

# **Examining TROPICS utility in observing structural changes during and preceding rapid TC intensity changes**

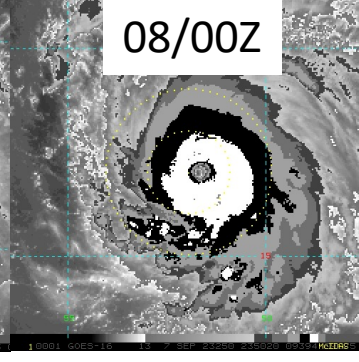
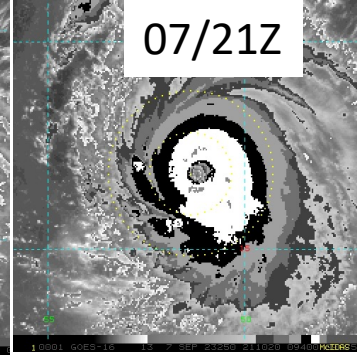
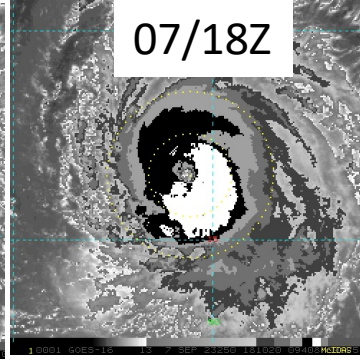
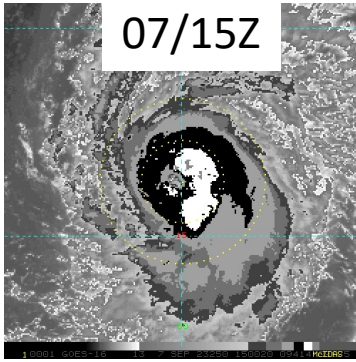
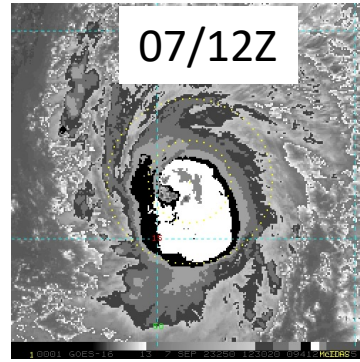
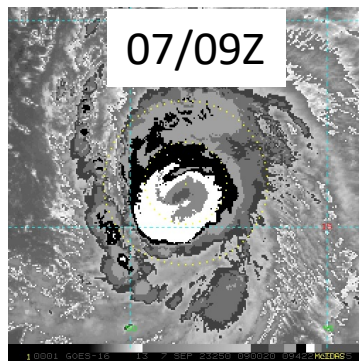
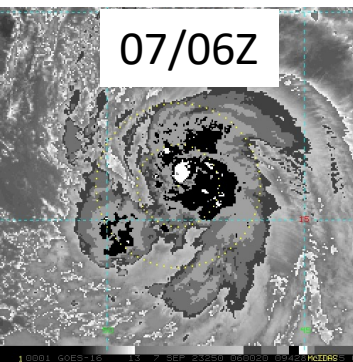
Derrick Herndon, Jeff Hawkins and Chris Velden

**University of Wisconsin  
Cooperative Institute of Meteorological Satellite Studies  
CIMSS**

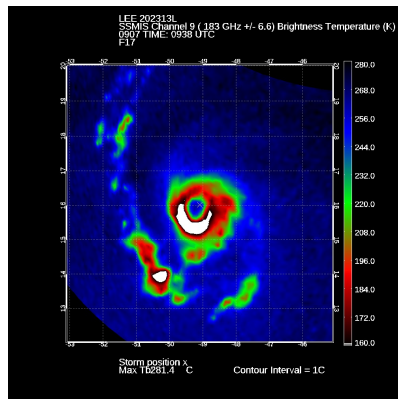
**May 9, 2024  
TROPICS Science Team Meeting  
Long Beach, CA**



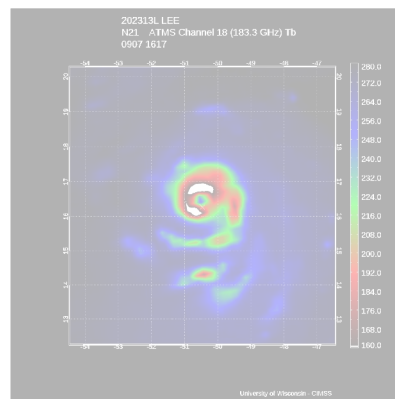
# Hurricane Lee RI: 09/07/06Z (75kts) – 09/08/06Z (145kts)



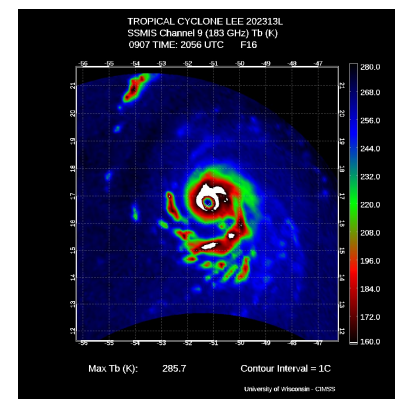
SSMIS



ATMS



SSMIS



AMSR2  
07/22Z

## TROPICS Channel 9 183 GHz

07/0557Z T1

07/0917Z T3

07/1129Z T6

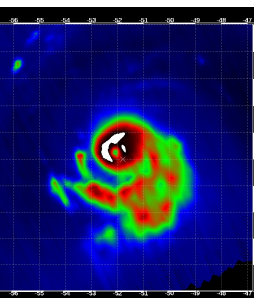
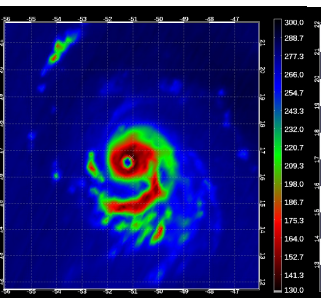
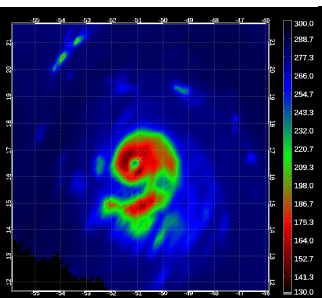
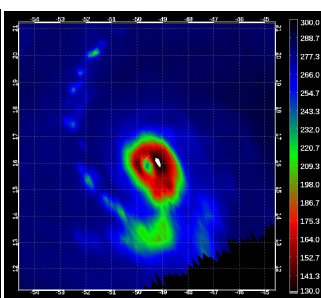
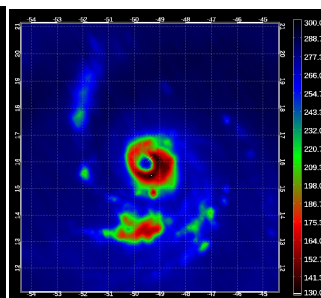
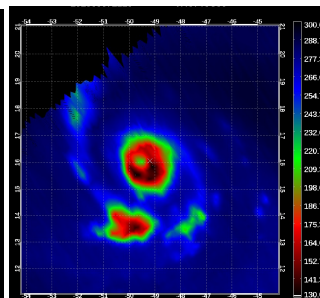
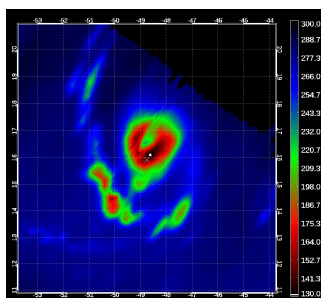
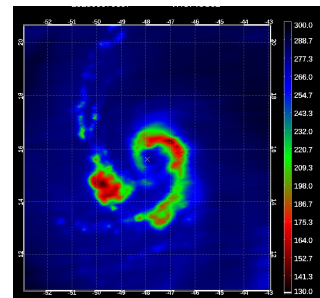
07/1129Z T5

07/1310Z T6

07/1956Z T6

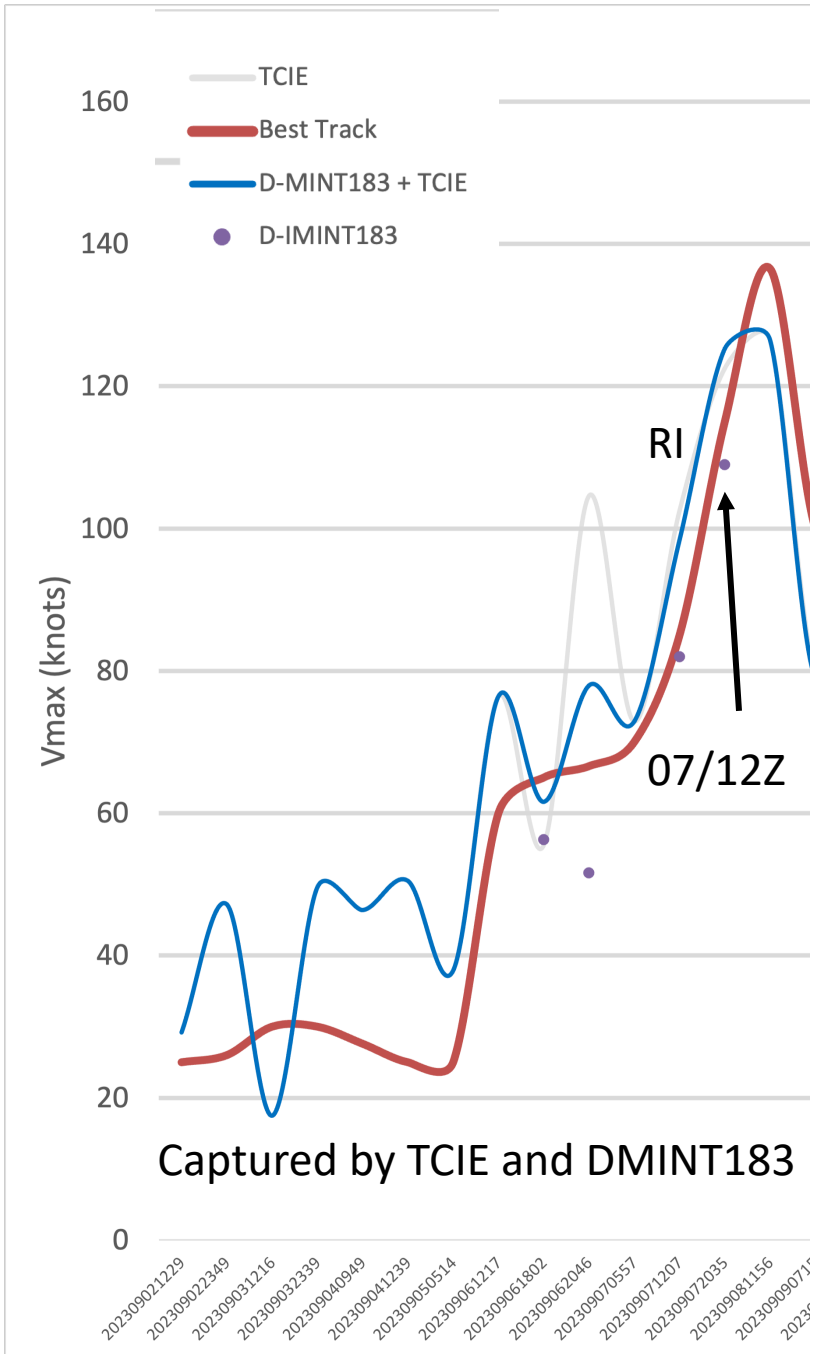
07/2035Z T5

08/0039Z T3

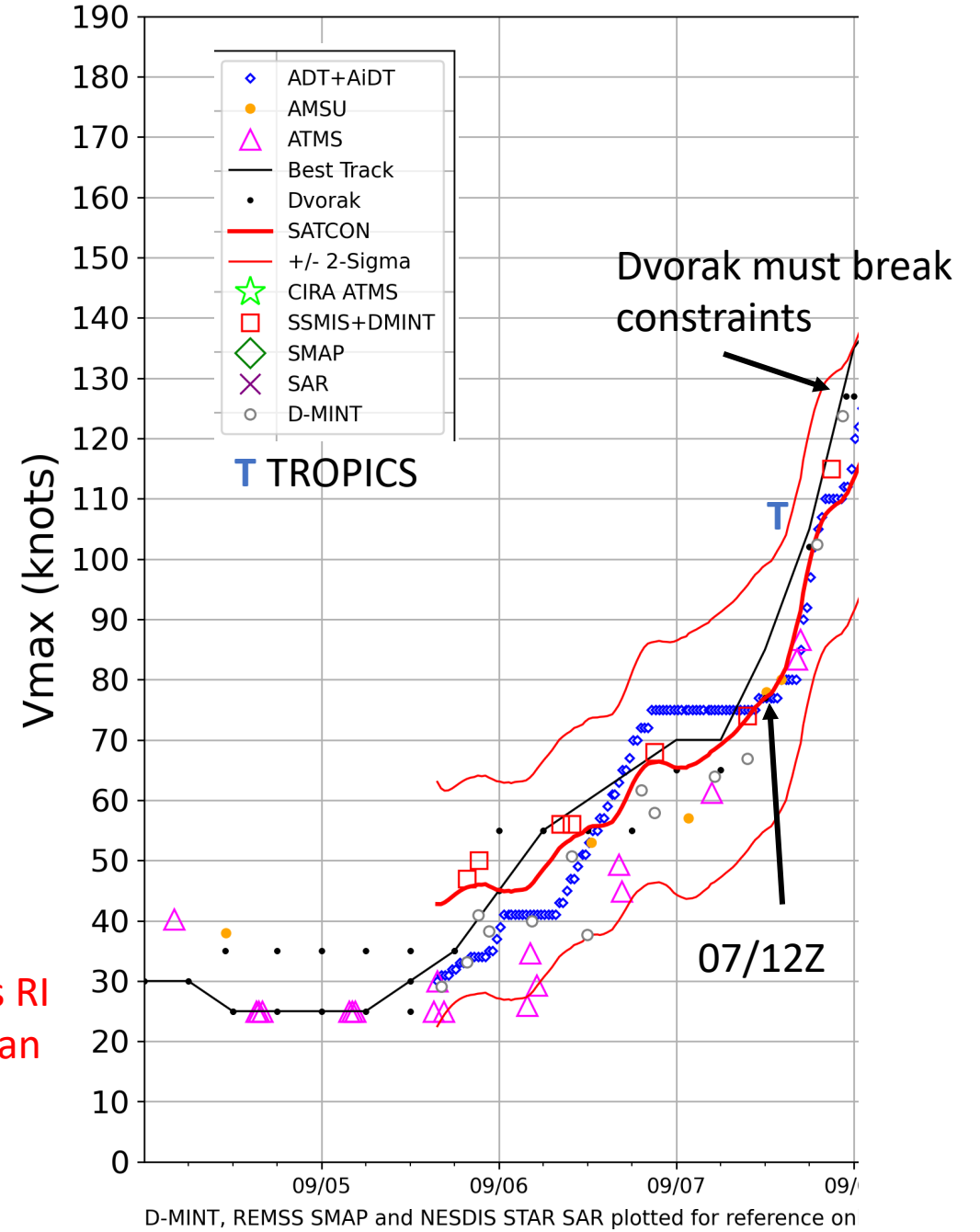


## RMW Contraction?

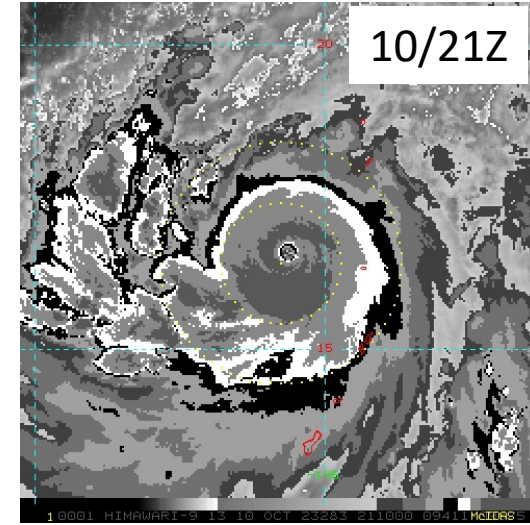
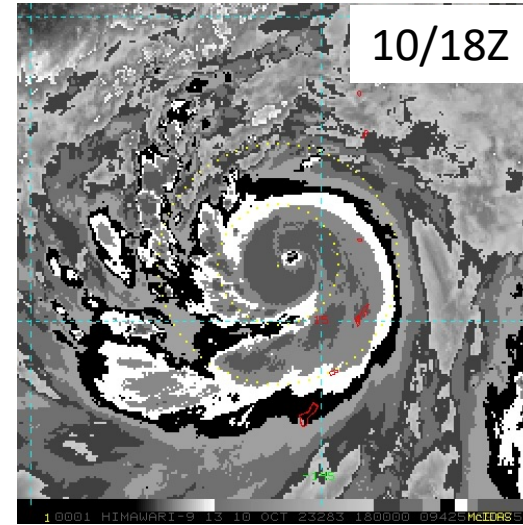
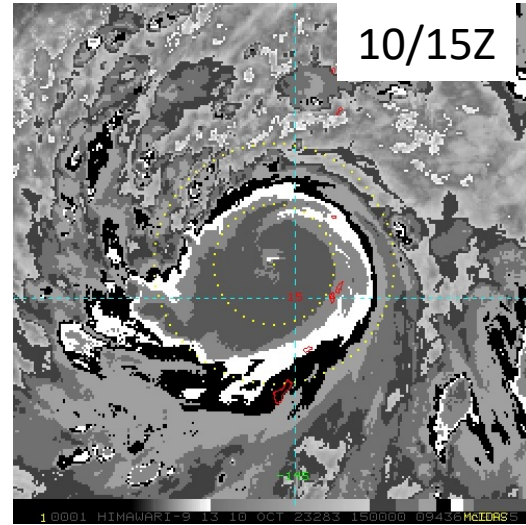
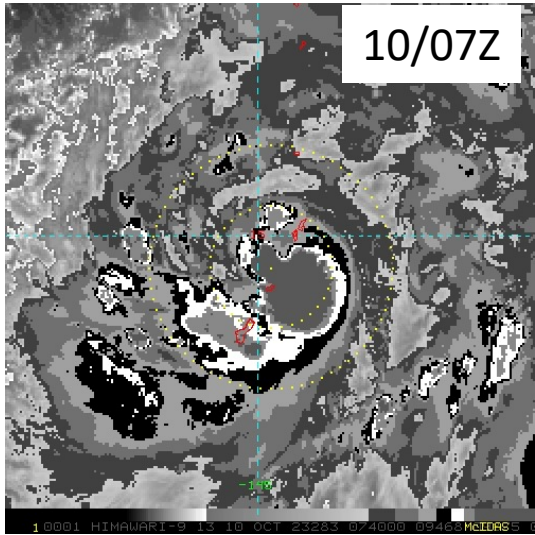
# Hurricane Lee Rapid Intensification



TROPICS captures RI 6 hours earlier than other algos



# Super Typhoon Bolaven RI: 10/10/06Z (70kts) – 10/11/00Z (140kts)



AMSR2  
10/1545

5 hours

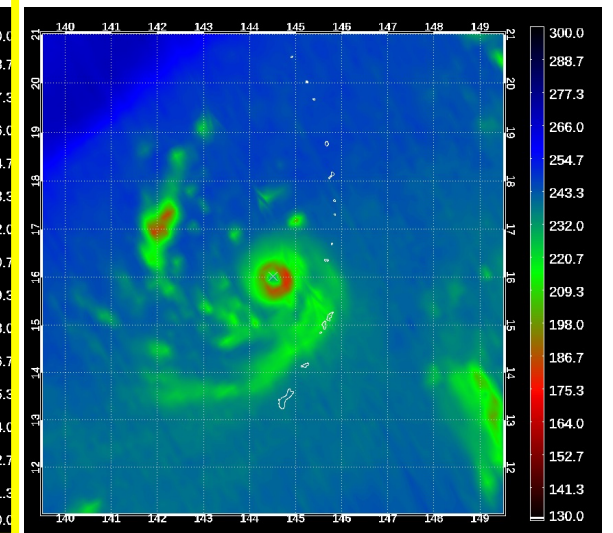
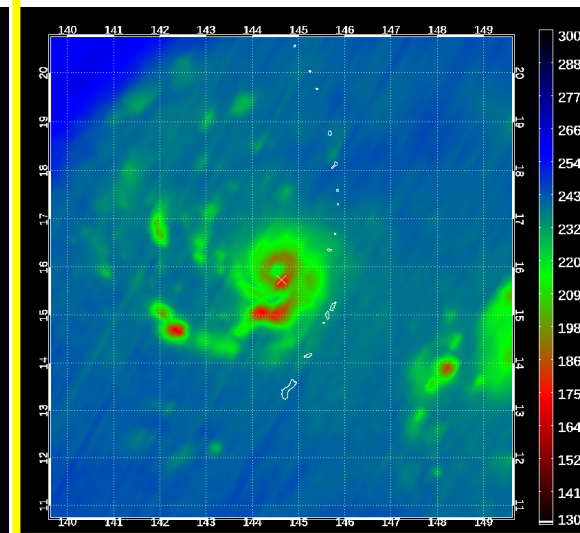
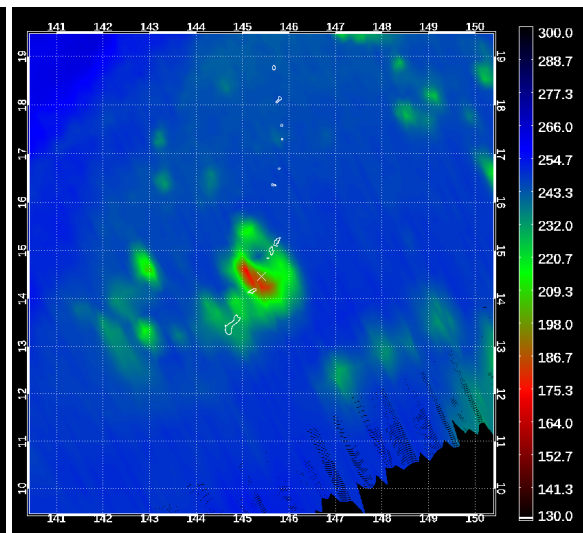
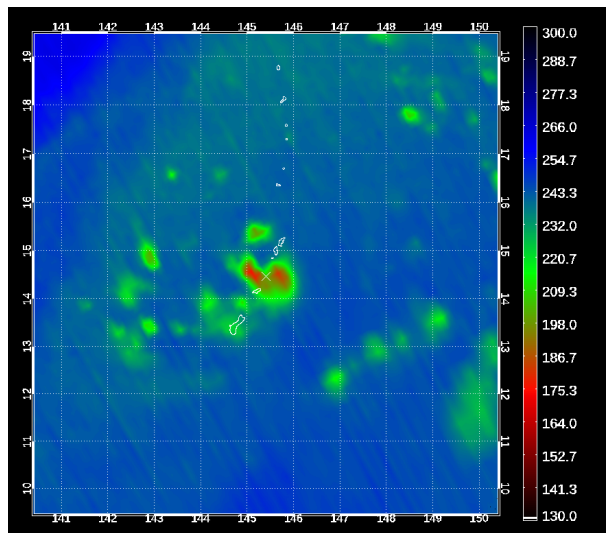
SSMIS  
10/2043

10/0735 T5

10/0759 T6

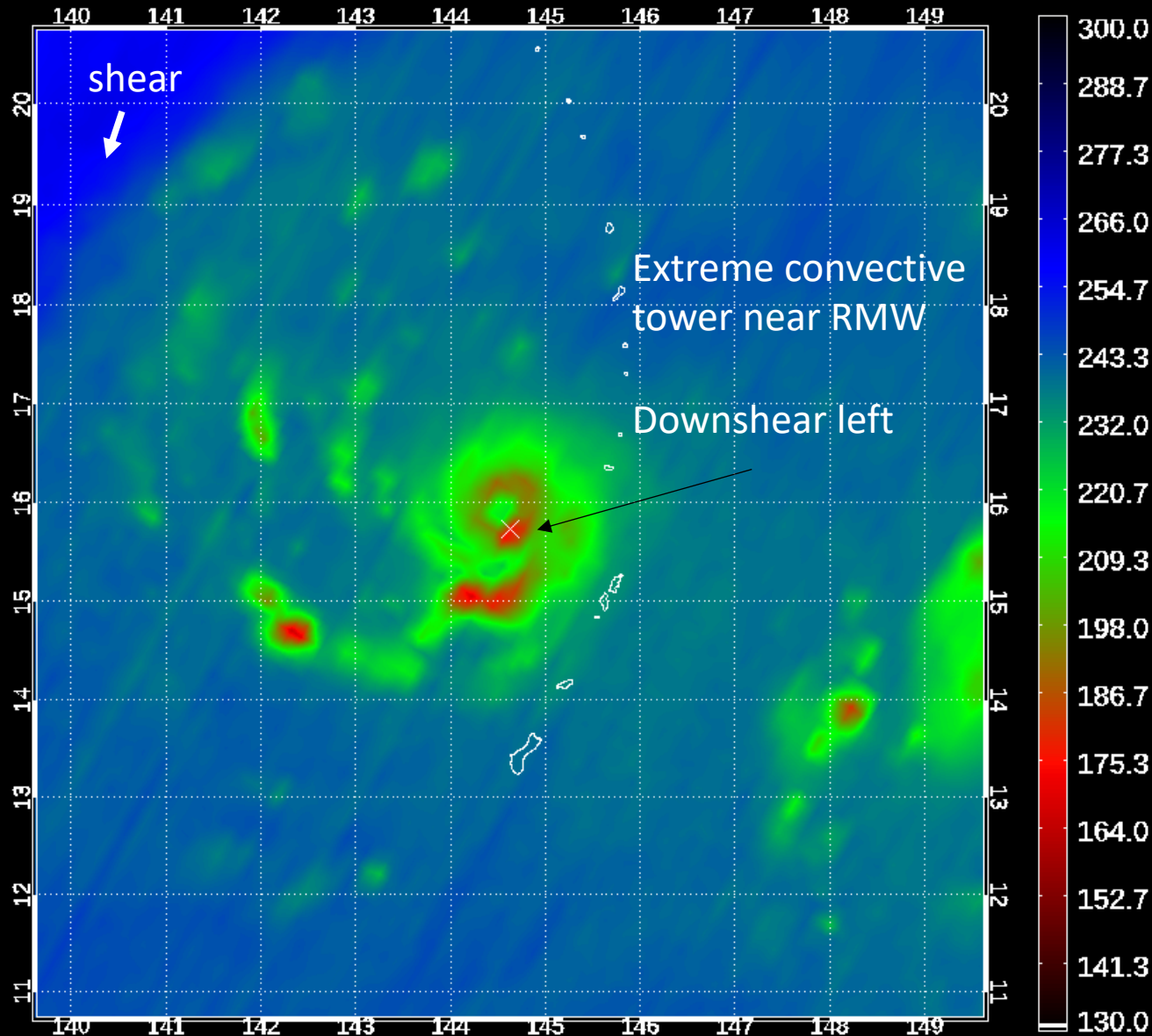
10/1604 T5

10/1842 T3



Tropical Cyclone BOLAVEN 15W  
 TROPICS Channel 9 (183 GHz +/-1 GHz) Tb (K)  
 202310101604 TROPICS05

← 5 knots



2970

MONTHLY WEATHER REVIEW

VOLUME 141

**Airborne Doppler Observations of the Inner-Core Structural Differences between Intensifying and Steady-State Tropical Cyclones**

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*NOAA/AOML/Hurricane Research Division, Miami, Florida*

SYLVIE LORSOLO

*Cooperative Institute for Marine and Atmospheric Studies, University of Miami, Miami, Florida*

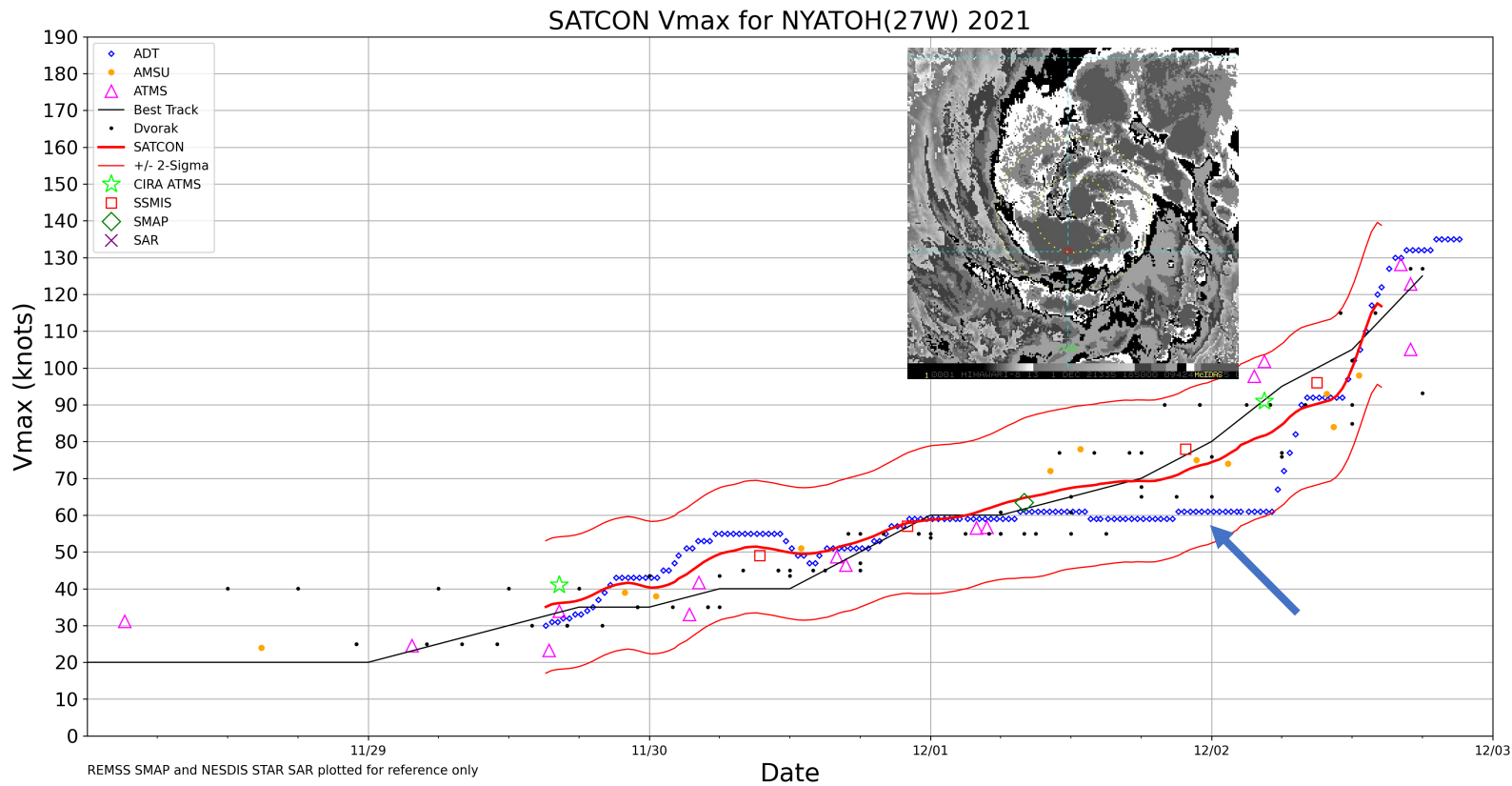
quadrants. The higher number of burst points in the downshear-left quadrant for IN cases is consistent with the quadrant-averaged structures shown in Figs. 10 and 11. Specifically, the deeper and stronger low-level inflow layer in the downshear-left quadrant for IN cases supports stronger eyewall convection, some of which can be classified as convective bursts. Furthermore, as the updrafts within these bursts ascend and are advected around the storm, they provide a greater contribution to the quadrant-averaged vertical velocity field downwind. As a result, the quadrant-averaged eyewall vertical velocity shows an upward motion peak in the upshear-left quadrant for the IN cases.

# TC Structure Parameters from TROPICS

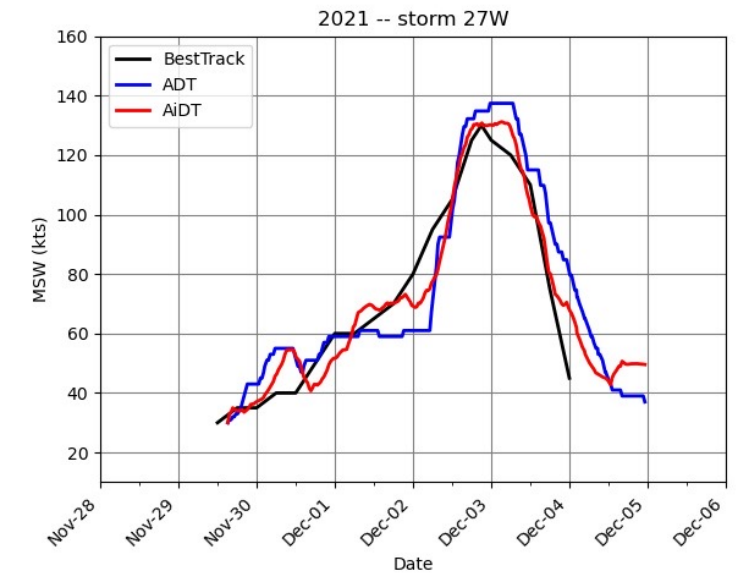
All TC warning agencies require estimates of RMW. Quality sources that produce this critical structure parameter are needed. Otherwise it is a “best guess” or persistence.

TC intensity algorithms use RMW/Eye size for bias corrections or intensity logic decision trees

- CIMSS AMSU, ATMS, SSMIS, TCIE, SATCON and ADT all use TC eye information in some form

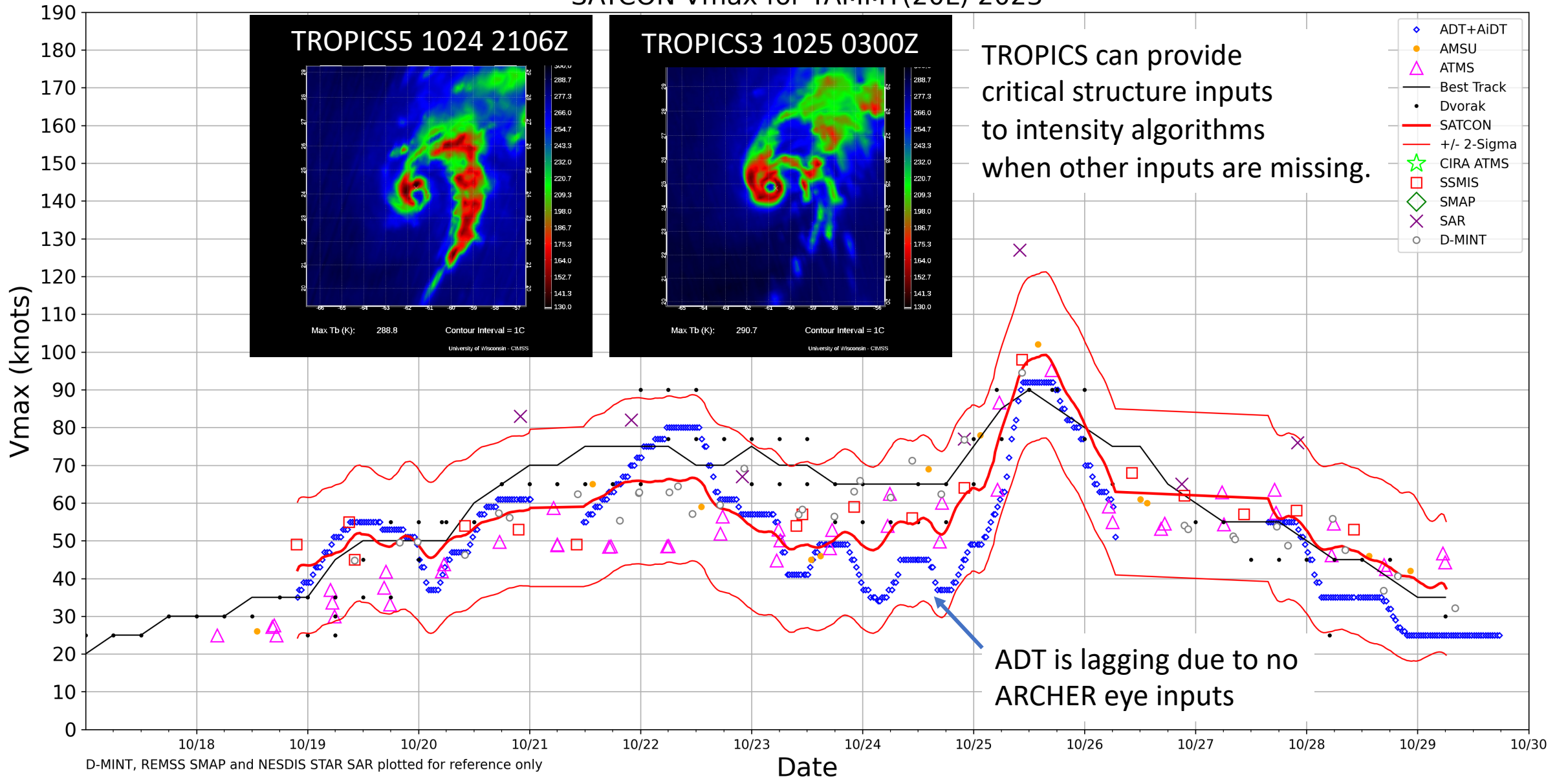


ADT without microwave (ARCHER) eye inputs to adjust logic can result in a plateau of intensity estimates



# TC Structure Parameters from TROPICS

## SATCON Vmax for TAMMY(20L) 2023



# Exploiting TROPICS Tb Imagery for TC Monitoring

## Original NRL-MRY TROPICS Color Tables

Ch.#1 92 GHz

Ch.#3 118 GHz

Ch.#9 184 GHz

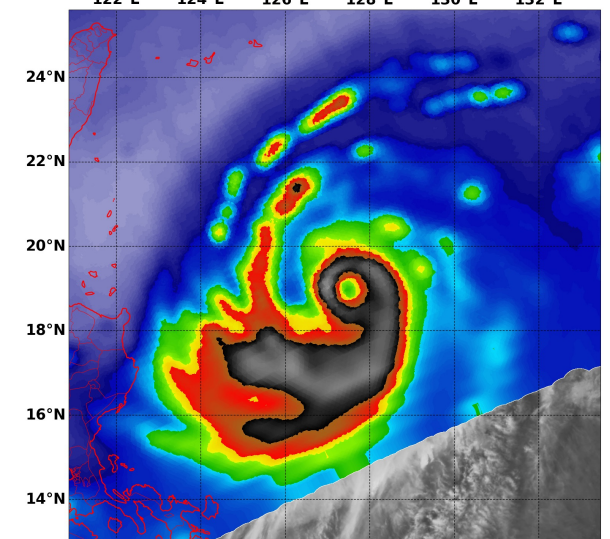
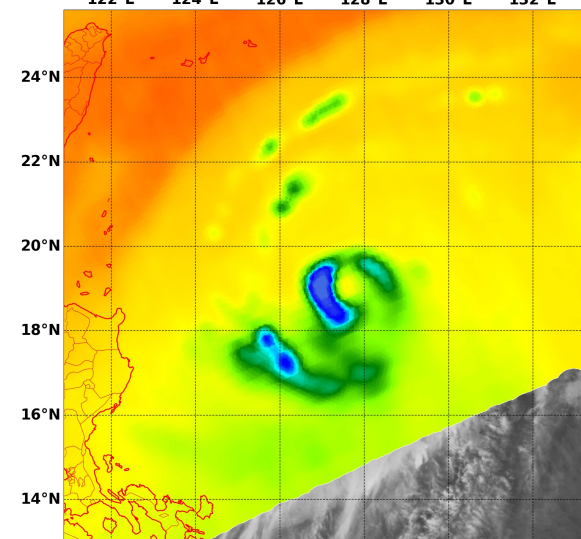
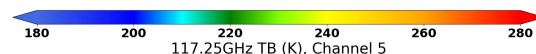
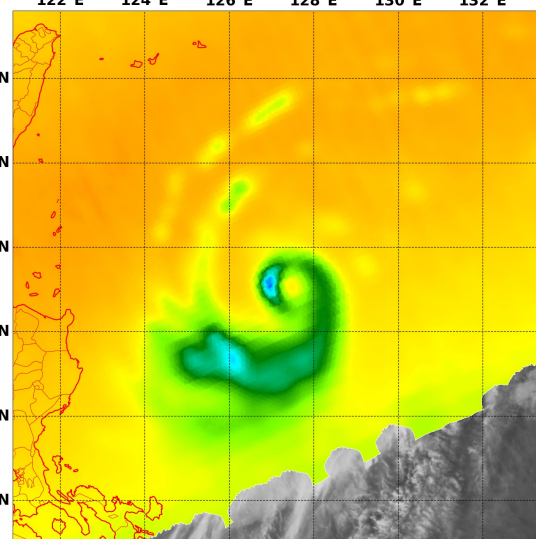
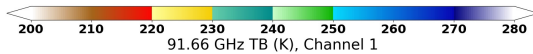
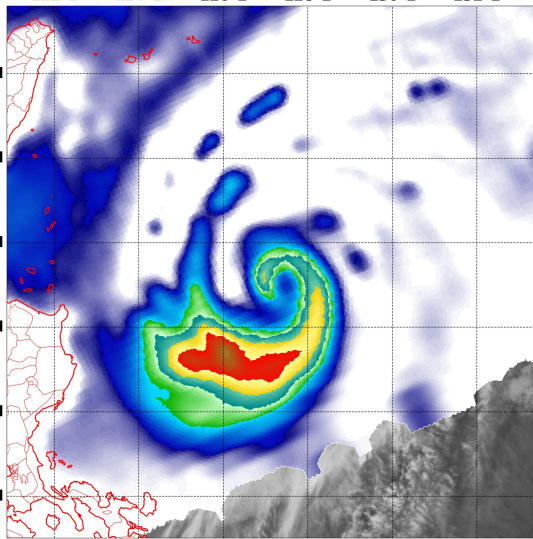
Ch.#12 204 GHz

WP14 KOINU at 2023-10-02 01:11:36, NRL-Monterey  
TROPICS-3 TMS 91p66 at 2023-10-02 01:08:38  
HIMAWARI-9 AHI Infrared-Gray at 2023-10-02 01:10:00

WP14 KOINU at 2023-10-02 01:11:36, NRL-Monterey  
TROPICS-3 TMS 117p25 at 2023-10-02 01:08:38  
HIMAWARI-9 AHI Infrared-Gray at 2023-10-02 01:10:00

WP14 KOINU at 2023-10-02 01:11:36, NRL-Monterey  
TROPICS-3 TMS 184p41 at 2023-10-02 01:08:38  
HIMAWARI-9 AHI Infrared-Gray at 2023-10-02 01:10:00

WP14 KOINU at 2023-10-02 01:11:36, NRL-Monterey  
TROPICS-3 TMS 204p8 at 2023-10-02 01:08:38  
HIMAWARI-9 AHI Infrared-Gray at 2023-10-02 01:10:00





# Exploiting TROPICS Tb Imagery for TC Monitoring

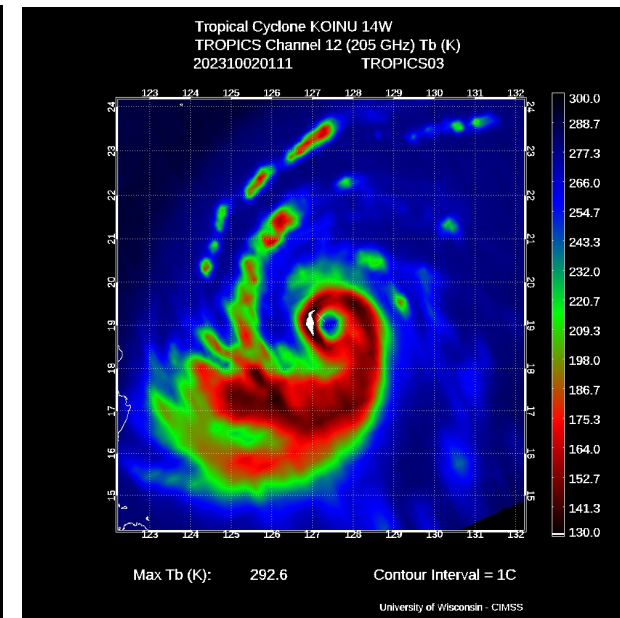
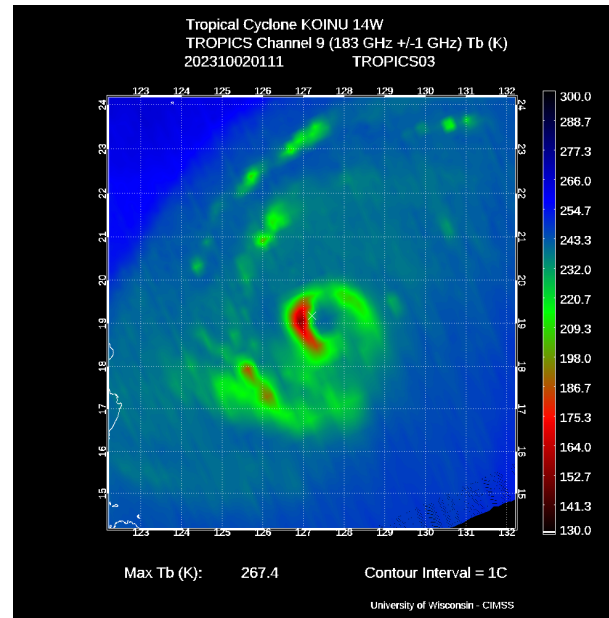
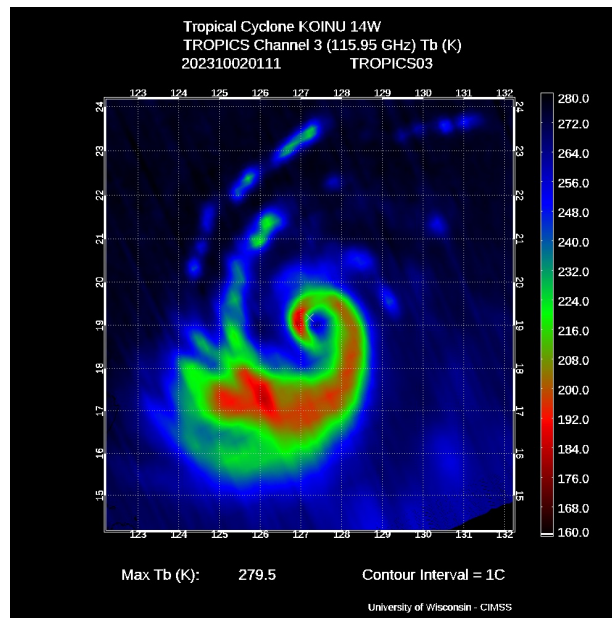
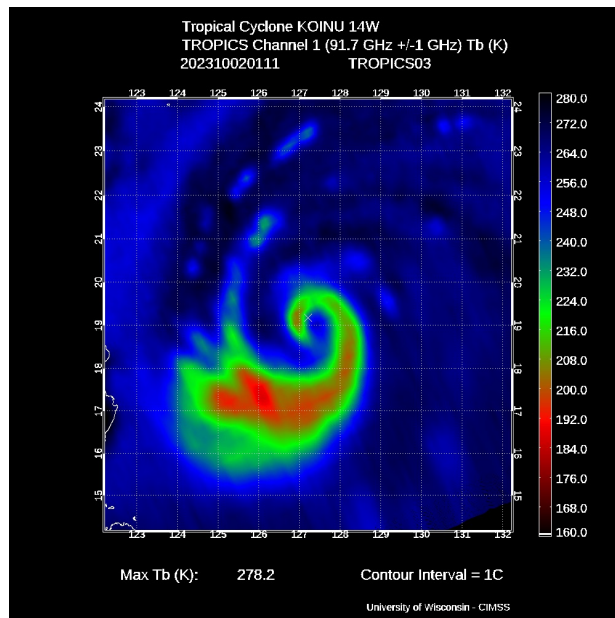
## Original CIMSS TROPICS Color Tables

Ch.#1 92 GHz

Ch.#3 118 GHz

Ch.#9 184 GHz

Ch.#12 204 GHz

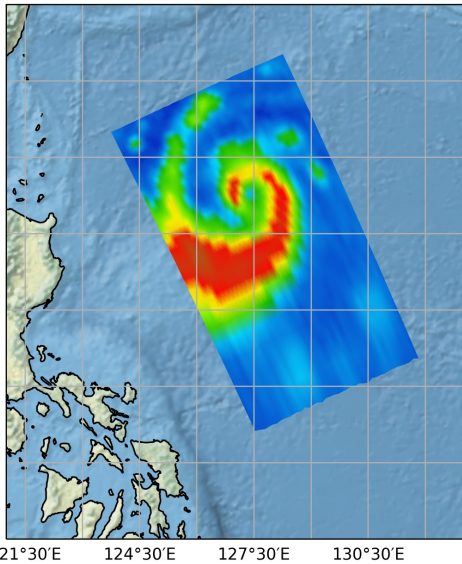


# Exploiting TROPICS Tb Imagery for TC Monitoring

## NRL-MRY W-band TROPICS Color Table

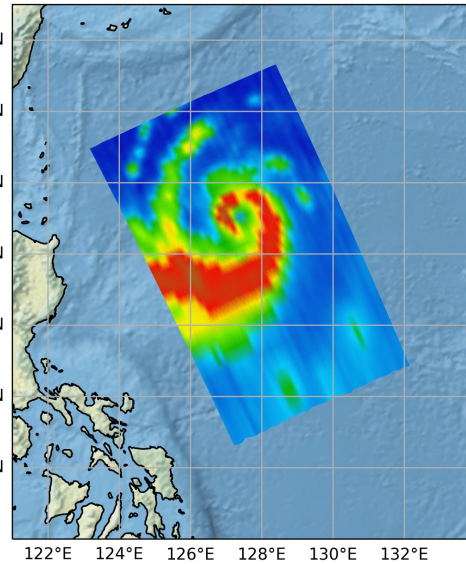
**Ch.#1 92 GHz**

Storm WP14 -- C01 S03 -- 2023275/0147UTC -- Scans/Spots 40/33



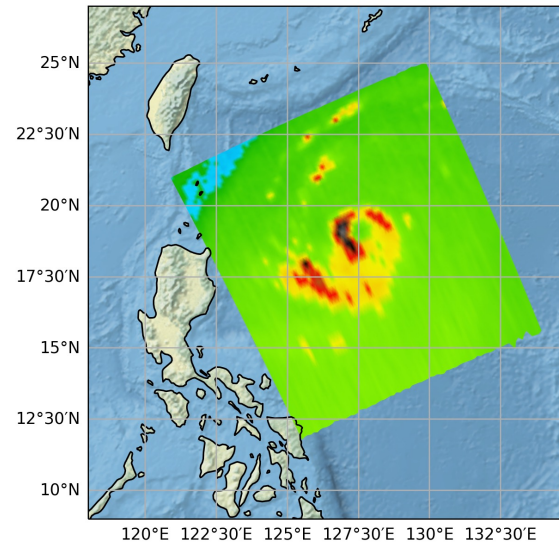
**Ch.#3 118 GHz**

Storm WP14 -- C03 S03 -- 2023275/0147UTC -- Scans/Spots 46/37



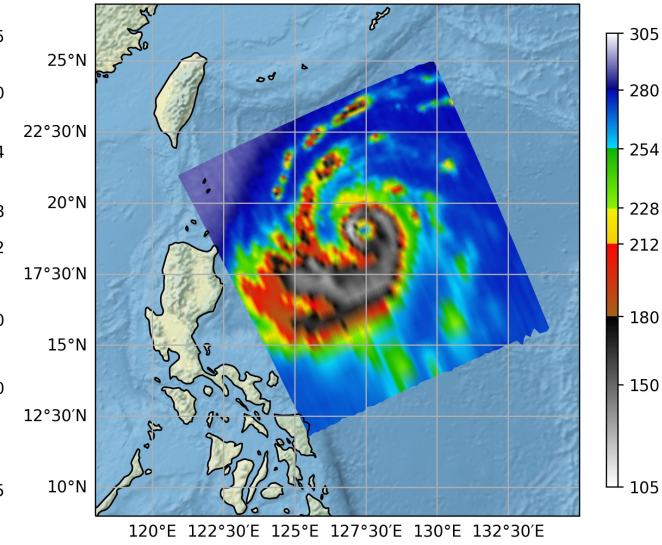
**Ch.#9 184 GHz**

Storm WP14 -- C09 S03 -- 2023275/0147UTC -- Scans/Spots 78/45



**Ch.#12 204 GHz**

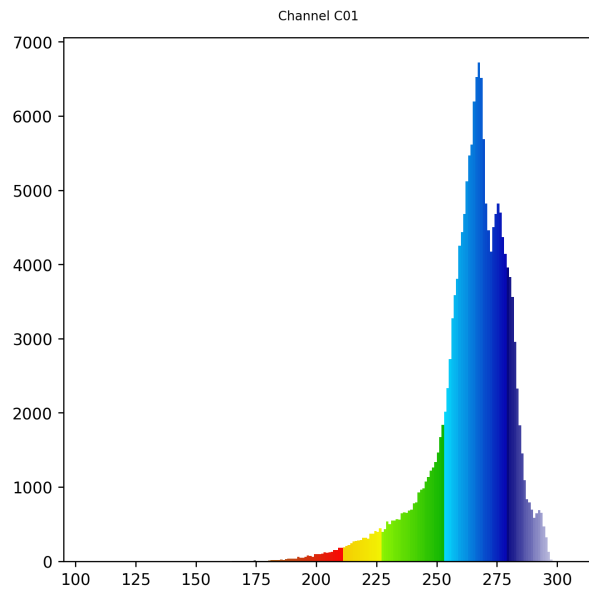
Storm WP14 -- C12 S03 -- 2023275/0147UTC -- Scans/Spots 78/45



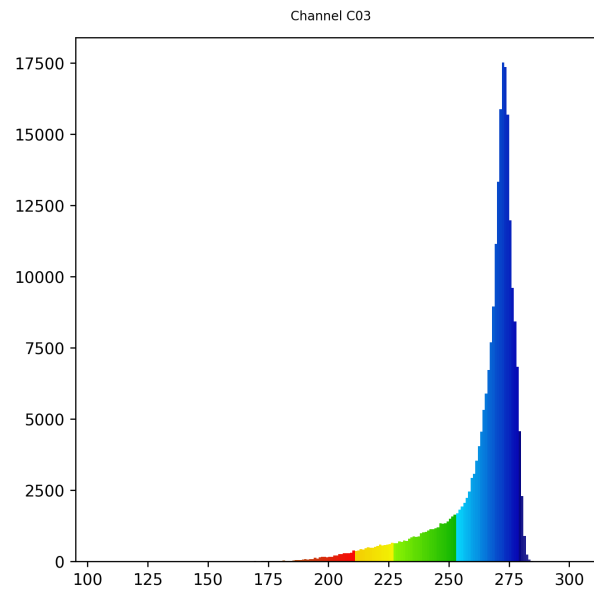
# Exploiting TROPICS Tb Imagery for TC Monitoring

## Color Table Histograms

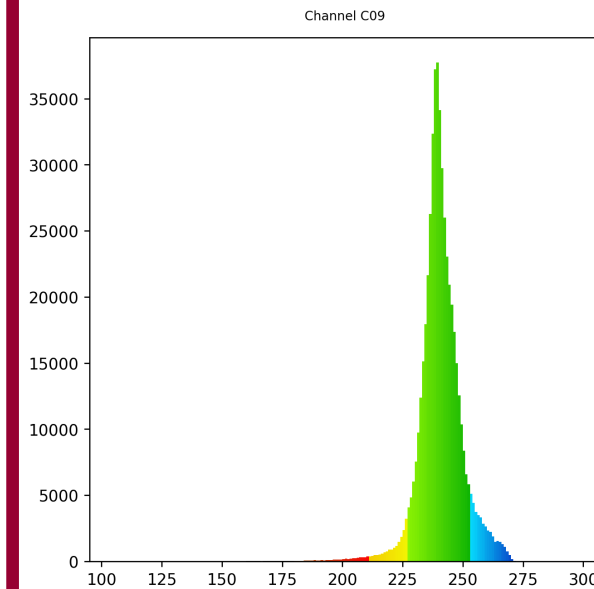
**Ch.#1 92 GHz**



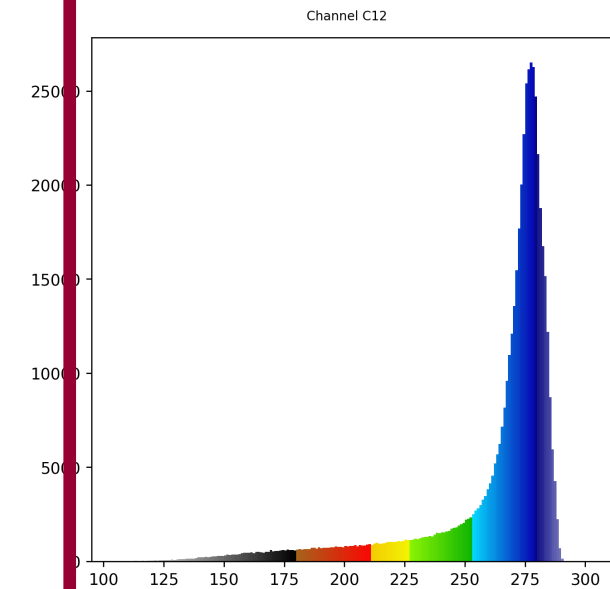
**Ch.#3 118 GHz**



**Ch.#9 184 GHz**



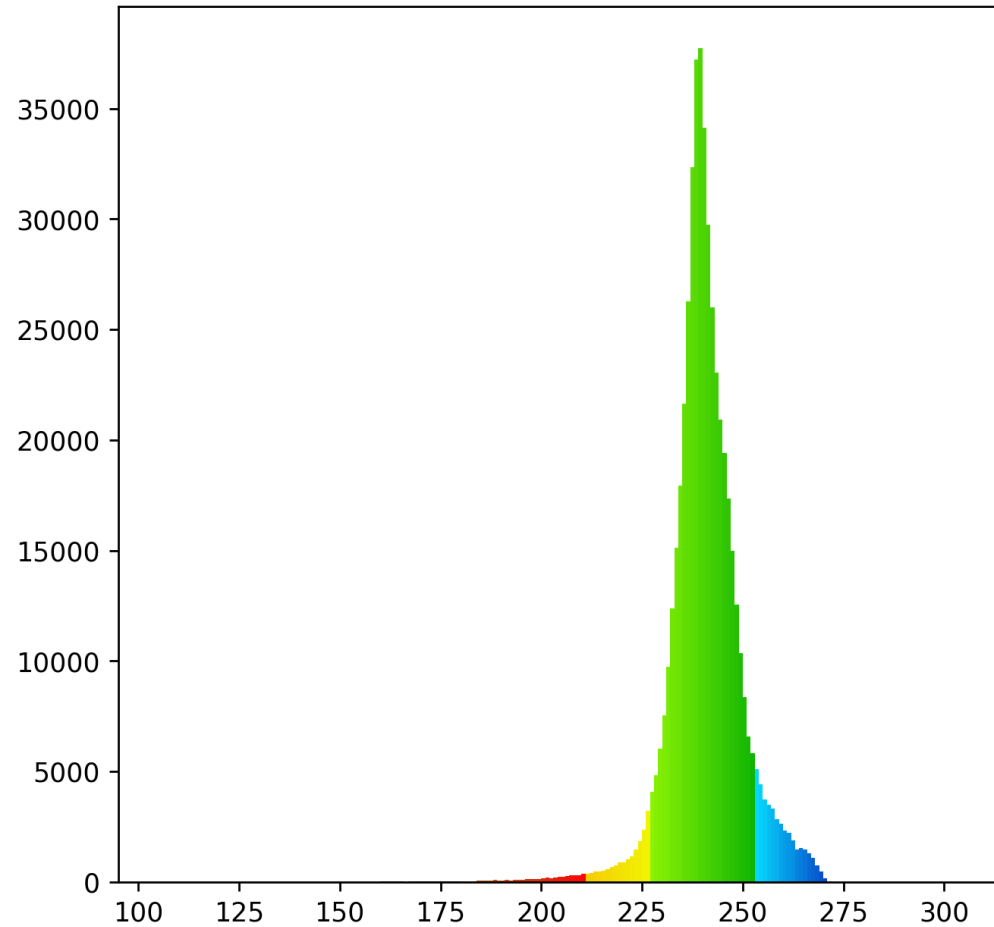
**Ch.#12 204 GHz**



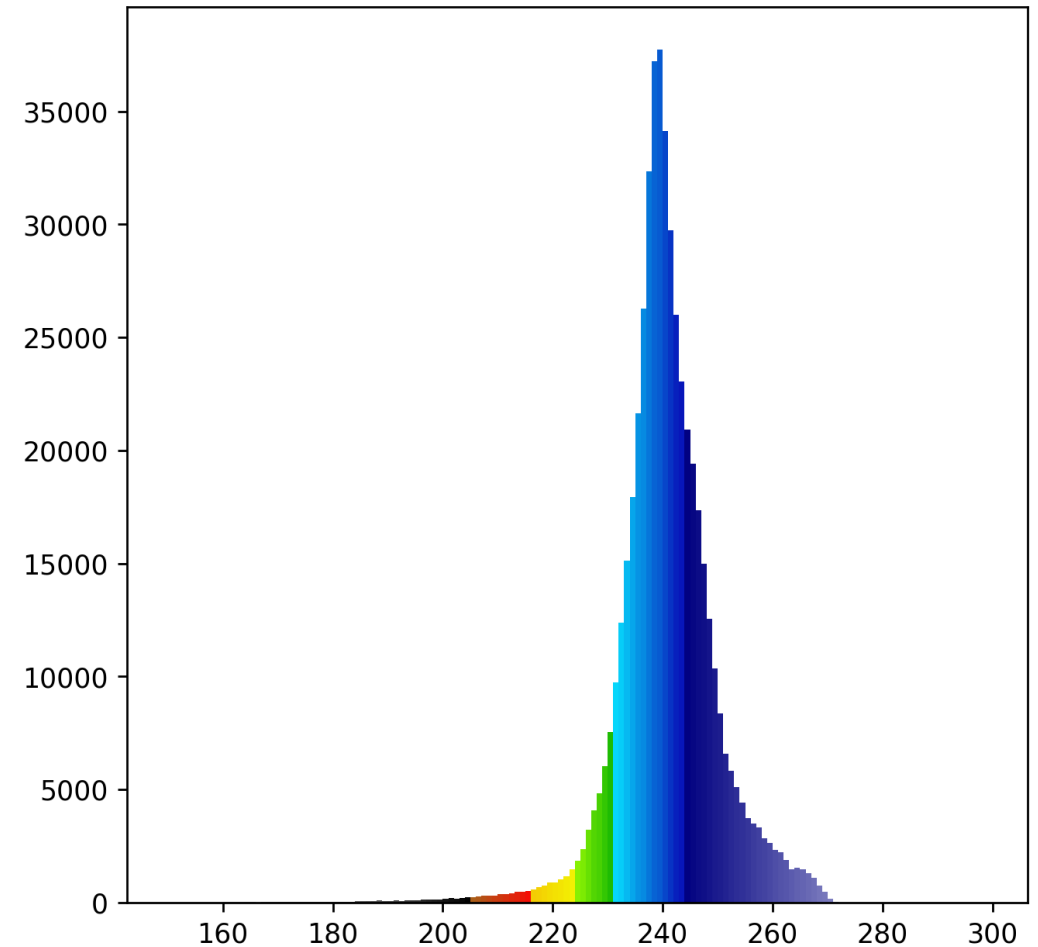
# Exploiting TROPICS Tb Imagery for TC Monitoring

## Ch. #9 184 GHz Color Table Histograms

Channel C09



Channel C09

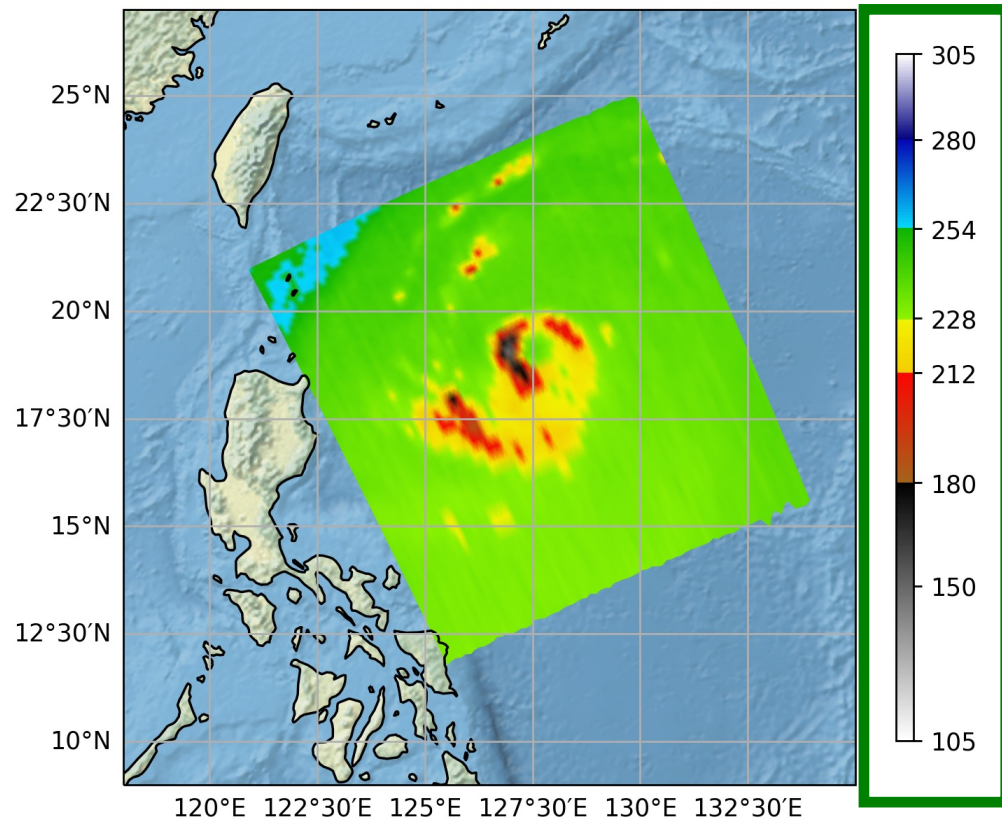


# Exploiting TROPICS Tb Imagery for TC Monitoring

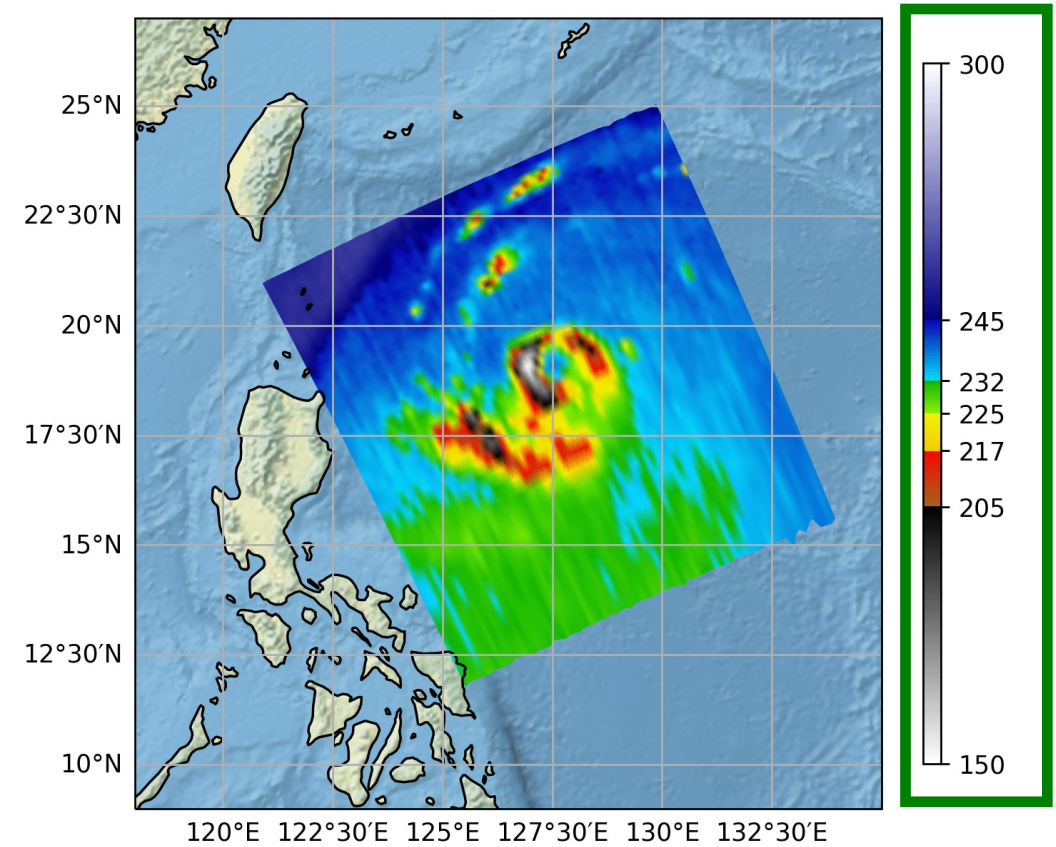
## Revised G-band TROPICS Color Table

Ch.#9 184 GHz

Storm WP14 -- C09 S03 -- 2023275/0147UTC -- Scans/Spots 78/45



Storm WP14 -- C09 S03 -- 2023275/0147UTC -- Scans/Spots 78/45



# Typhoon Bolaven

## TROPICS Channel 9 Color Tables

