High Wind Observations within Extratropical Cyclones from Radiometers and Scatterometer

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• Data reprocessed for hurricane seasons 2006-2016 (except 2007)
  – Recalibrated Tb’s
  – Changes in surface emissivity model for winds and sst (<15C)
  – Rain estimation from channel variance
  – Change in atmospheric model for Ta<5
• Winter data still work in progress
  – Correction for t5-Ta>5C
• Sonde data reprocessed since 2006
  – Utilizing NHC WL150 conversion to surface winds
• For data access email Zorana or Paul
NOAA STAR vs HRD SFMR Winds

STAR vs. HRD SFMR Rain Rate

STAR vs. HRD SFMR Wind Speed
Wind Field Structure Observations within Mature ETC’s

• Satellite observations of extratropical cyclone
  – QuikSCAT: KNMI, JPL and RSS
  – ASCAT-A: KNMI, NOAA and RSS
  – SMAP JPL and RSS
  – RSS Radiometer wind products: SSMIF16, SSMIf17, WindSat, AMSR-E, GMI, AMSR-2
Extract Science QS 12.5km Data & Perform QC (land, ice, coast, rain) flags

Generate Mean Wind Fields

Generate Frequency of HF Occurrence per grid fields

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

LIFE CYCLE OF AN OCEAN STORM

OPEN WAVE
FRONTAL FRACTURE
T-BONE
MATURE (SECLUSION)

GALE WINDS
STORM WINDS
HURRICANE FORCE WINDS
QuikSCAT Products Comparison
2001-2009

North Atlantic

500 km radius
1000 km
1500 km

North Pacific
Frequency of Hurricane Force Winds >62kts

Frequency of Storm Force Winds 48-61kts

Frequency of Gale Force Winds 34-47kts
ASCAT-A Products Comparison
2007-2015

North Atlantic

North Pacific
North Pacific

Frequency of Hurricane Force Winds >62kts

Frequency of Storm Force Winds 48-61kts

Frequency of Gale Force Winds 34-47kts
SMAP Winds Within Extratropical Cyclones

- RSS SMAP winds
- JPL SMAP winds
  - Global wind product
  - High wind product
  - High wind product salinity qc applied
SMAP Wind Products Comparison
2015-2017

North Atlantic

North Pacific
Frequency of Gale Force Winds 34-47kts

Frequency of Storm Force Winds 48-61kts

Frequency of Hurricane Force Winds >62kts
North Atlantic Extratropical Storm
Aircraft Observations, February 6th, 2017
SFMR Timeseries
Feb 6\textsuperscript{th}, 2017 Flight

SFMR vs SMAP

Wind Speed (m/s)

Hour of Day

Time Difference (Hr.)

SONDE
Windsat RSS
SFMR
SMAP RSS
SMAP JPL
SMAP JPL HW
Summary

• Difference in surface composites within extratropical cyclone can be attributed to different retrieval algorithm schemes, different gmf, different background filed used for nudging, different quality control scheme
  – RSS Scatterometer products when compared to other scatterometer products are producing stronger and specially larger wind fields on average in both North Atlantic and North Pacific storms
  – Two products from SMAP measurements produce highest winds within mature extratropical cyclones than any other wind product that we have so far
• Development of high wind model function while talking into account sfmr and sonde data as a reference has to take into account aerial distribution of high wind speeds as well