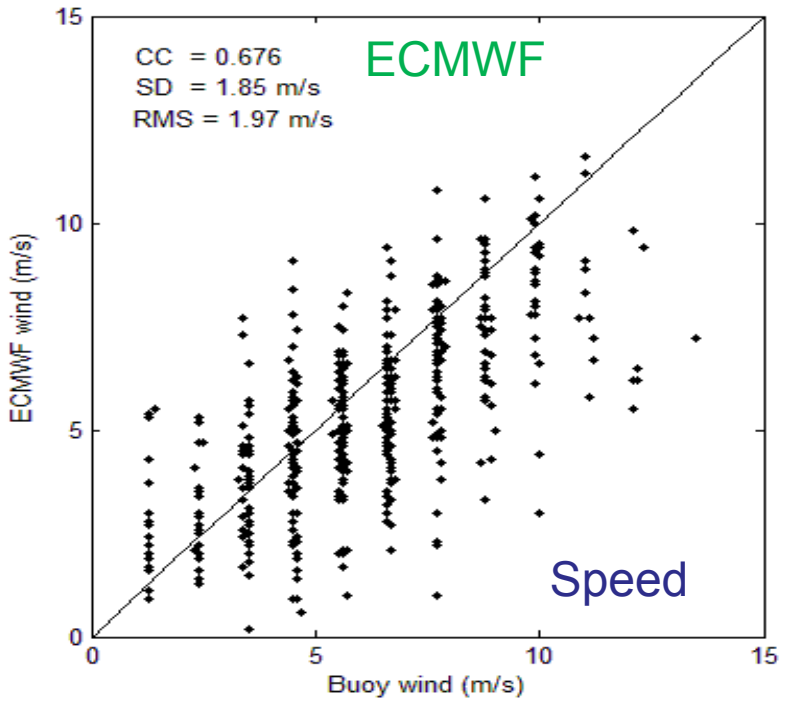
Directional information can be lost

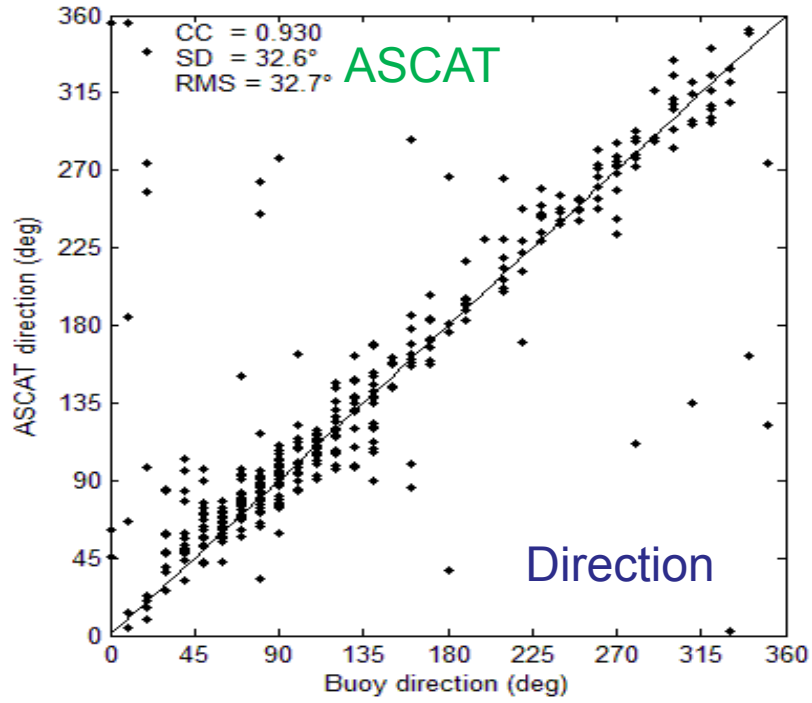
Variable roughness due to wind downbursts

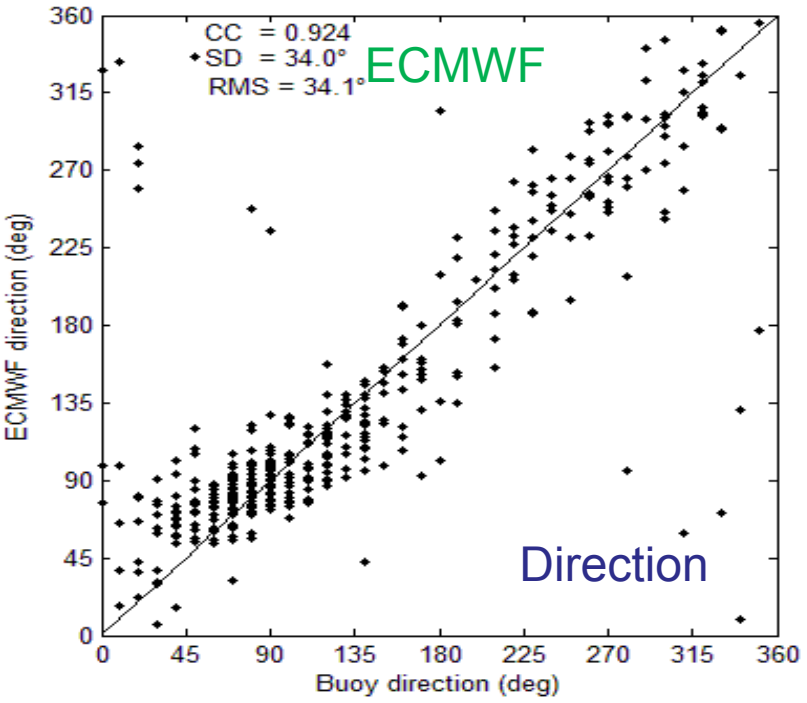
Confused sea state, speed/direction unclear ?







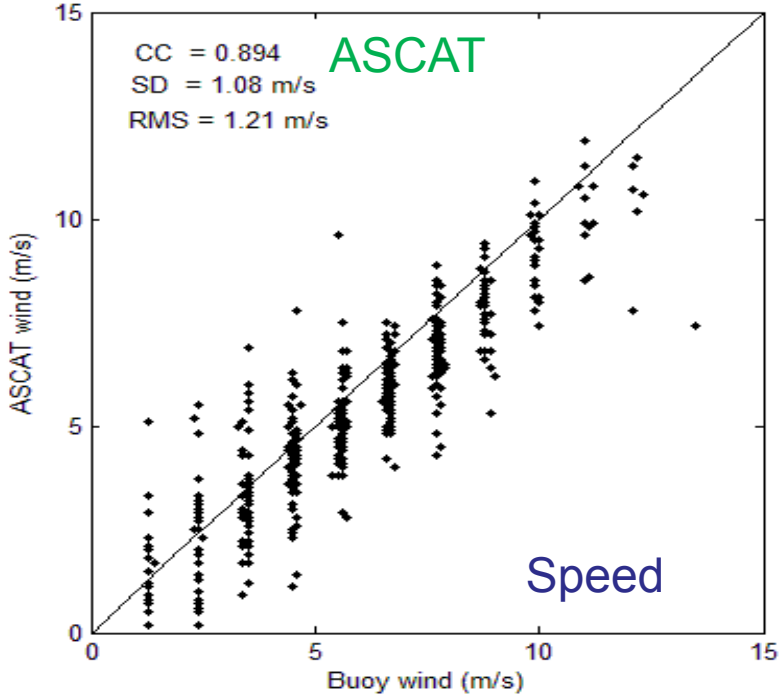


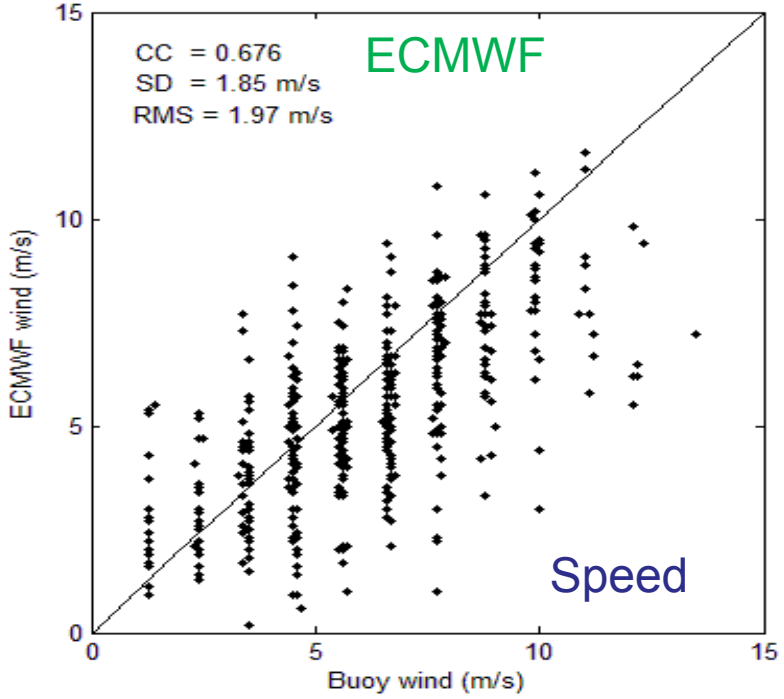


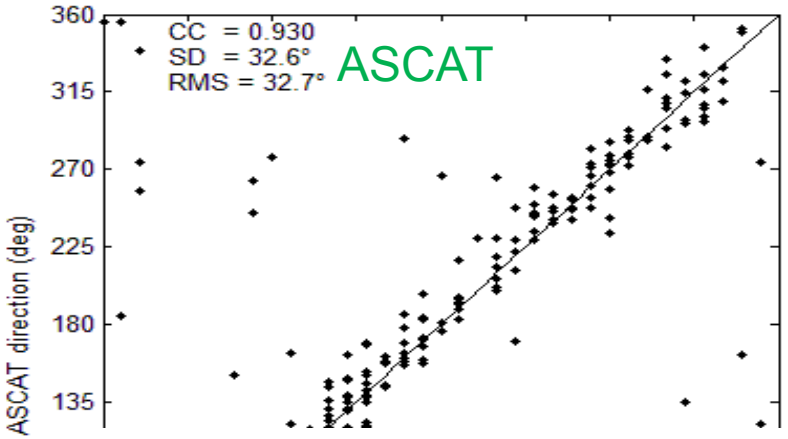
IWP SAF
erical Weather Prediction

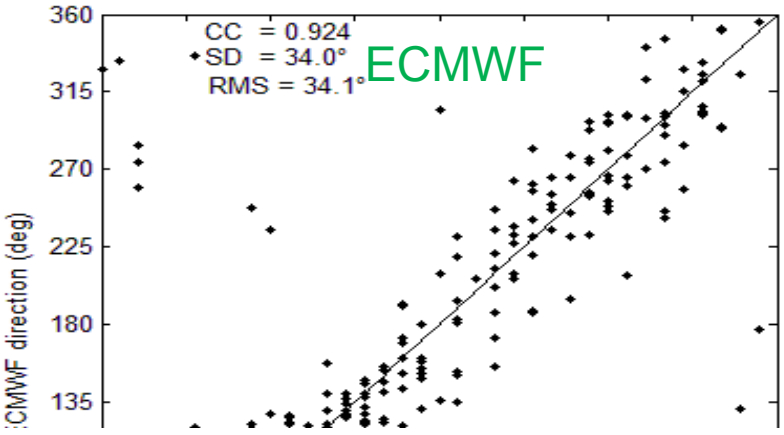
Validation near Rain

Validation near Rain









ASCAT 25 km (selected) winds closer to buoy winds than ECMWF winds in the vicinity of rainy areas (**buoy rain data**).

Our users want …

- NRT winds at different times of day (HY2A, CFOSAT, ASCAT, OSCAT, …)
- In a common data format (BUFR; NetCDF) and a common template
- With no systematic biases w.r.t. our other products (same retrieval codes; cal/val)
- Validation of quality w.r.t. requirements
- Quality assurance (automatic and continuous monitoring)
- User manual; documentation
- Guidance w.r.t. data use, training