



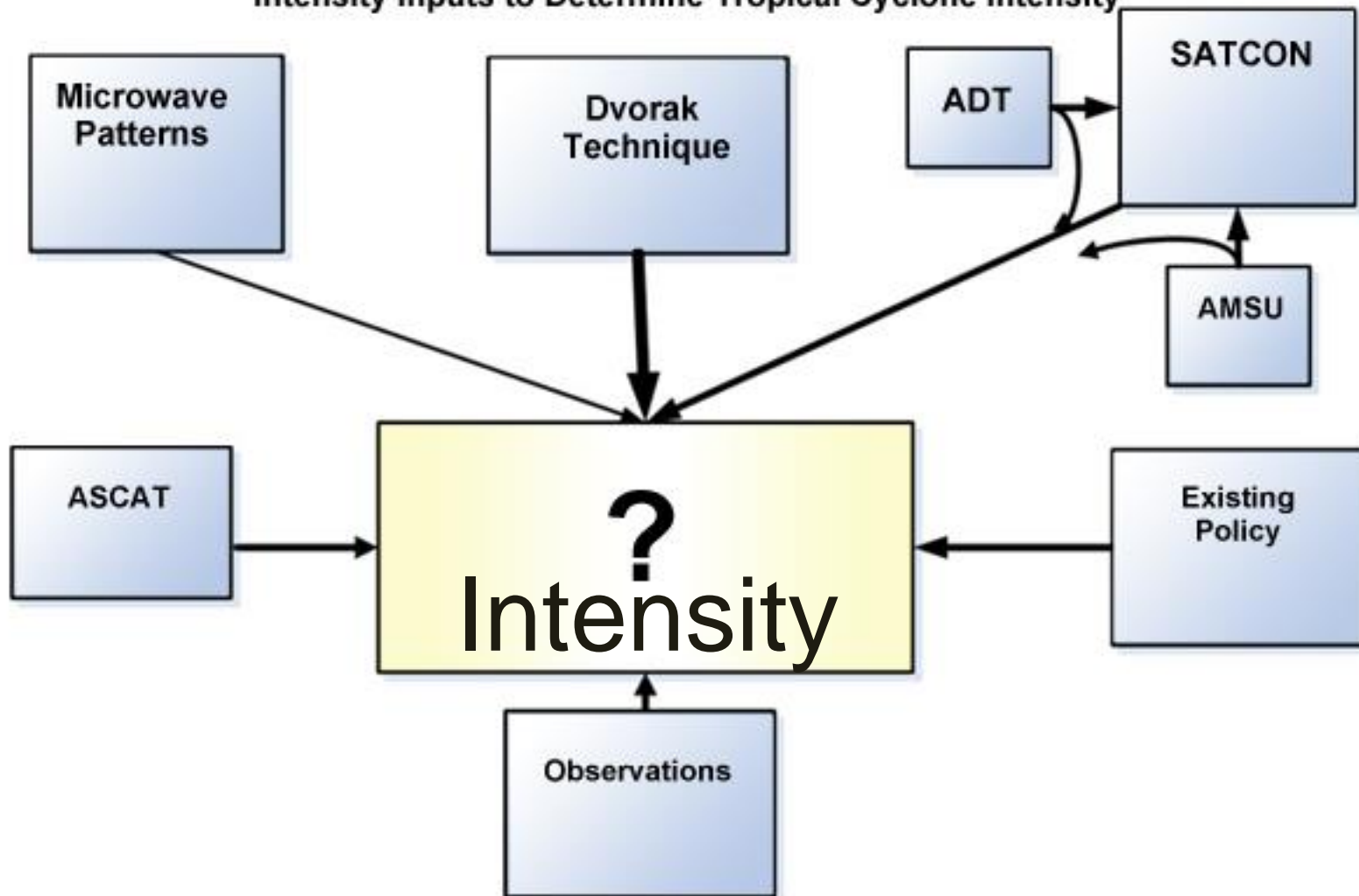
Australian Government

Bureau of Meteorology

TC Intensity analysis

b. other methods

Intensity Inputs to Determine Tropical Cyclone Intensity





Australian Government

Bureau of Meteorology

TCs fluctuate intensity

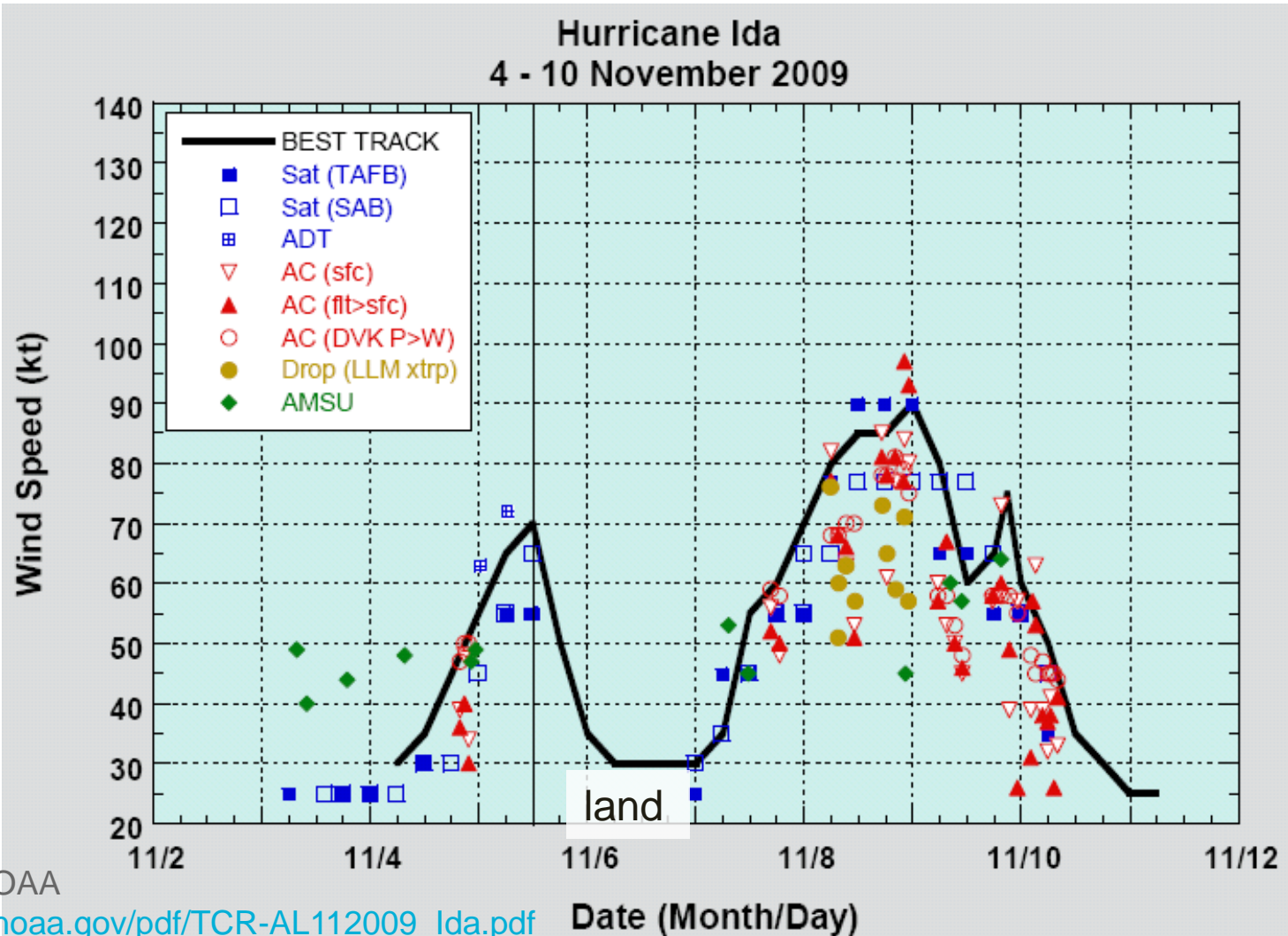


Image: NHC, NOAA

http://www.nhc.noaa.gov/pdf/TCR-AL112009_Ida.pdf



Australian Government

Bureau of Meteorology

Surface Observations

“Standard exposure AWS
observed winds (10min)
give a minimum maximum
wind”

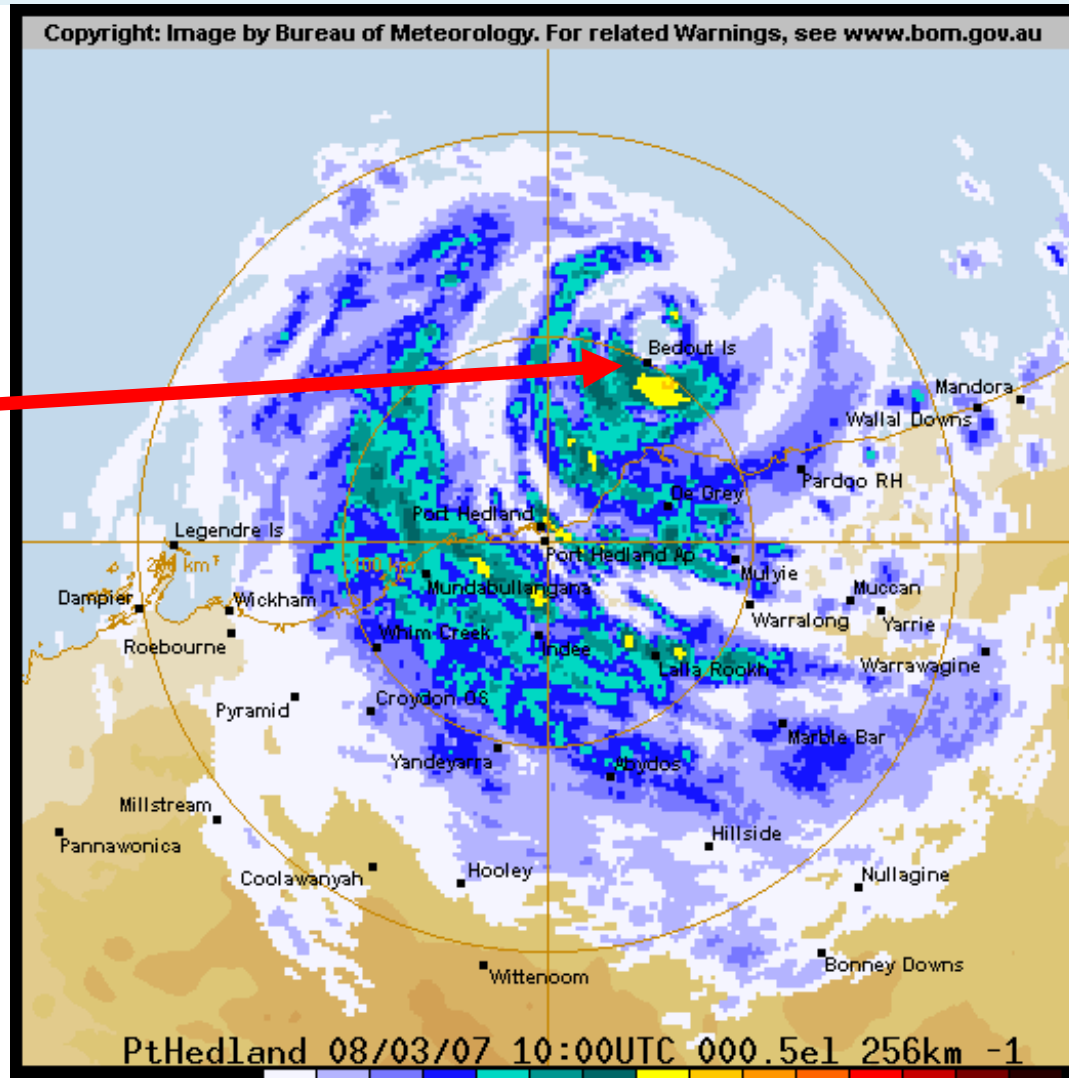
Examples: George

Bedout Is 105 knots

Hourly sampling

Dvorak: T6.5

Vmax = 110kn





Australian Government

Bureau of Meteorology

Surface Observations

Knowledge of site exposure is required:

Hayman Is (on a hill at 59m elevation) reported 93 kn from SE during Ului – slope reduction factor ~30% *ref Craig Miller* (cf $V_{max}=85\text{kn}$ in BT)





Australian Government

Bureau of Meteorology

Surface Observations

Ships: What to do with a 40kn observation??

Ships: ~10 % enhancement structure & reduction to 10m

BUT considerable variation in quality : correction for motion?

Ref: <http://icoads.noaa.gov/kiel/Kiel.Taylor.pdf>

ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-10-CLIMAR-99/Presentations/session_02/02.1_Taylor.pdf

Use caution! Check consistency, verify against scat





Australian Government

Bureau of Meteorology

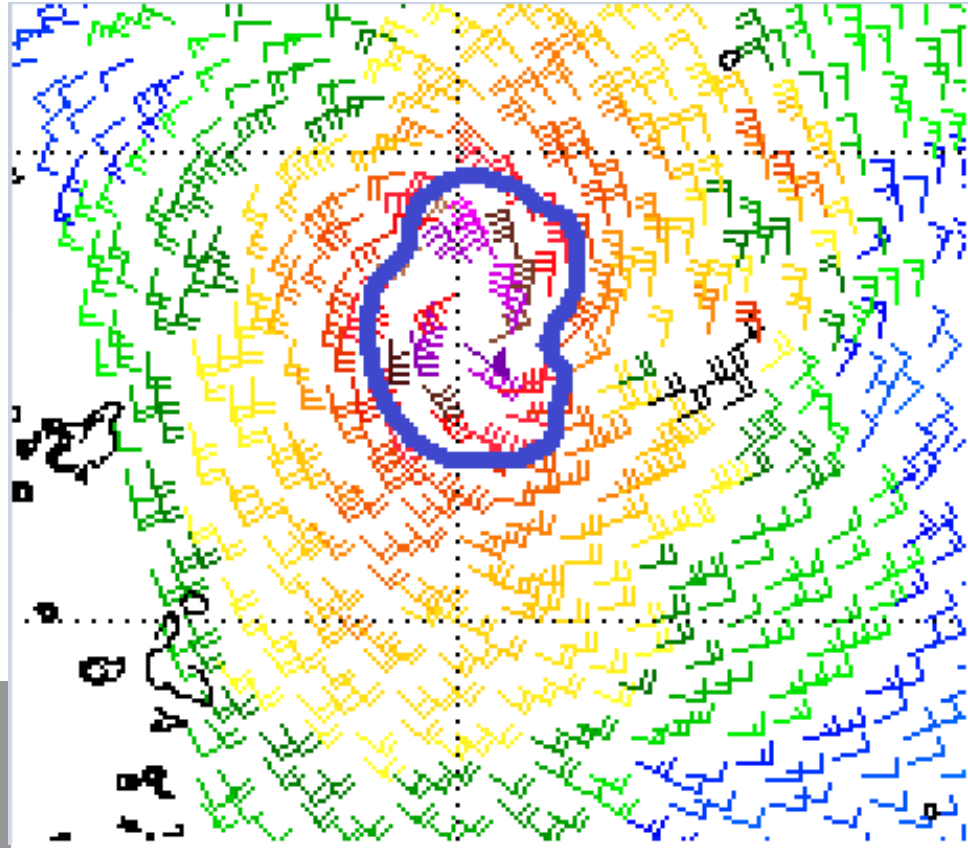
Scatterometry: ASCAT

- useful for <55 knot intensity range

Esp at tropical low stage when other measures don't work so well.

- good for structure - wind radii,

TC Ian 0949UTC 8/1/2014
ASCAT Vmax=50 knots
Max wind likely 50-55 kn



<http://manati.orbit.nesdis.noaa.gov/ascat/>



Australian Government

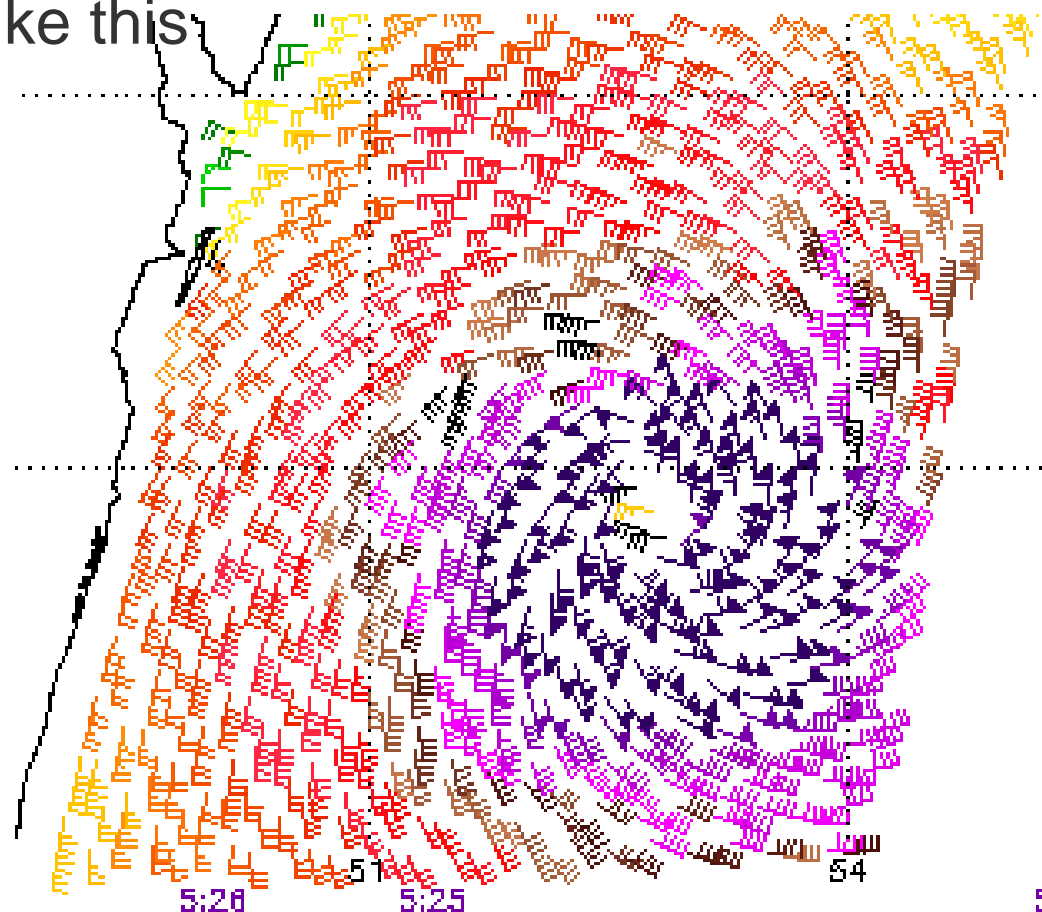
Bureau of Meteorology

ASCAT

Strongest pattern would look like this

Giovanna 13 Feb 2012

> 100 kn intensity



are GMT 2) Times along bottom correspond to measurement at -1
fer is 22 hrs from Feb 14 02:14 UTC 2012 4) Black circles indic

NOAA/



Australian Government

Bureau of Meteorology

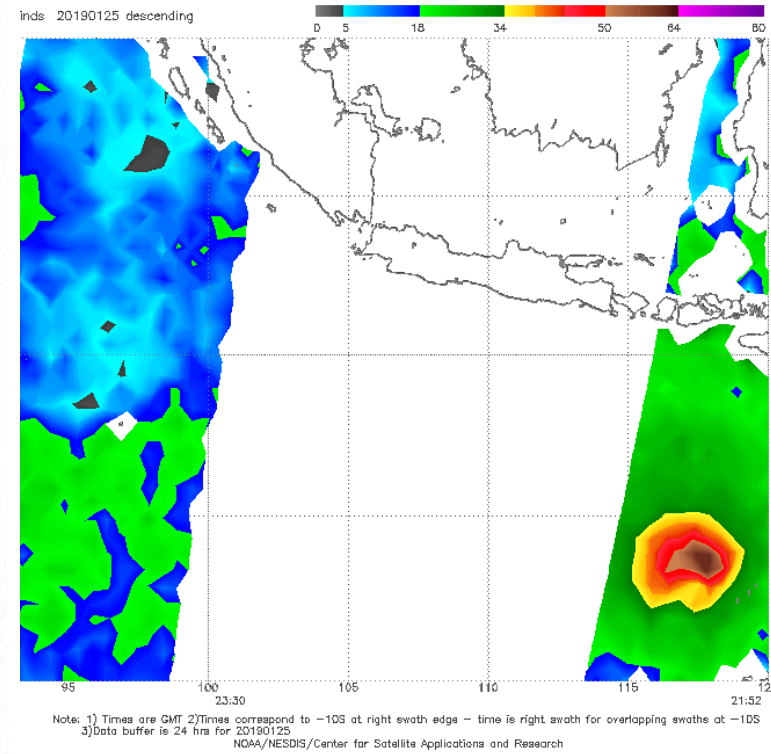
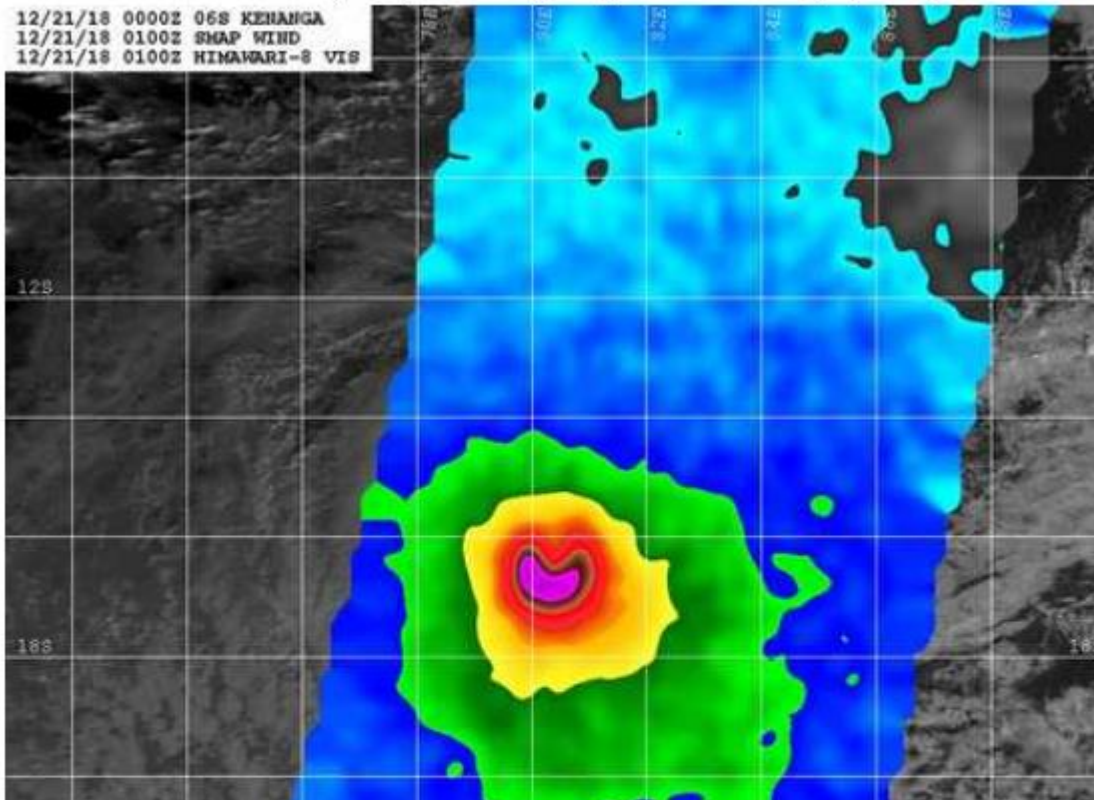
SMAP : L Band Radiometers

NRL: https://www.nrlmry.navy.mil/tc-bin/tc_home2.cgi

NOAA manati

<https://manati.star.nesdis.noaa.gov/datasets/SMAPData.php>

Accuracy to within 10 per cent at all wind speeds.



Example: Kenanga 2018 75kn

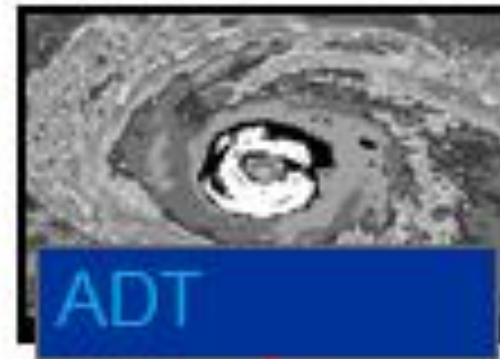
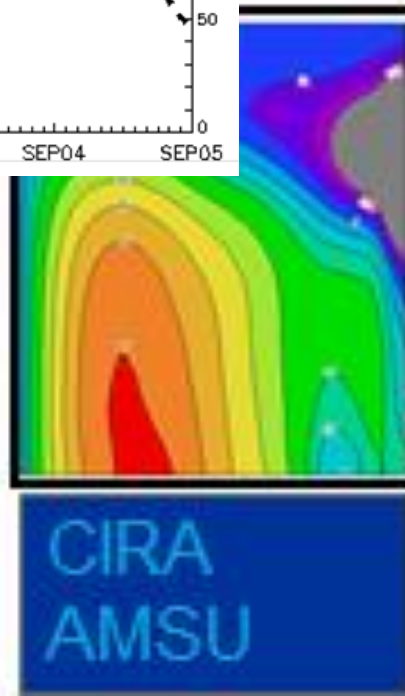
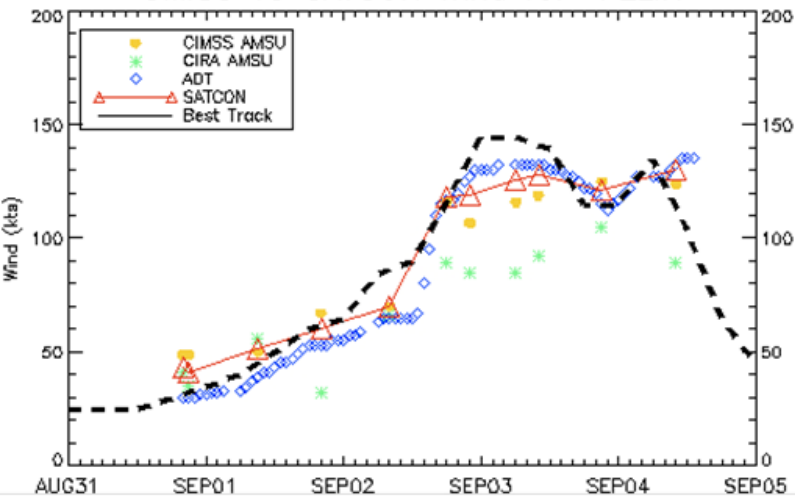
Courtesy: NRL <https://www.nrlmry.navy.mil/tcdat/tc19/SHEM/06S.KENANGA/smap/wind/20181221.0100.smap.x.wind.06SKENANGA.80kts-976mb-163S-804E.054pc.jpg>



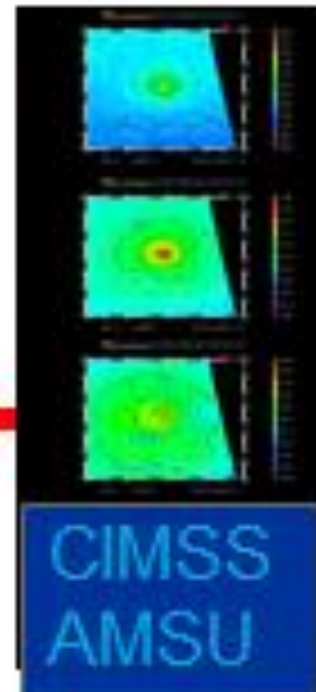
Australian Government
Bureau of Meteorology

Objective Techniques Satellite Consensus (SATCON)

CIMSS TC SATCON Wind for FELIX



SATCON





Australian Government

Bureau of Meteorology

Advanced Dvorak Technique ADT

Uses IR imagery to assess eye temperature, curvature and cloud region temperature.

Logic based on the subjective Dvorak Method

Linear regression scheme developed by matching recon MSLP estimates to important IR parameters.

Each TC image is classified according to “scene type” which drives the logic structure leading to the intensity estimate

CIMSS: <http://tropic.ssec.wisc.edu/real-time/adt/adt.html>

NESDIS: <http://www.ssd.noaa.gov/PS/TROP/adt.html>

Version 8.2.1 current as of July 2017

A satellite image of a tropical cyclone showing a clear, circular eye in the center, surrounded by a dense, swirling cloud structure. The eye is labeled "EYE" in a white box. The image is color-coded to show cloud top temperatures, with a color bar at the bottom ranging from -40 to -10. The text "Satellite image of a tropical cyclone with a well-defined eye" is visible at the bottom of the image.

Example errors as a function of scene type

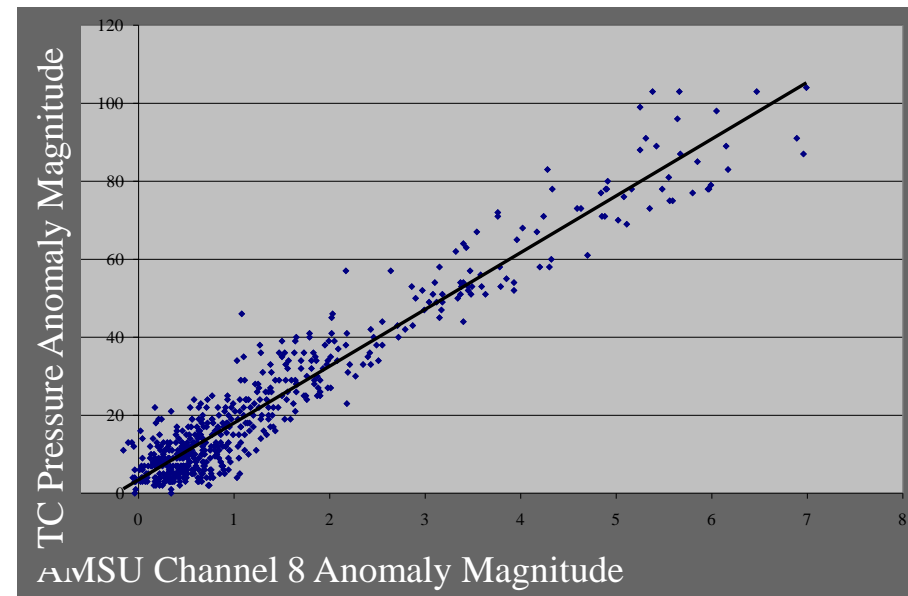
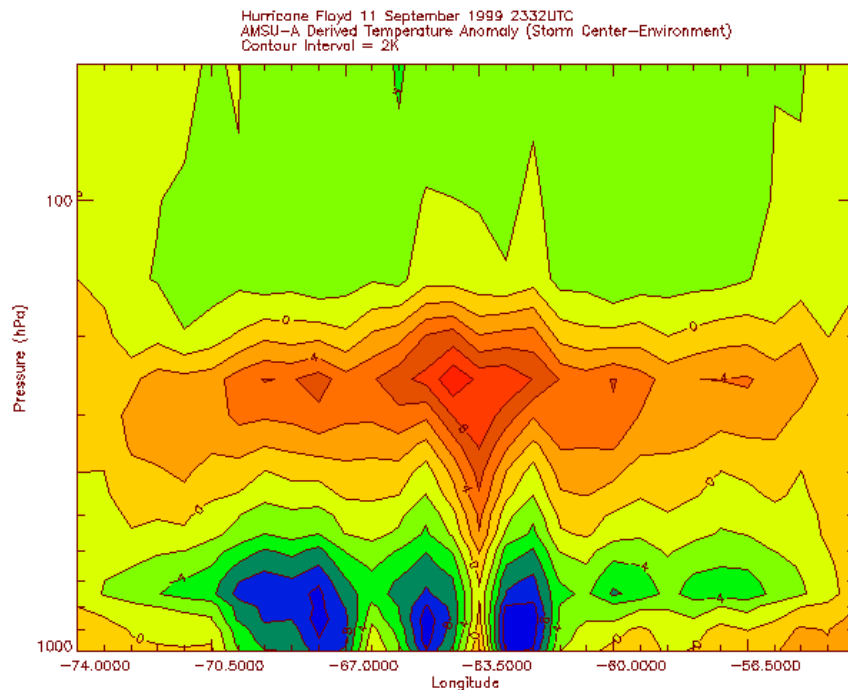


Australian Government
Bureau of Meteorology

Microwave Intensity

AMSU and SSMIS

Microwave sounder which includes channels for measuring brightness temperatures (Tb) at 550-150 hPa layer.



<http://amsu.ssec.wisc.edu/explanation.html>

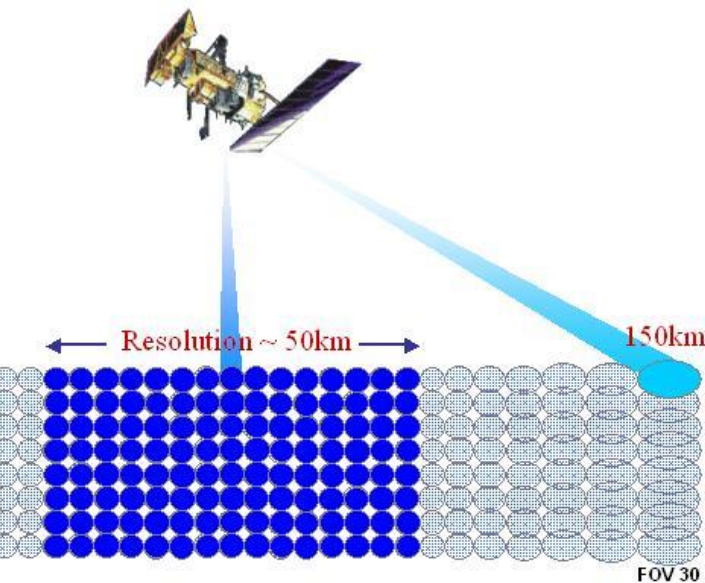


Australian Government

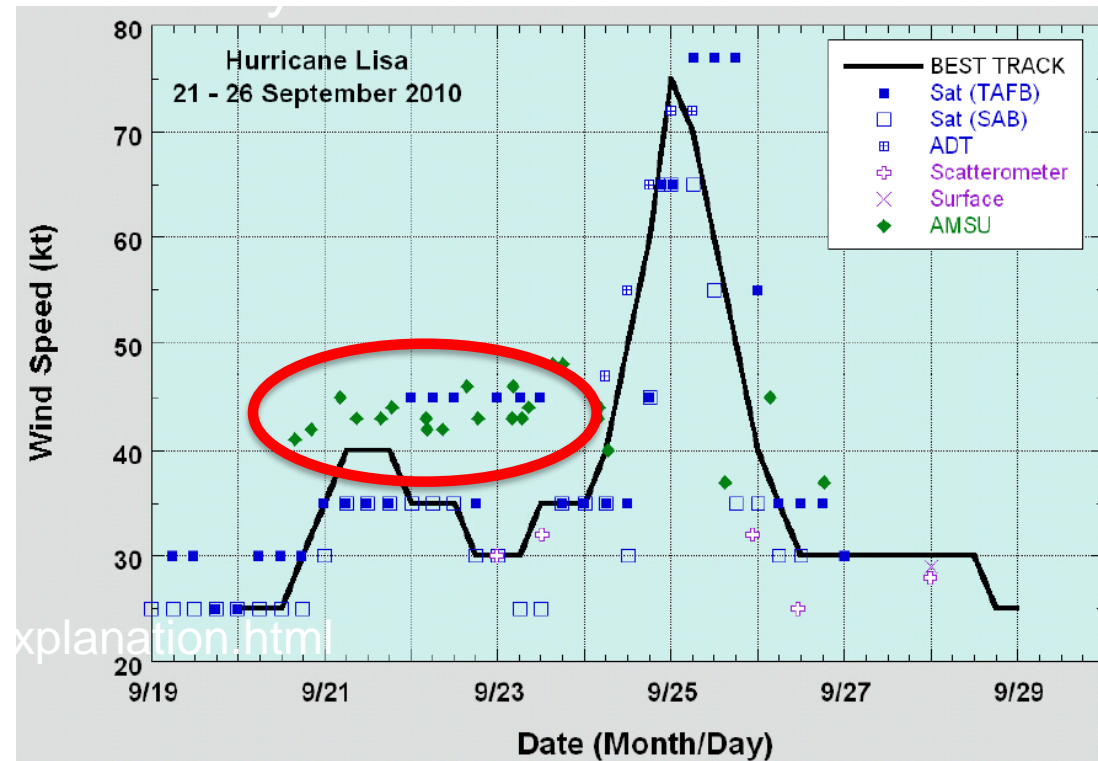
Bureau of Meteorology

AMSU Intensity: Issues

Underestimates when TC near the edge of the swathe and for small eyes (corrections applied)
 Overestimates for weak system
 Rain contamination esp



AMSU Scanning Geometry and Resolution





Australian Government

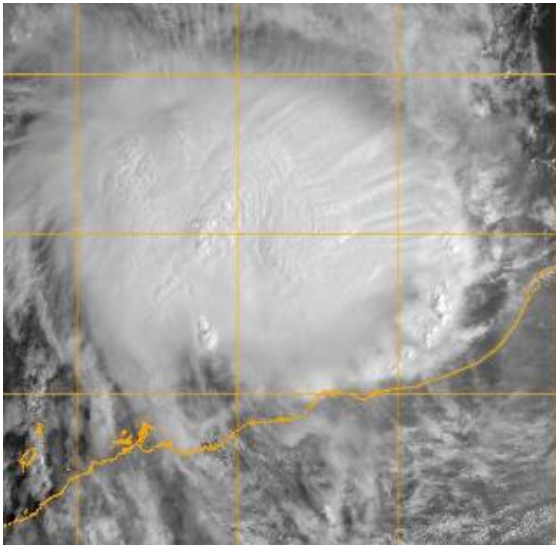
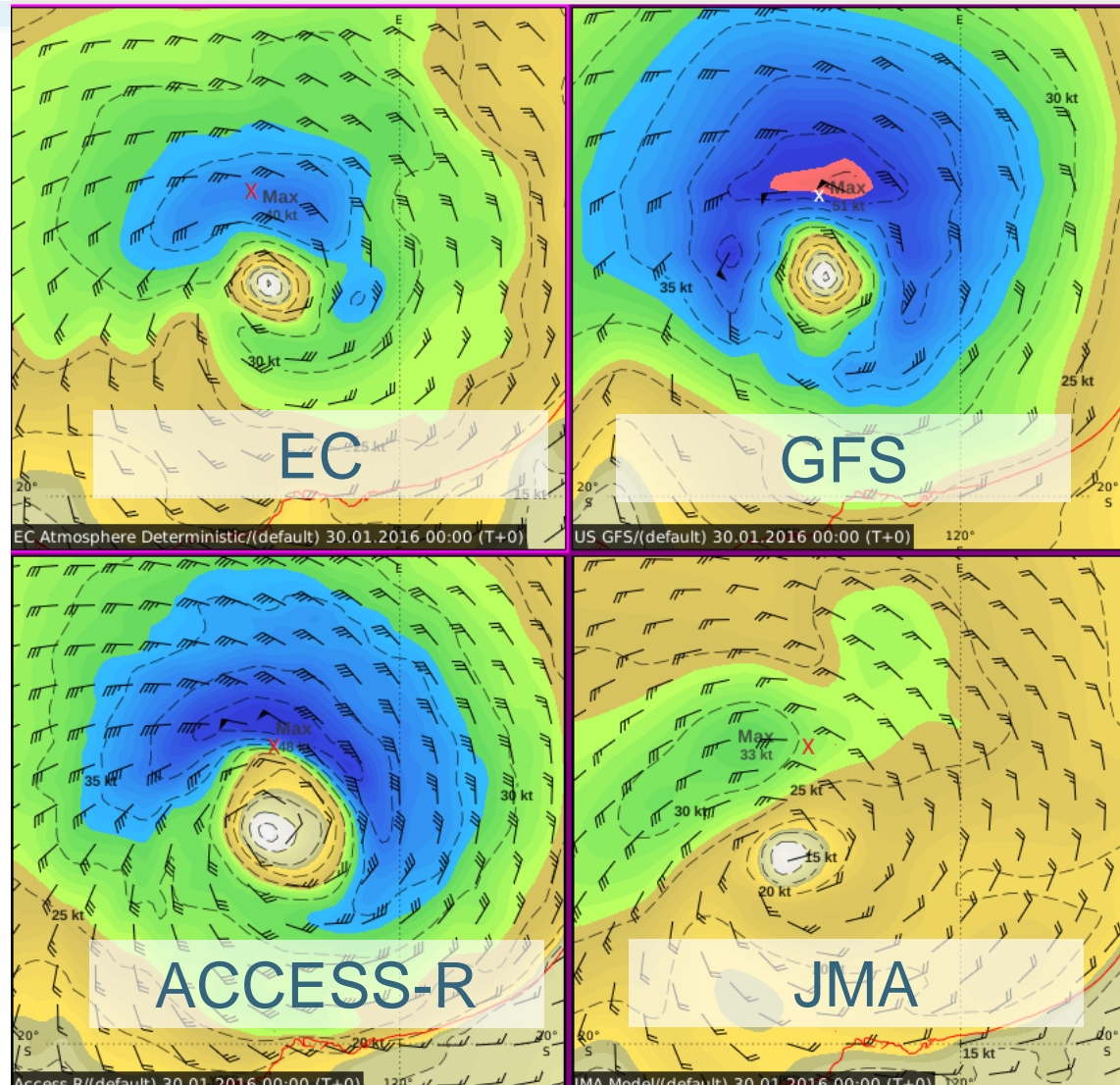
Bureau of Meteorology

NWP: structure and sometimes intensity

TC Stan 00UTC 30/1/2016

T4.0 => 55kn

Rowley Shoals 49kn (point x)
close to max winds

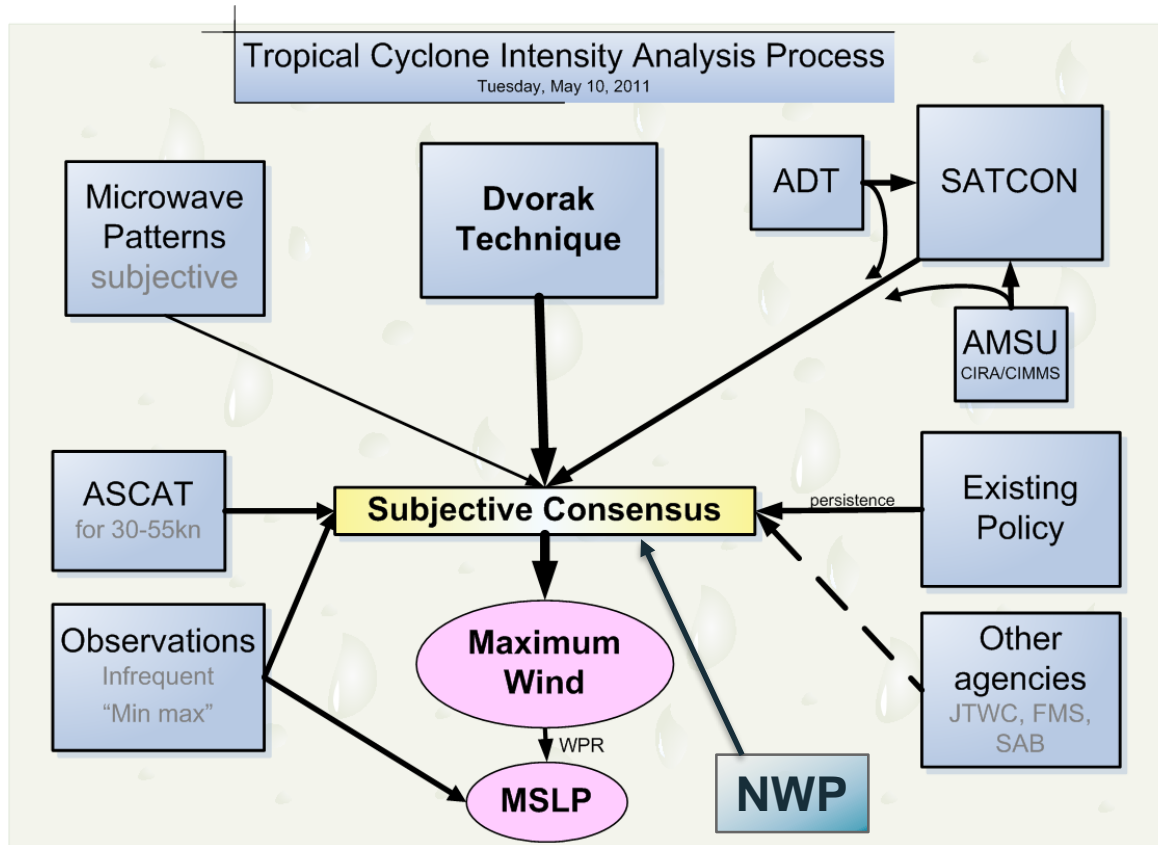




Australian Government

Bureau of Meteorology

Intensity Summary



COMET module: https://www.meted.ucar.edu/training_module.php?id=1083

Intensity exercises: <https://bmtc.moodle.com.au/course/view.php?id=107>



Australian Government

Bureau of Meteorology

Intensity Questions

1. ASCAT is most useful for intensity estimates at the range of :

A. 25-35kn B. 25-50kn C. 25-75kn D. 50-75kn E. >75kn

2. SATCON has the following benefits (select all that apply).

- a. Automatic hourly updates 24h/day
- b. Uses IR, Vis and microwave imagery
- c. Objective method with known errors/bias
- d. Better than human (subjective) analysis

3. True or False "Your final intensity estimate should consider all available inputs and weight each according to the situation".