AOMSUC-10

2–7 December 2019
Melbourne, Australia

10TH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE

Application of spectral bands to RGB composites

Introduction to the Socrative cloud based learner response system for interaction during the AOMSUC-10 Training Event

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Bureau of Meteorology Training Centre
Australian VLab Centre of Excellence

Australian Government
Bureau of Meteorology

Content of this session

- Introduction to the Socrative cloud based learner response system
- The RGB composites as endorsed by WMO
- The Night Microphysics RGB composite in detail
- Advantages and limitations in using the RGB composites.
- Some useful resources

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How to access and answer the Socrative Questions

1 On your computer or smartphone open up a new window in your browser

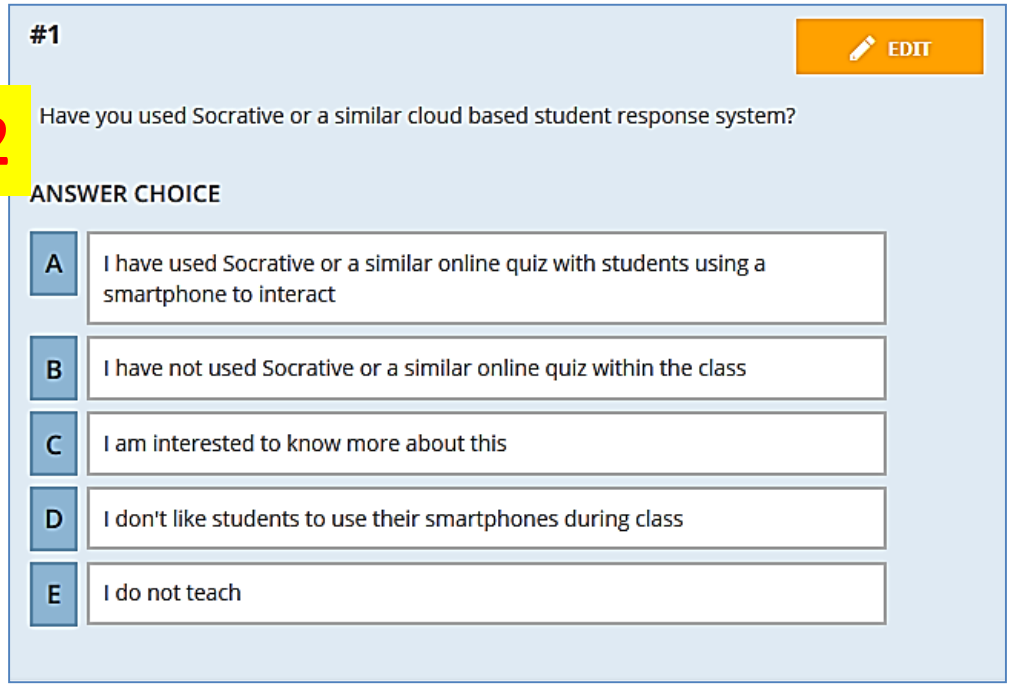
type in **b.socrative.com**

Choose "**LOGIN**" (top RHS)

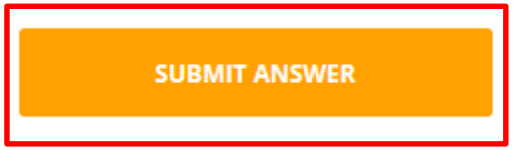
choose "**Student Login**"

Then Room Name "**AOMSUC10**"

2

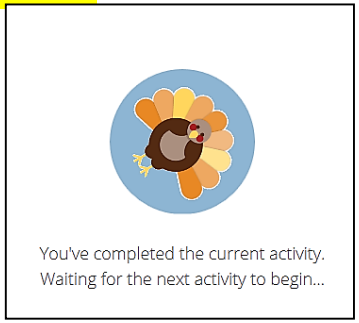


3 Answer the question



4

5



Socrative question 1: Have you used Socrative or a similar cloud based learner response system?

A. I have used Socrative or a similar online quiz to interact in the classroom.
B. I have not used Socrative or a similar online quiz within the classroom
C. I am interested to know more about this
D. I don't like the use of smartphones during the class

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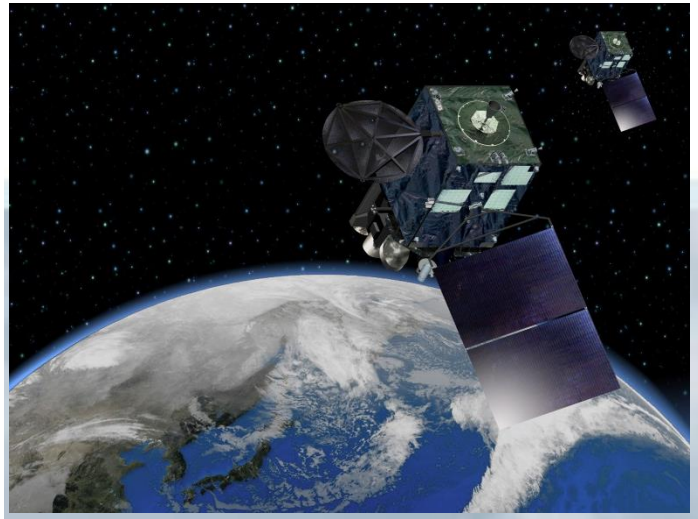
The 16 Himawari-8 bands

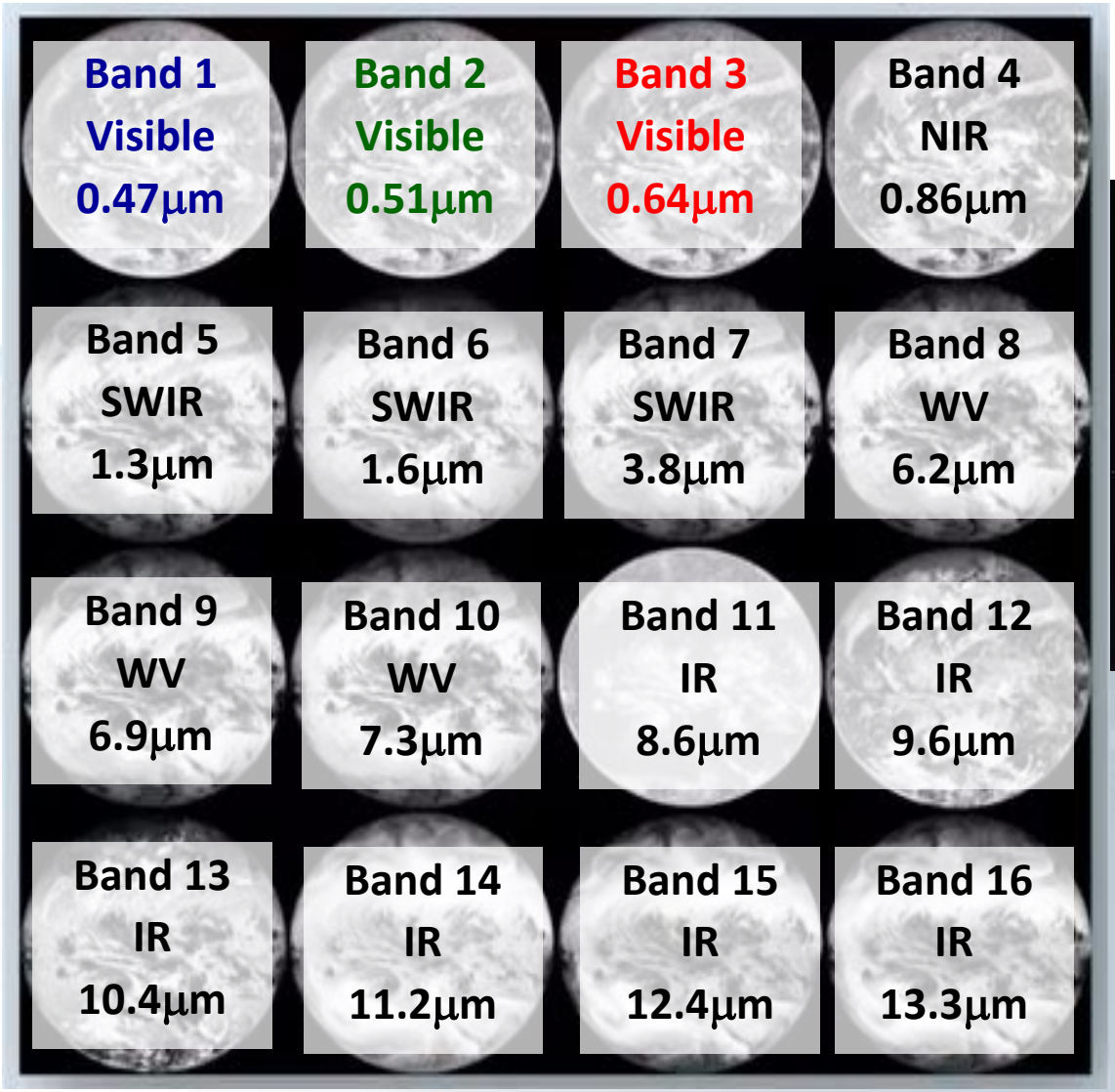
Band 1 Visible 0.47μm	Band 2 Visible 0.51μm	Band 3 Visible 0.64μm	Band 4 NIR 0.86μm
Band 5 SWIR 1.6μm	Band 6 SWIR 2.3μm	Band 7 SWIR 3.7μm	Band 8 WV 6.2μm
Band 9 WV 6.9μm	Band 10 WV 7.3μm	Band 11 IR 8.6μm	Band 12 IR 9.6μm
Band 13 IR 10.4μm	Band 14 IR 11.2μm	Band 15 IR 12.4μm	Band 16 IR 13.3μm

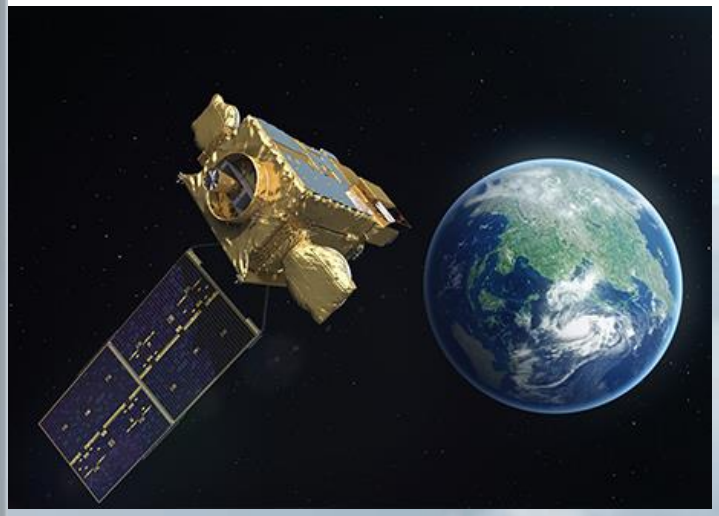


Himawari-8

Himawari-8 image courtesy JMA

The 16 GEO-KOMPSAT-2A bands





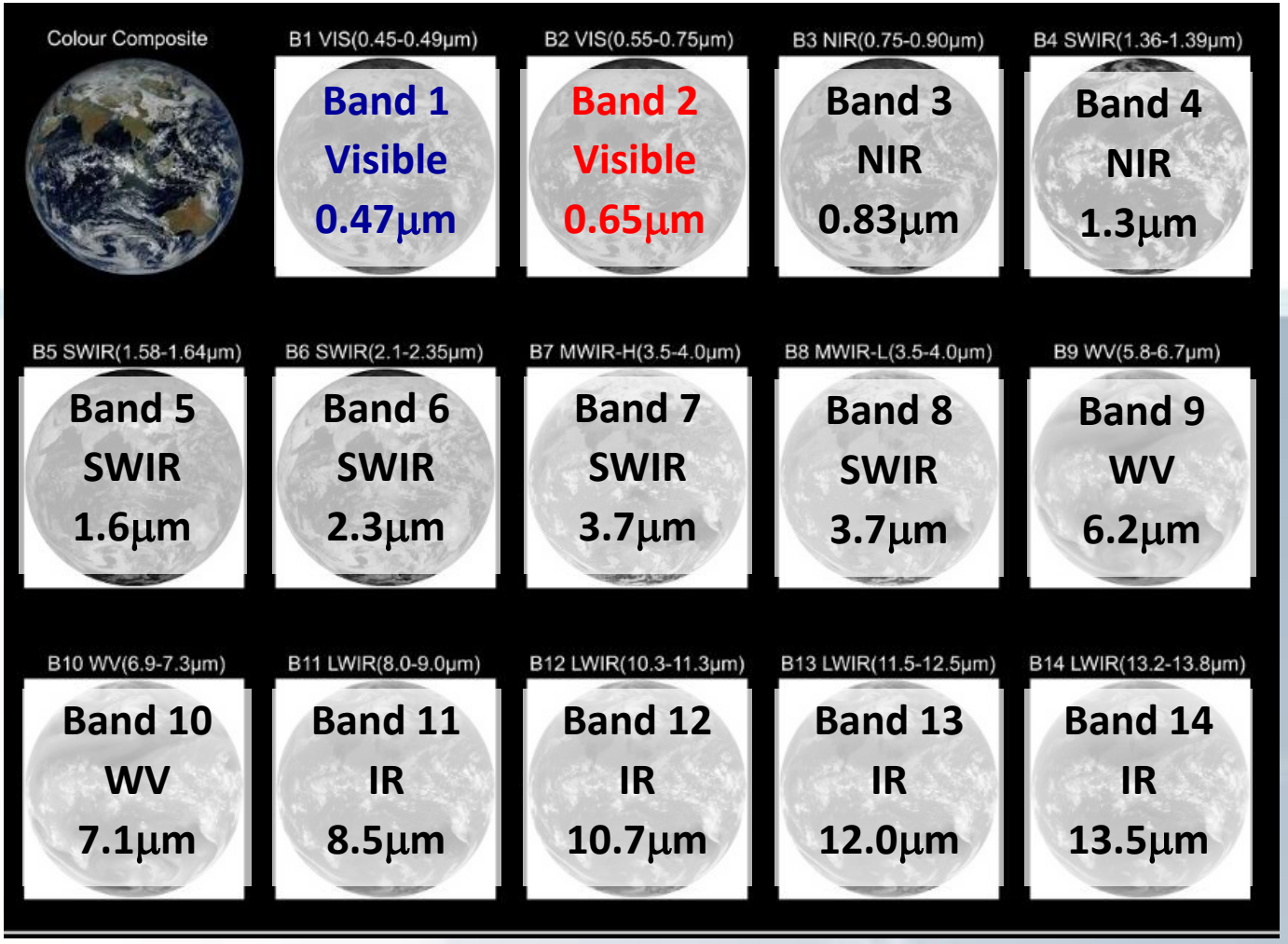
Similar to Himawari-8 except:

GK-2A has the 1.3 μ channel

H-8 has the 2.3 μ channel

full disk image courtesy Hyunjong Oh, KMA, central band details courtesy WMO OSCAR

The 14 Fengyun-4A bands



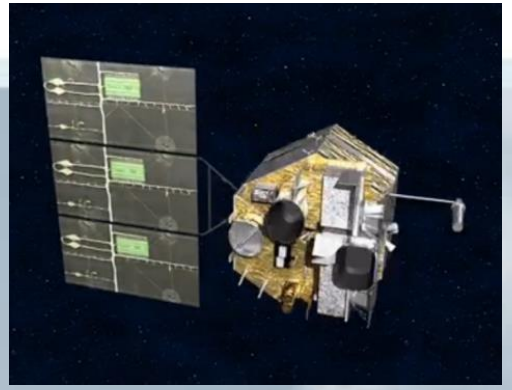
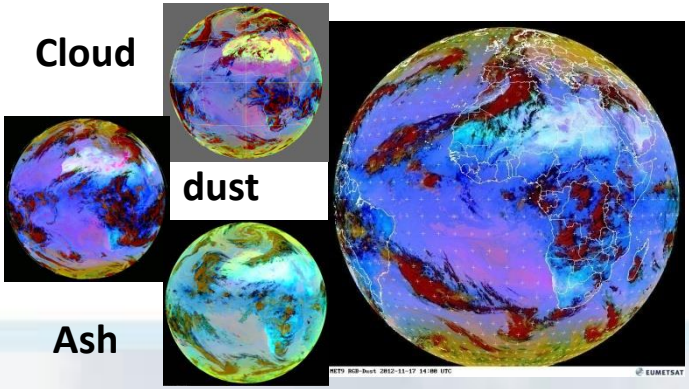


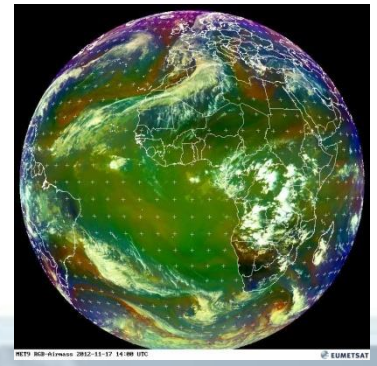
image processed by NMSC CMA

RGB composites for Operational Forecasting as recommended by EUMETSAT

Two RGB composites which complement each other



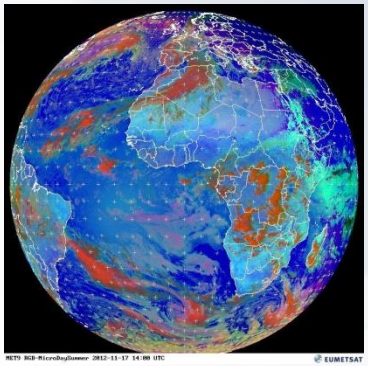
24 hour Microphysical RGB



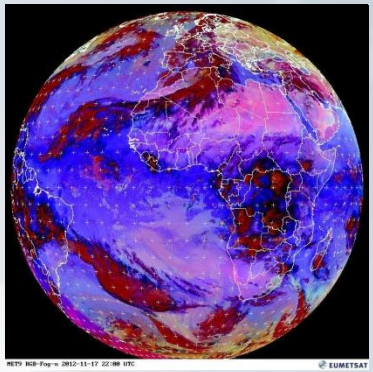
Airmass RGB

from RGB Products Overview (RGB Tutorial) J. Kerkmann EumetSAT

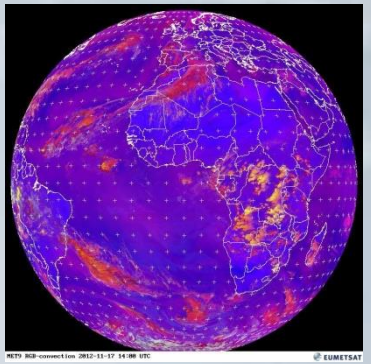
Five application specific RGBs



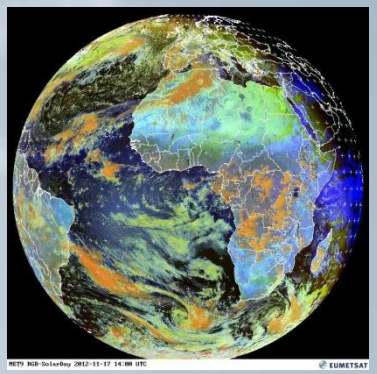
Day Microphysical RGB



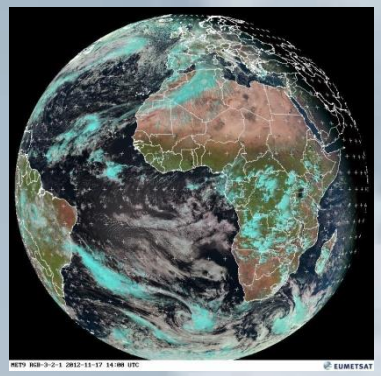
Night Microphysical RGB



Day Convection RGB

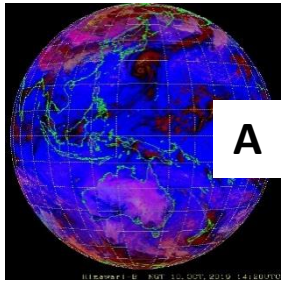


Snow / fog RGB



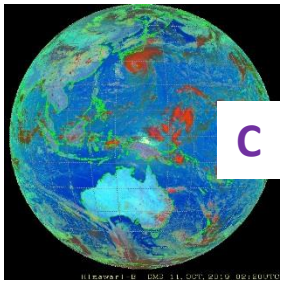
Natural Colours RGB

Socrative question 2: Which RGB composites do you use the most during your work?

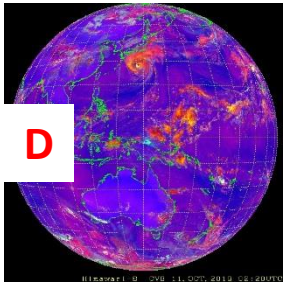


A. Night Microphysics RGB

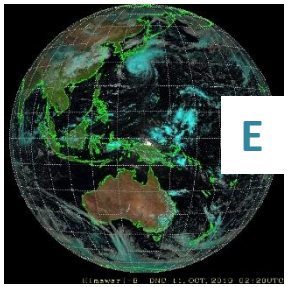
B. True Colour RGB



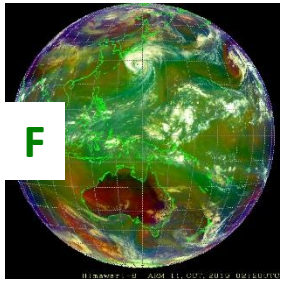
C. Day Microphysics RGB



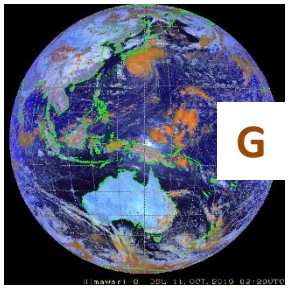
D. Day Convection RGB



E. Natural Colour RGB

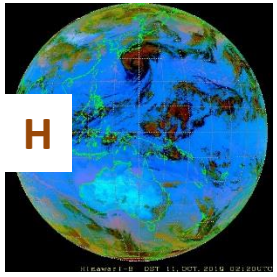


F. Airmass RGB



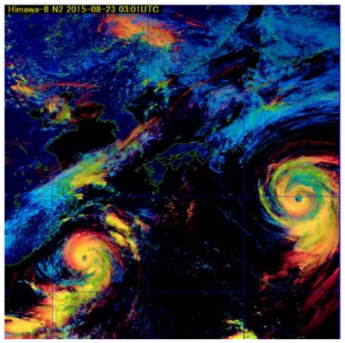
G. Snow/fog RGB

H. 24 hours Microphysics RGB (Ash, Dust RGB)

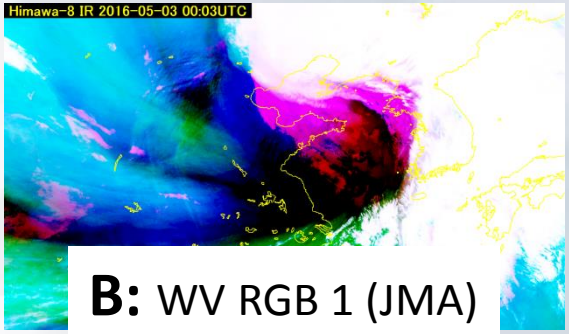


I. I have not used RGB composites

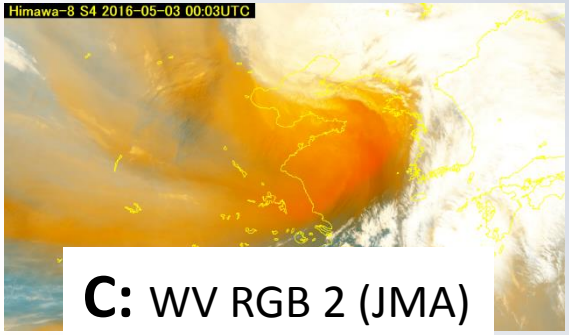
Other RGB composites as presented during Australian Vlab Centre of Excellence Regional Focus Group meetings



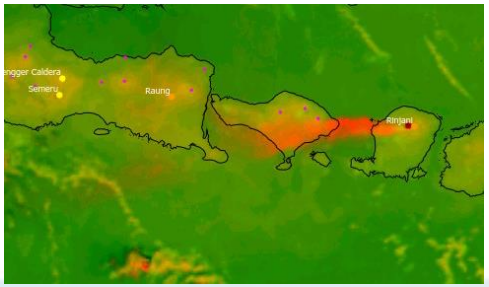
A: Cloud Phase RGB (JMA)



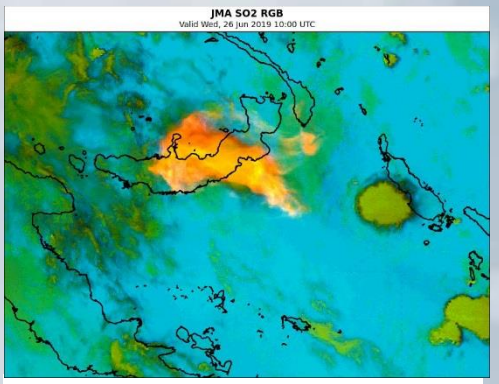
B: WV RGB 1 (JMA)



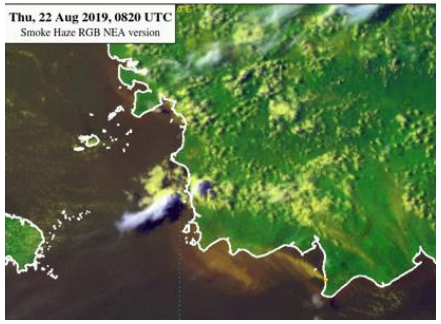
C: WV RGB 2 (JMA)



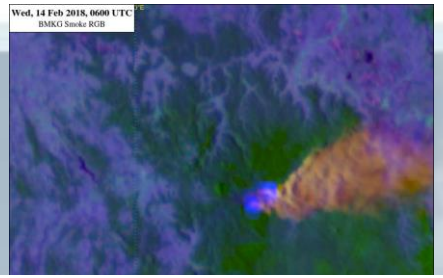
D: BMKG Volcanic Ash RGB



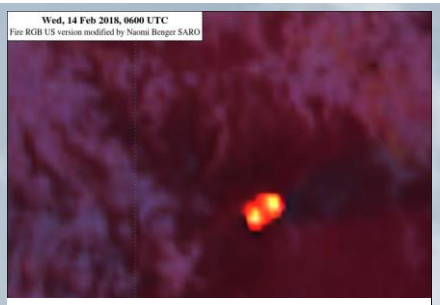
E: SO2 RGB (JMA)



F: Smoke Haze RGB (NEA Singapore)



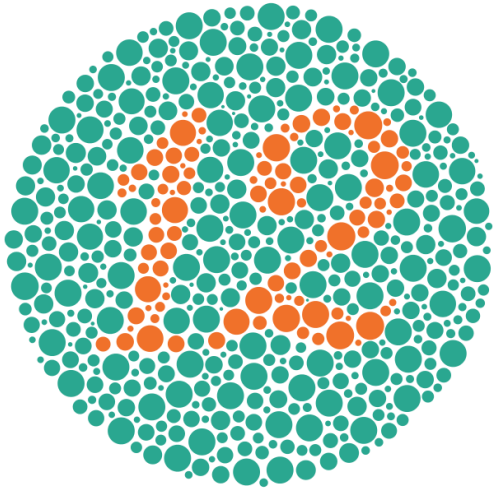
G: BMKG Smoke RGB

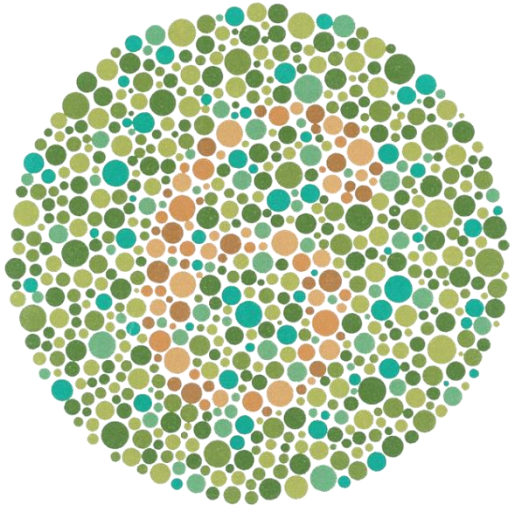


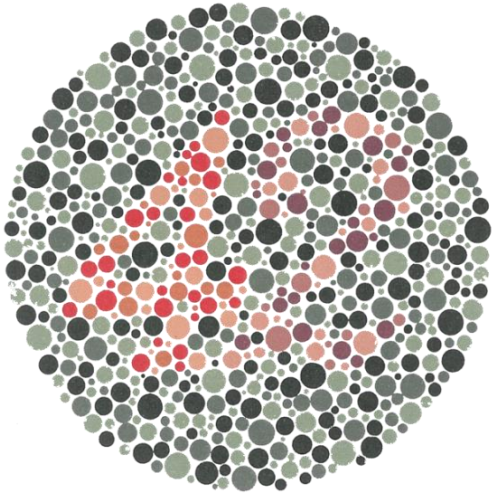
H: Fire Temp RGB (US/SARO)

images from wikipedia

Socrative question 3: What number do you see in the central Ishihara circle (Circle 2) ?







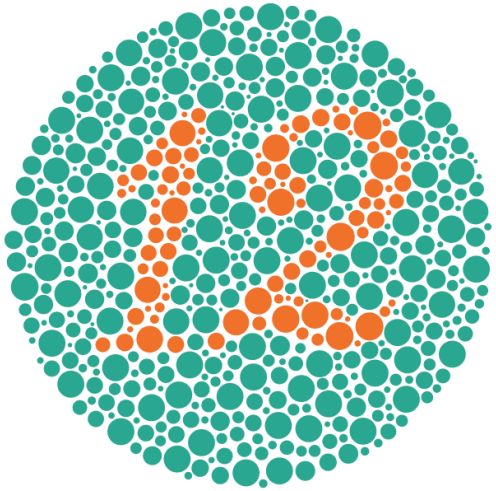
Circle 1	Circle 2	Circle 3

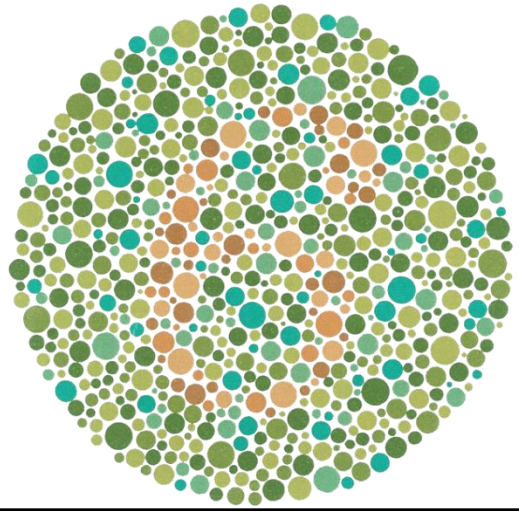
Socrative question 3: What number do you see in the central Ishihara circle (Circle 2)?

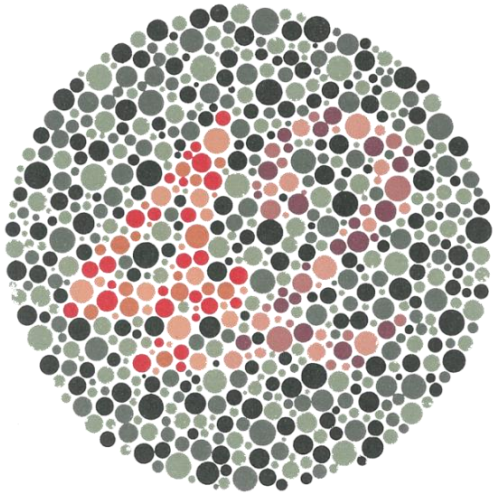
A. 4
B. 6
C. 8
D. 10
E. 90
F. I cannot see any number

images from wikipedia

Intermission – Ishihara Vision Colour Deficiency assessment







All people should see a number 12, including those with total colour blindness	**Those with normal colour vision will see a 6.** The majority of colour blind people cannot see this number clearly.	**Those with normal colour vision should see a 42.** Red colour blind people will see a 2, mild red colour blind people will also faintly see a number 4. Green colour blind people will see a 4, mild green colour blind people may also faintly see a number 2

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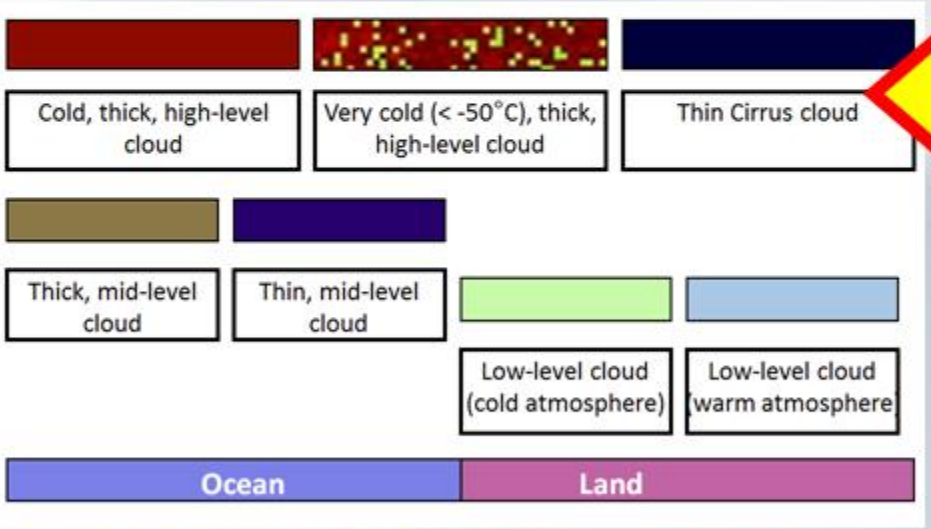
images courtesy JMA

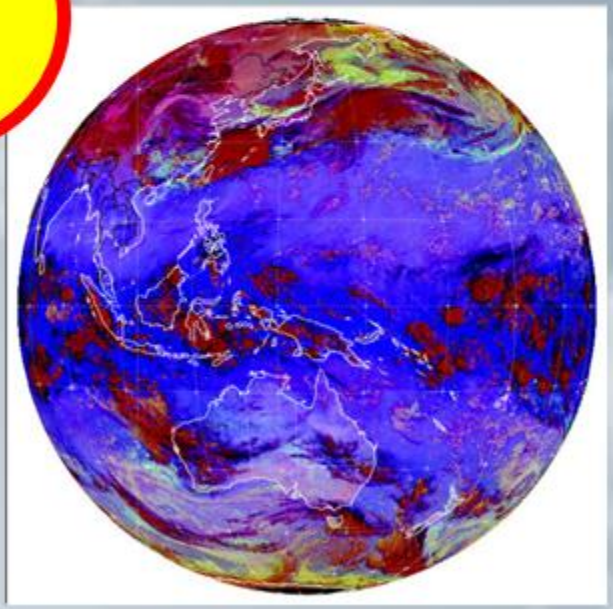
The Night Microphysics RGB as tuned for Himawari-8 by JMA

Night Microphysics RGB (#2)	Range	Gamma
12.0 – 10.4 micron	-6.7 to 2.6	1.0
10.4 – 3.9 micron	-3.1 to 5.2	1.0
10.4 micron	243.6 to 292.6	1.0

CHANNEL COMBINATION



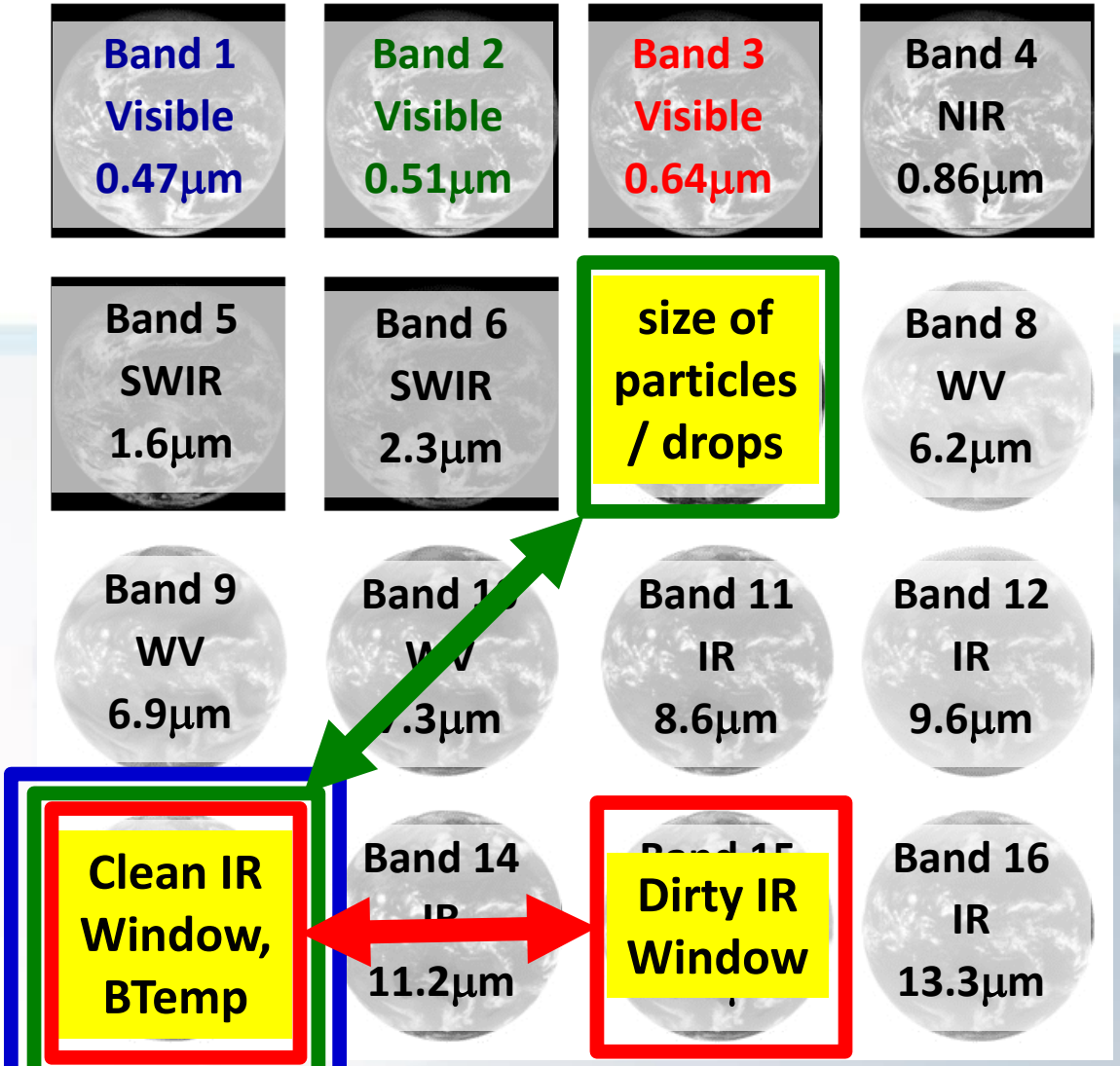
COLOUR INTERPRETATON
(some colours)

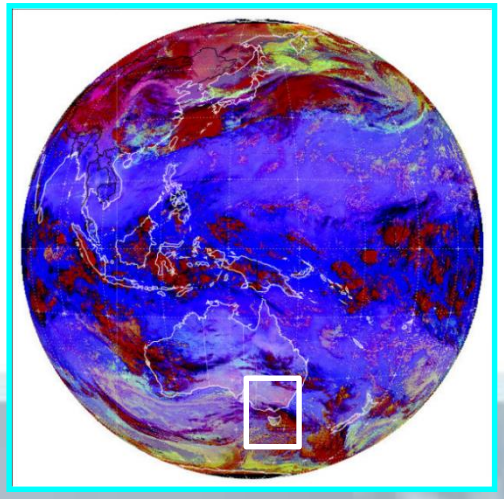


Himawari-8 RGB Composite

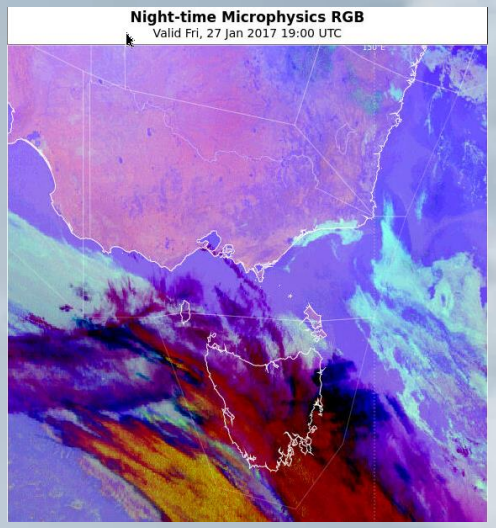
EUMETSAT = European Organization for the Exploitation of Meteorological Satellites

The Himawari-8 bands composing the Night Microphysics RGB composite





Night Microphysics RGB



Himawari-8 image courtesy JMA

construction courtesy B.Zeschke BOM

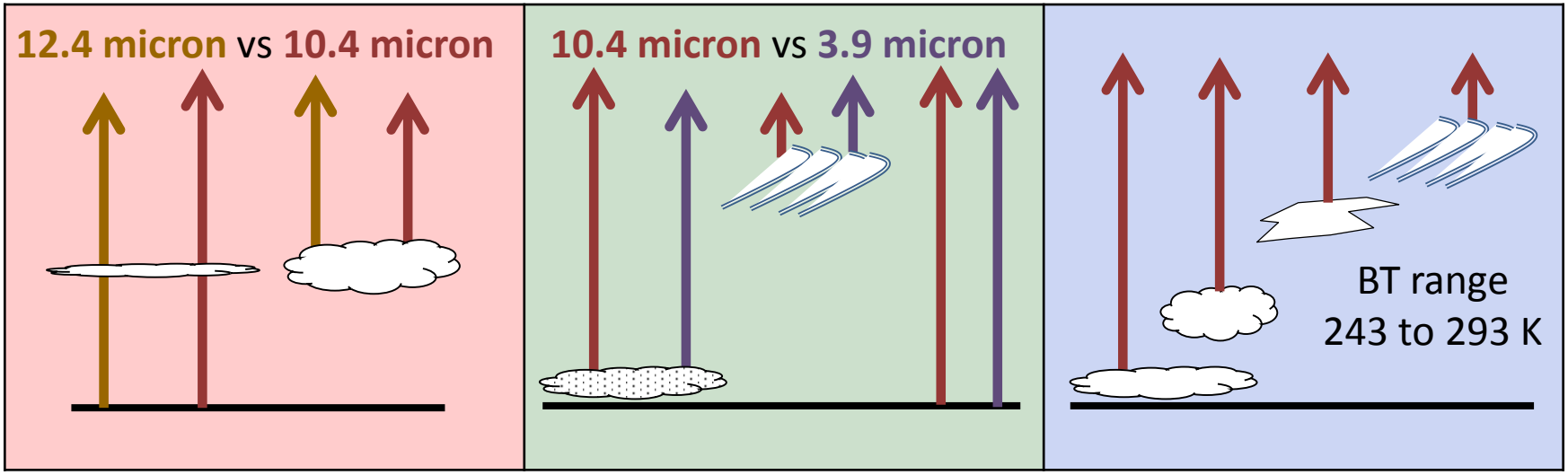
Channel combination recipe of the Night Microphysics RGB

Beam	Channel	Range	Gamma	Gamma 2
Red	IR12.4 – IR10.4	-6.7 … +2.6	1.0	1.0
Green	IR10.4 – NIR3.9	-3.1 … +5.2	1.0	1.0
Blue	IR10.4	+243.6 … +292.4 K	1.0	1.0

Thick clouds = strong red beam

Small water droplet clouds = strong green beam

Low clouds and land / ocean = strong blue beam



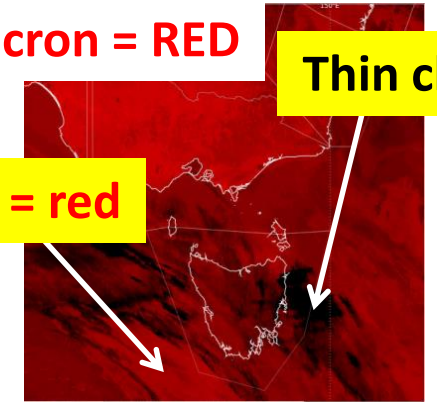
images courtesy JMA/BOM

The Night Microphysics RGB composite as adapted to Himawari-8 data over the southeast Australian region

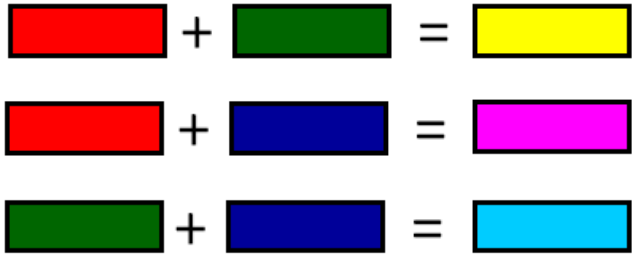
12.4-10.4 micron = RED

Thin clouds = no red

Thick clouds = red

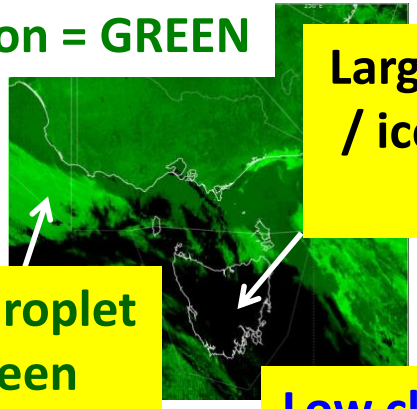


Combining beams



10.4-3.9 micron = GREEN

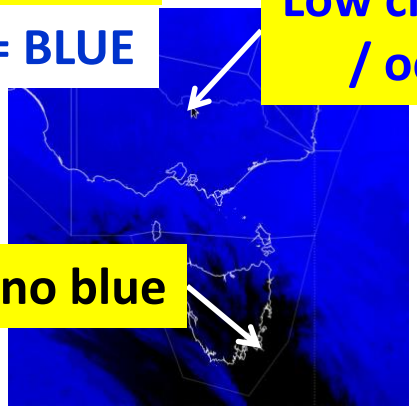
Large water droplet / ice crystal clouds = no green



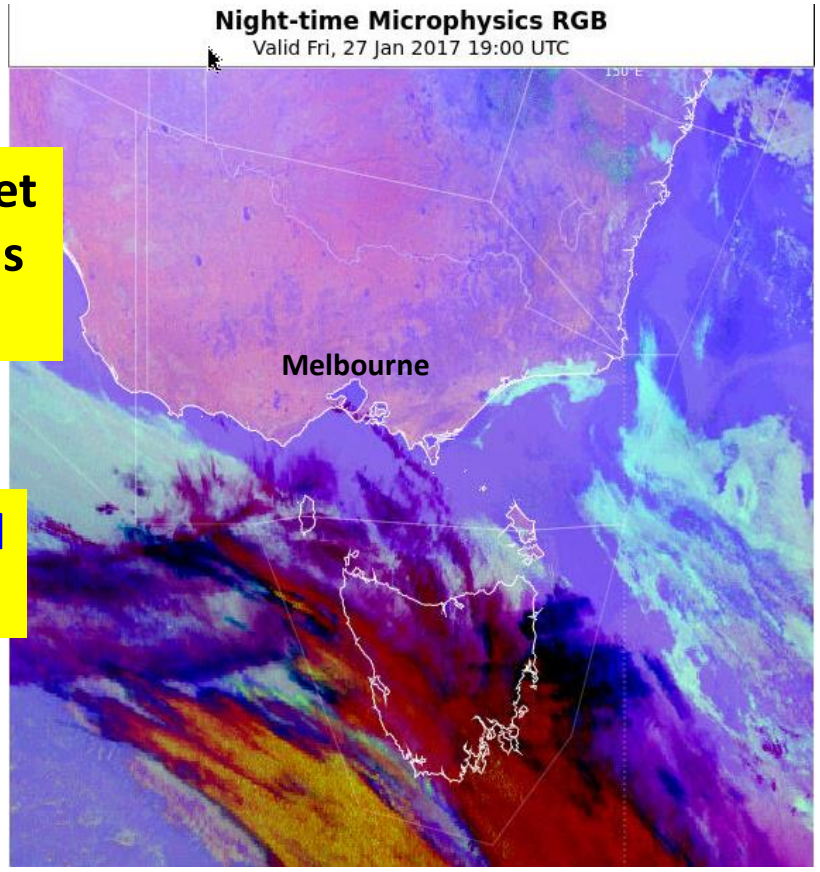
Small water droplet clouds = green

10.4 micron = BLUE

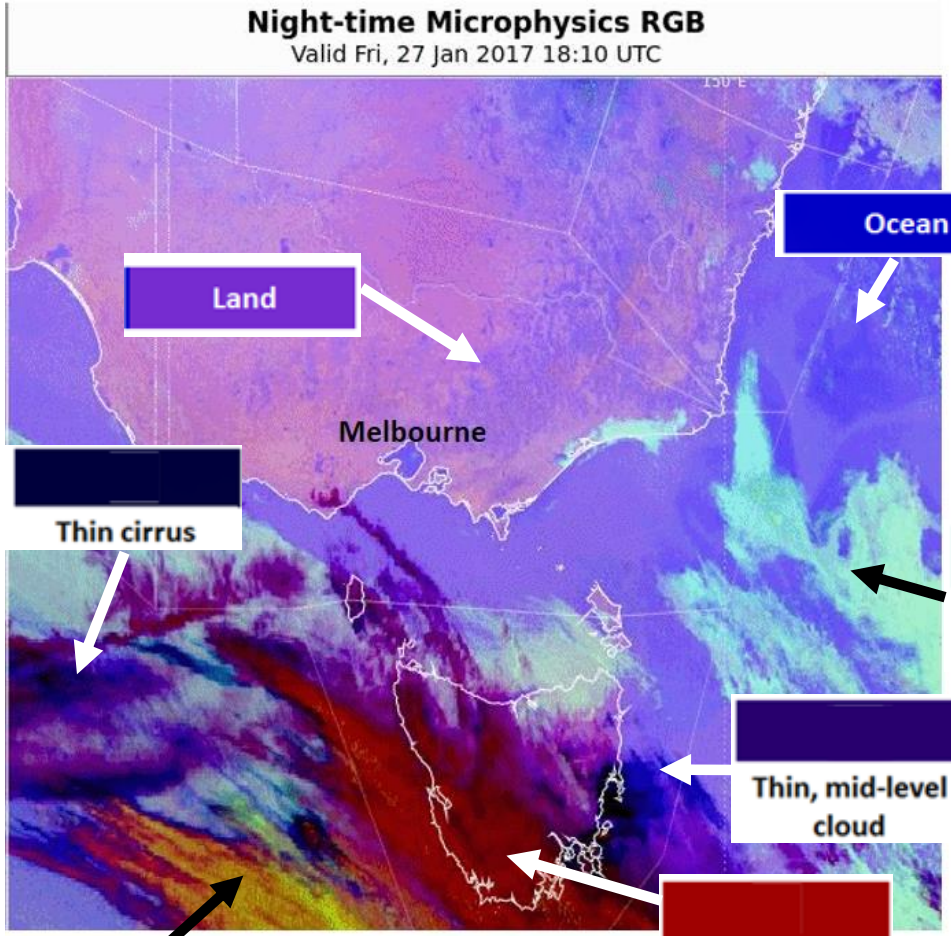
Low clouds and land / ocean = blue



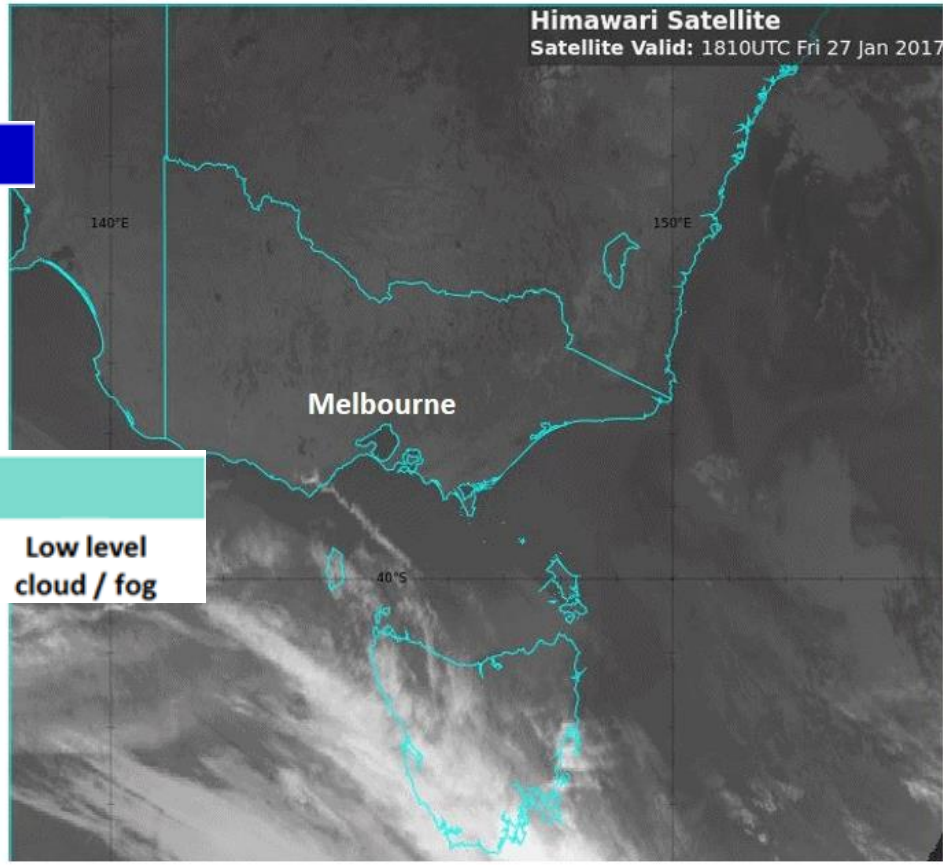
High clouds = no blue



The colour scheme of the Night Microphysics RGB composite



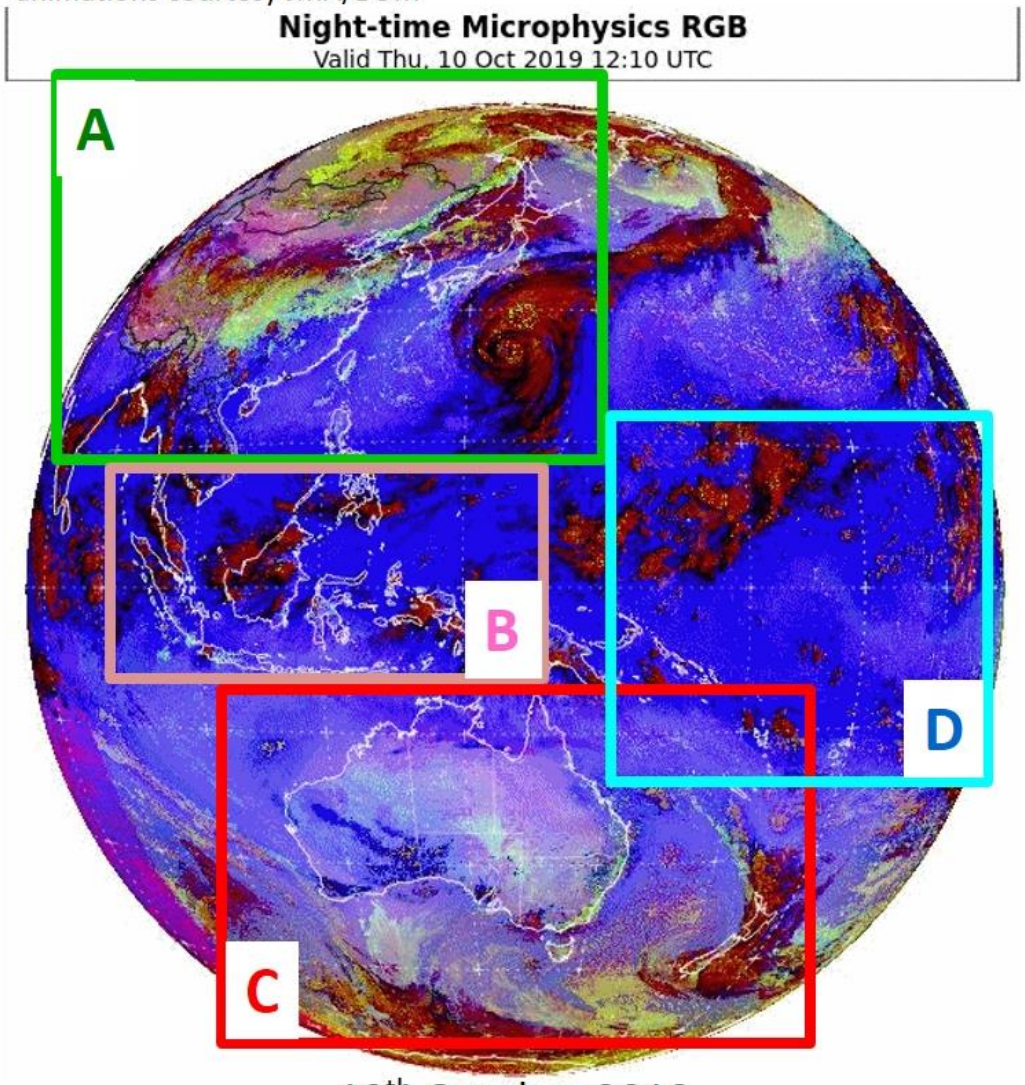
Night Microphysics RGB



Infrared/visible composite

Animation: Over which region(s) is the light blue fog/low cloud signal the clearest? (Socrative Question 4)

animations courtesy JMA/BOM



10th October 2019

- Australia-New Zealand Region
- Indonesian region
- Southwest Pacific
- East Asia

Thick high cloud
Thin Cirrus
Thick mid-level cloud
Thin mid-level cloud

Low cloud/fog (warm)
Low cloud/fog (cold)
Ocean
Land

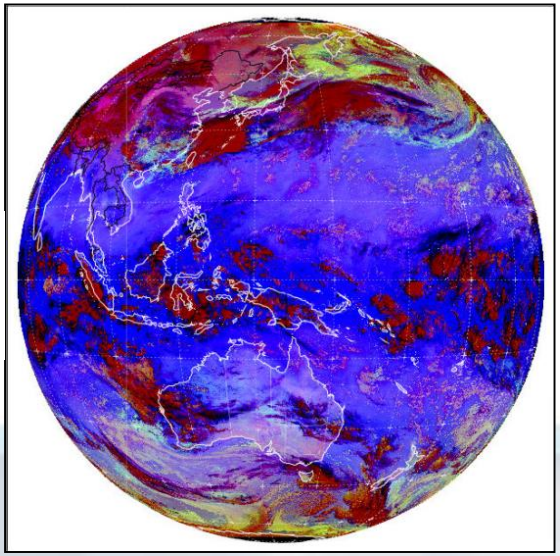
Please start the PowerPoint Slide Show to activate the animations

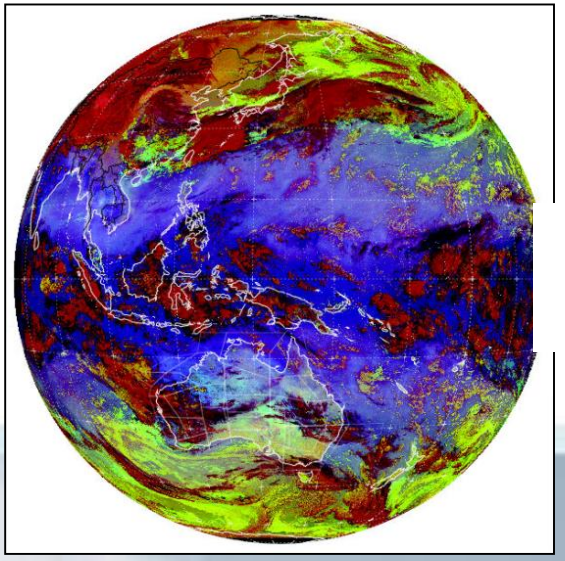
Socrative question 4: Over which region(s) is the light blue fog/low cloud signal the clearest? You can choose more than one option

A. Region A
B. Region B
C. Region C
D. Region D

Tropical and Mid-latitude versions of the Night Microphysics RGB

Mid-latitude version



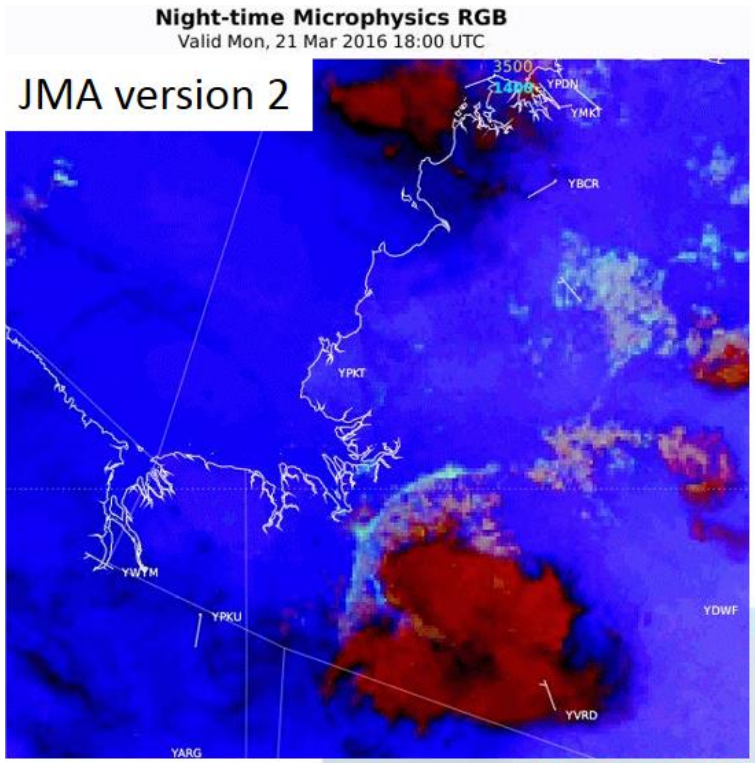


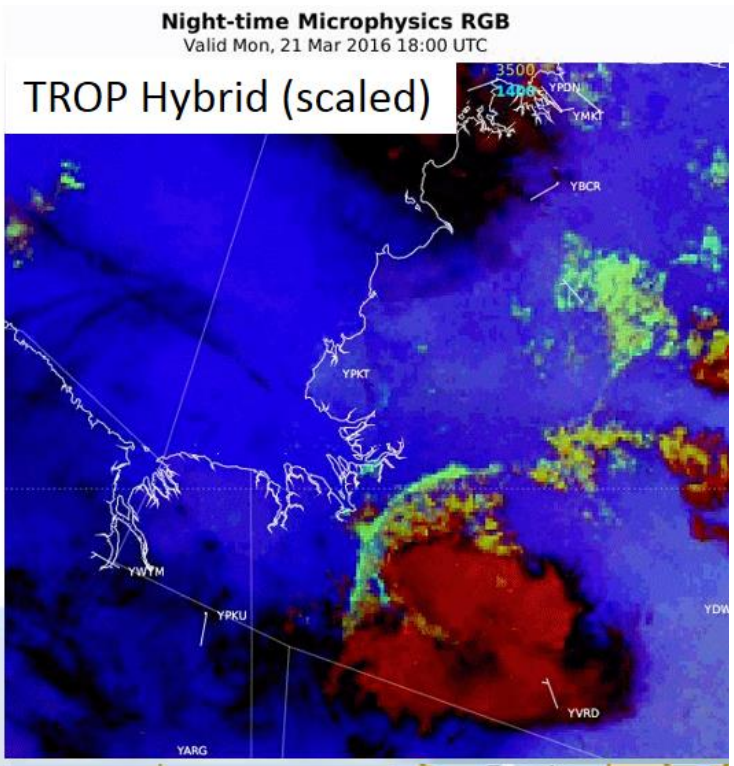
Tropical version

Night-time Microphysics RGB
Valid Sun, 10 Apr 2016 14:00 UTC

Thick high cloud	Thick mid-level cloud	Low cloud/fog (warm)	Ocean
Thin Cirrus	Thin mid-level cloud	Low cloud/fog (cold)	Land

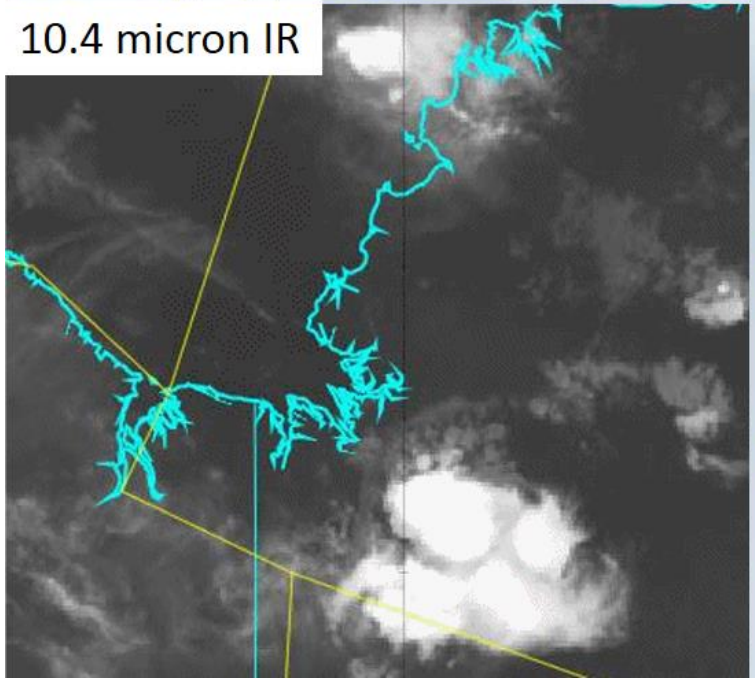
	RED (IR12.0 – IR10.4)	GREEN (IR10.4-NIR3.9)	BLUE (IR10.4)
Midlatitude version (JMA version 2)	-6.7 to 2.6	-3.1 to 5.2	-29.4 to 19.4
Tropical version	-6.7 to 2.6	-3.1 to 2.6	0.6 to 26.4





Comparing Tropical and Midlatitude versions of the Night Microphysics RGB. Northern Territory,

21st March 2016, 18UTC

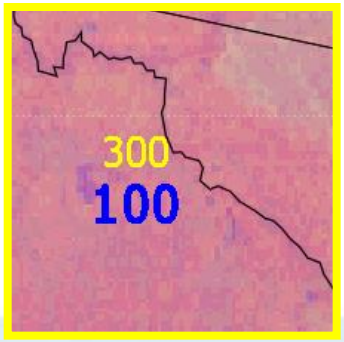


satellite images courtesy BOM/JMA

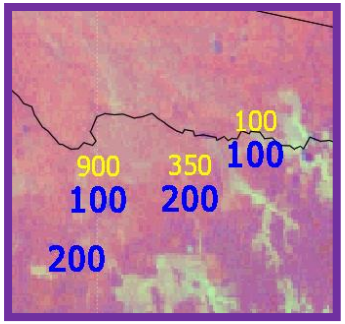
images courtesy JMA/BOM

Limitations in the Night Microphysics RGB composite

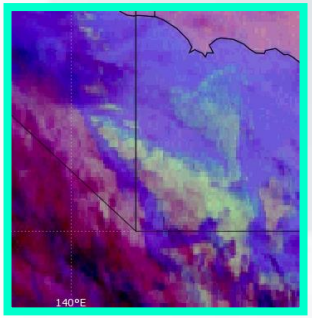
Victoria and Southeast Australia, 22UTC 19th June 2017



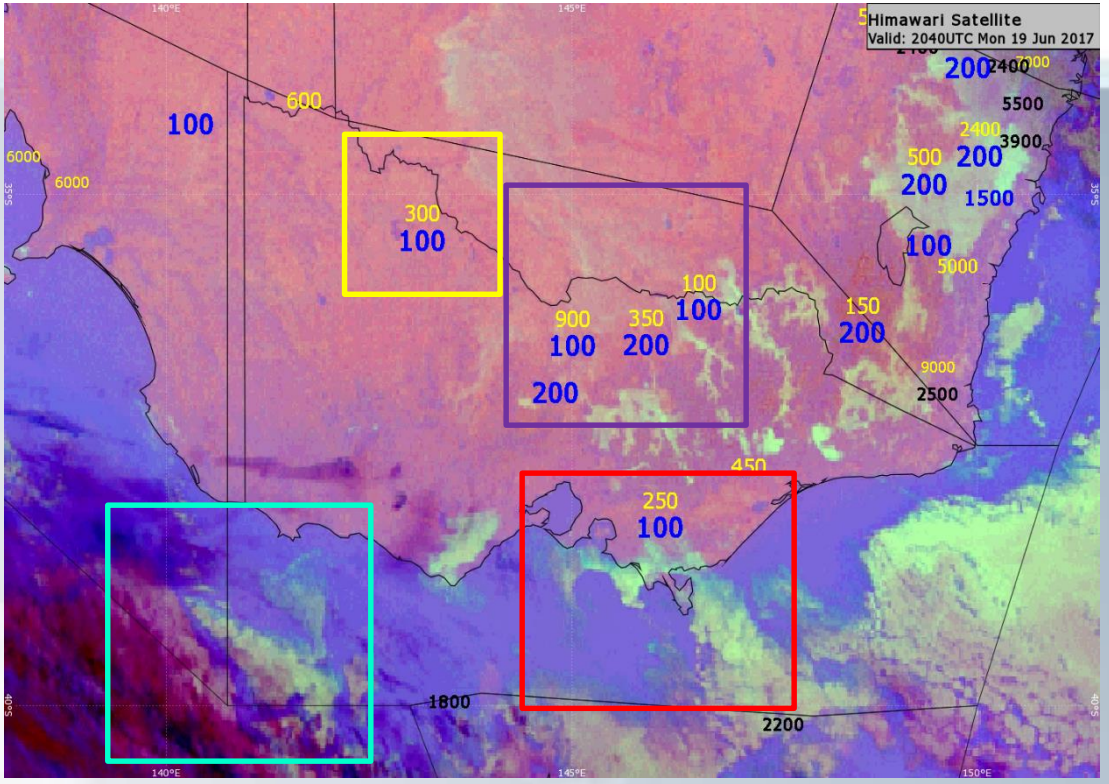
Low cloud, reduced visibility but no signal

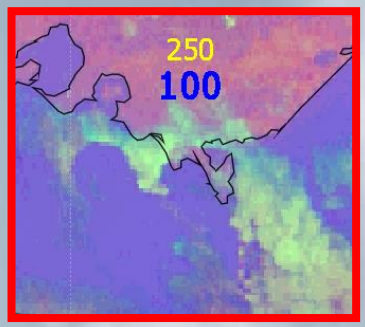


Interpreting various shades of the fog/low cloud signal



low cloud / fog under high cloud





Fog or low cloud over the ocean areas

Australian Government
Bureau of Meteorology

Content of this session

- Introduction to the Socrative cloud based learner response system
- The RGB composites as endorsed by WMO
- The Night Microphysics RGB composite in detail
- Advantages and limitations in using the RGB composites.
- **Some useful resources**

BOM forecaster resource: Night Microphysics RGB

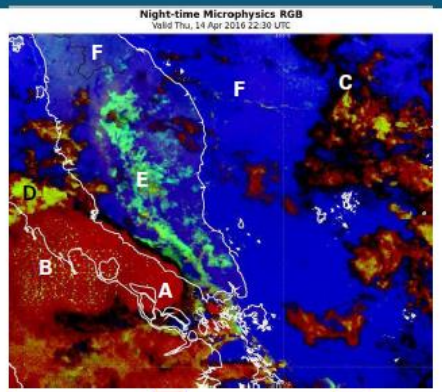
Aviation Forecasters Satellite Quick Reference (7/9)

Night Microphysics RGB - Himawari 8

Tropical Version

Product Use: Nightime fog / low stratus detection and monitoring.
Other (secondary) applications are the detection of fires, low-level moisture boundaries and cloud classification in general. To be used as a guide only.

The breakdown of the **Tropical** Night Microphysics RGB:



A	Thick high cloud.	B	Very cold, thick, high cloud.	C	Thin mid/high level cloud
D	Thick, mid-level cloud.	E	Low level cloud/ fog.	F	Ocean/land

Channel combination - aka The Recipe

Beam	Channel (µm)	Equates to Band (select this in VW)	Range	Gamma
Red	IR 12.4 – IR 10.4	WV 15 - WV 13	-6.7 to 2.6 (K)	1.0
Green	IR 10.4 – IR 3.9	IR 13 - IR 7	-3.1 to 2.6 (K)	1.0
Blue	IR 10.4	IR 13	Tropical: 0.6 to 26.4 (C) **Mid-lat: -29.4 to 19.4 (C)**	1.0

Information courtesy JMA, Bodo Zeschke (bodo.zeschke@bom.gov.au).
Contact James Lannan for corrections (james.lannan@bom.gov.au)
Aviation Weather Services

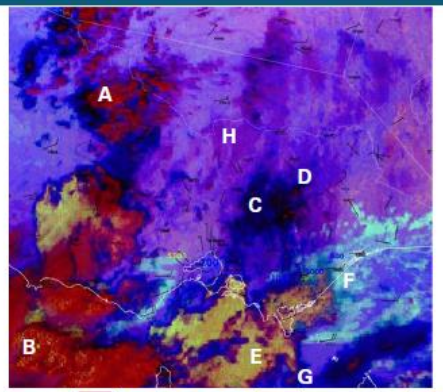
Aviation Forecasters Satellite Quick Reference (8/9)

Night Microphysics RGB - Himawari 8

Mid-latitude Version

Product Use: Nightime fog / low stratus detection and monitoring.
Other (secondary) applications are the detection of fires, low-level moisture boundaries and cloud classification in general. To be used as a guide only.

The breakdown of the **Mid-latitude** Night Microphysics RGB:



A	Thick high cloud.	B	Very cold, thick, high cloud.	C	Thin cirrus	D	Thin, mid level cloud.
E	Thick mid level cloud	F	Low level cloud/ fog	G	Ocean	H	Land

Night Microphysics RGB: Mid-latitude Vs Tropical

The two versions of the Night Microphysics RGB are not actually calculated differently, however due to the large temperature and moisture differences between the Tropics and the Mid-latitudes, the resulting colour representations are tuned slightly differently. For some areas it will be worth consulting both of the products to gain a full insight into a situation.

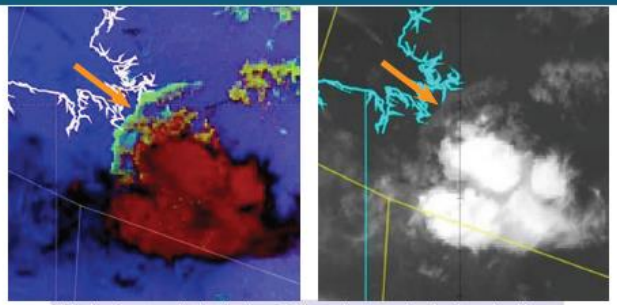
Information courtesy JMA, Bodo Zeschke (bodo.zeschke@bom.gov.au).
Contact James Lannan for corrections (james.lannan@bom.gov.au)
Aviation Weather Services

BOM forecaster resource: Night Microphysics RGB

Aviation Forecasters Satellite Quick Reference (9/9)

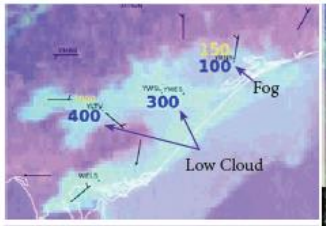
Night Microphysics RGB - Examples

Tropical Examples

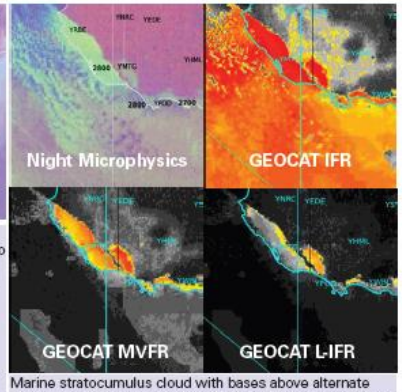


This thunderstorm in the Northern Territory shows no fog, but low cloud in the outflow, not the normal case of use for this RGB, but a good bonus. Notice the difference between looking at the Night Microphysics RGB Vs the IR imagery. This storm occured on the 21/03/2016 at 18:20UTC.

Mid-latitude Examples



Both the YLTV and YMES observations for the 7th January 2017 indicate very low cloud, but no fog, with visibilities remaining above HAM for a majority of the evening. In contrast, although it looks like the same cloud on the night microphysics RGB enhancement (and appears to have the same cloud top), YBNS shows evidence of being in a thick fog event. Notice the slight tinge of pink around YBNS, often the light blue and pink colour corresponds to fog, whereas purely light blue often corresponds to low cloud.



Marine stratocumulus cloud with bases above alternate conditions can masquerade in the fog/low cloud signal with the Night Microphysics product. The GEOCAT product can assist with confirming the possibility of fog and low cloud.

More detailed information can be found on the Himawari-8Training Page: http://www.virtuallab.bom.gov.au/training/hw-8-training/introduction-resources-and-case-studies/

Aviation Forecasters Satellite Quick Reference (8/9)

Night Microphysics RGB - Himawari 8

Mid-latitude Version

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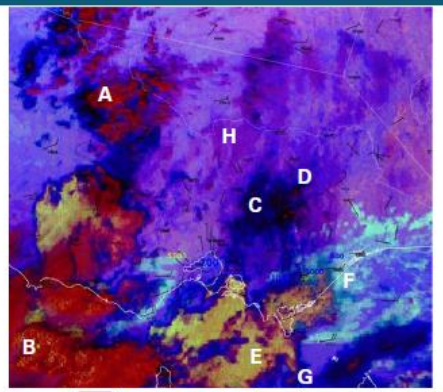

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Night Microphysics RGB: Mid-latitude Vs Tropical

The two versions of the Night Microphysics RGB are not actually calculated differently, however due to the large temperature and moisture differences between the Tropics and the Mid-latitudes, the resulting colour representations are tuned slightly differently. For some areas it will be worth consulting both of the products to gain a full insight into a situation.

Information courtesy JMA, Bodo Zeschke (bodo.zeschke@bom.gov.au).
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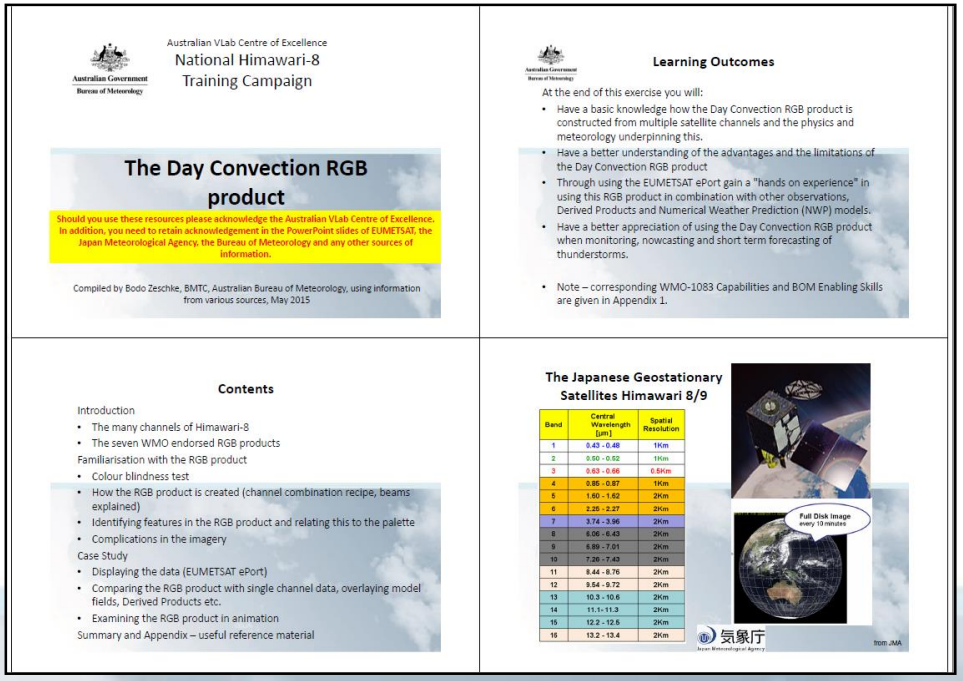
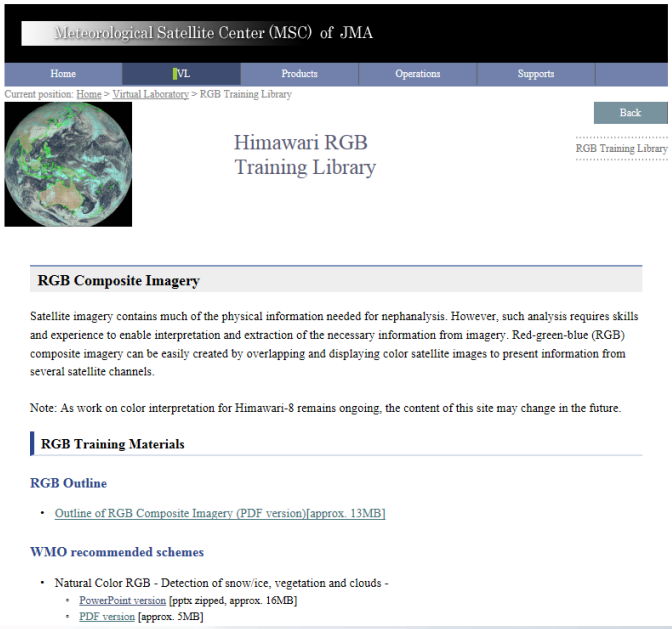
Aviation Weather Services

Accessing RGB resources

Australian VLab Centre of Excellence web page

http://www.virtuallab.bom.gov.au/training/hw-8-training/introduction-resources-and-case-studies/



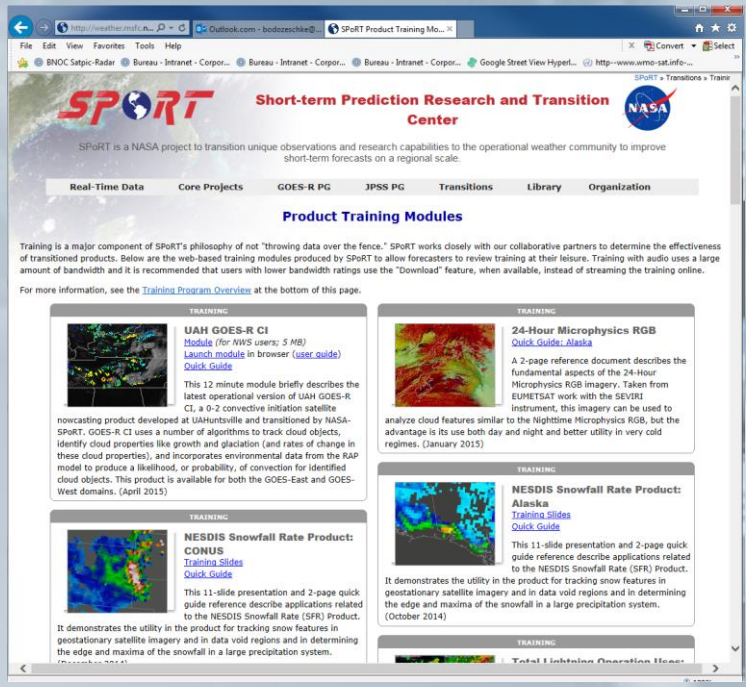


JMA User's Guide to RGB composite imagery (Himawari RGB Training Library)

http://www.data.jma.go.jp/mscweb/en/VRL/VLab_RGB/RGBimage.html

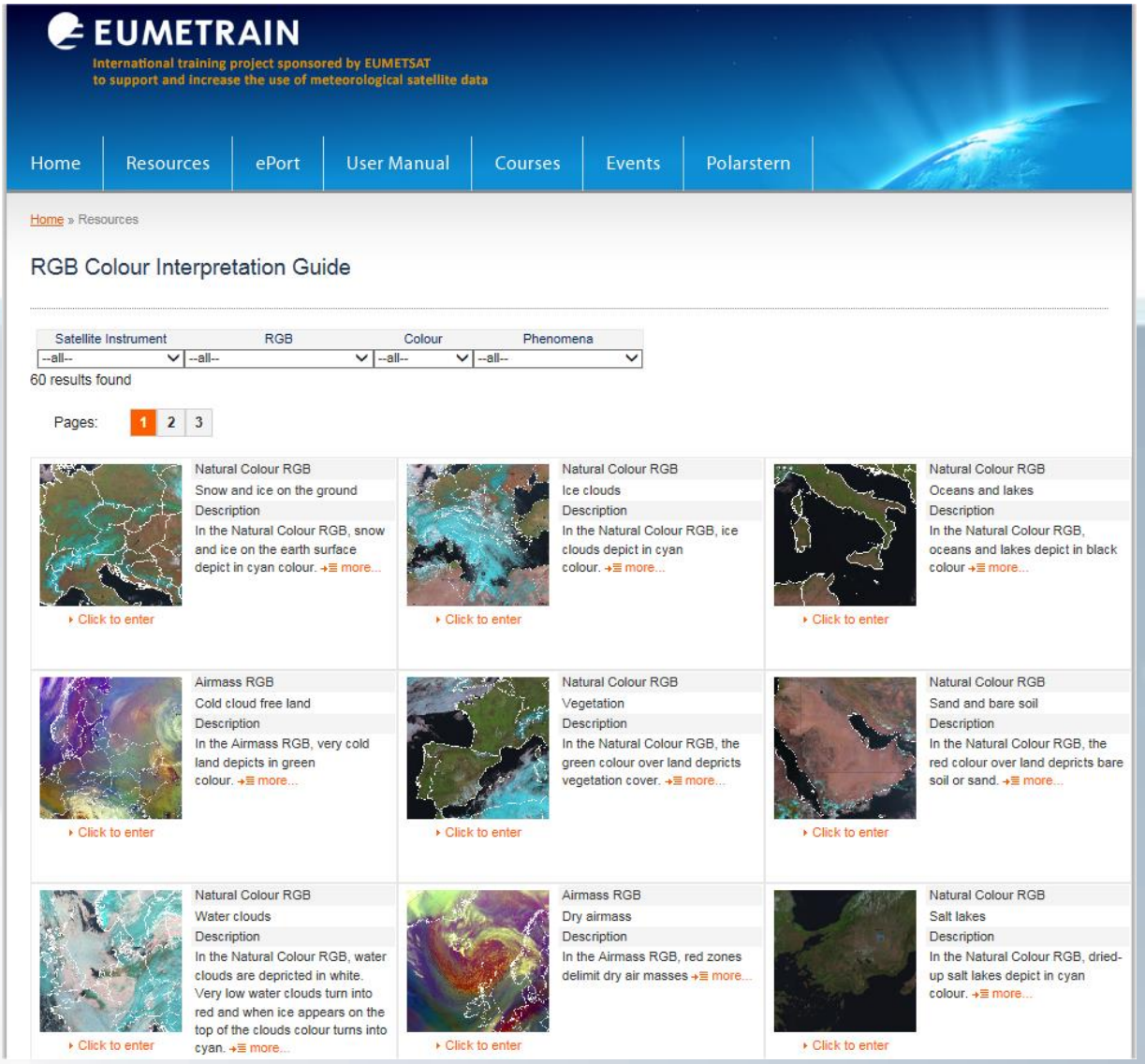
NASA Short-term Prediction Research and Transition Center (SPORT) Training

http://weather.msfc.nasa.gov/sport/training/



Very useful website for reference – the EUMETRAIN RGB Colour Interpretation Guide

http://www.eumetrain.org/RGBguide/rgbs.html



Socrative question 5: Do you have any RGB composite resources that you would like to advertise to your colleagues? Please give details, including web links below

Write your answer into the space provided

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Content of this session

The Socrative cloud-based learner response system has been introduced, we have gained practical experience in the use of this.

- The RGB composites as endorsed by WMO have been introduced, including the Night Microphysics RGB.
- We have summarised the advantages and limitations in using the Night Microphysics RGB composite.
- We have shown some online resources pertaining to RGB composites.