



Australian Government

Bureau of Meteorology



Himawari-8 derived RGB products applied to the Australasia-Pacific region

AOMSUC-6 Training Event

Bodo Zeschke

Australian Bureau of Meteorology Training Centre

Australian VLab Centre of Excellence

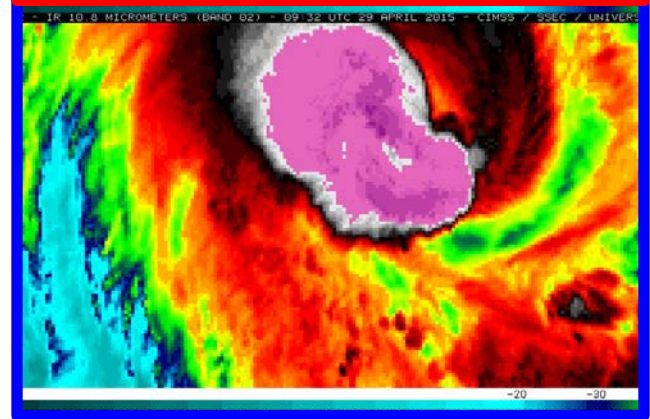
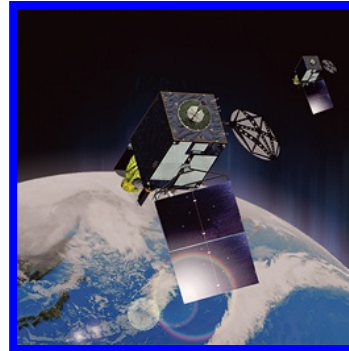
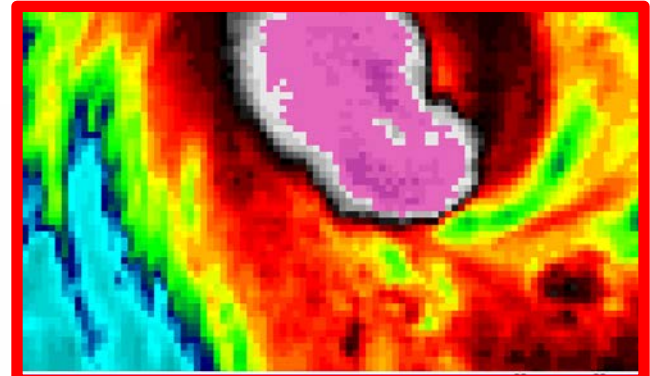
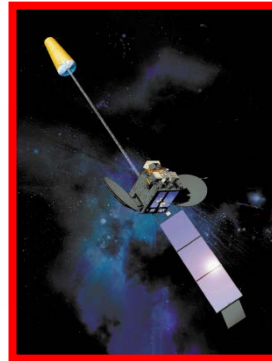


Content

- During this session the WMO/EUMETSAT endorsed RGB products will be briefly introduced.
- We will compare RGB products generated from Himawari-8 data with equivalent METEOSAT RGB products.
- We will examine the suitability and limitations of Himawari-8 RGB products across the Australasia-Pacific region utilising a number of case studies.
- To give attendees a better understanding of this topic there will be some practical exercises during the session.
- Useful resources and references will also be presented.

Comparing Himawari 8/9 with **MTSAT-2**

MTSAT 2



Himawari 8

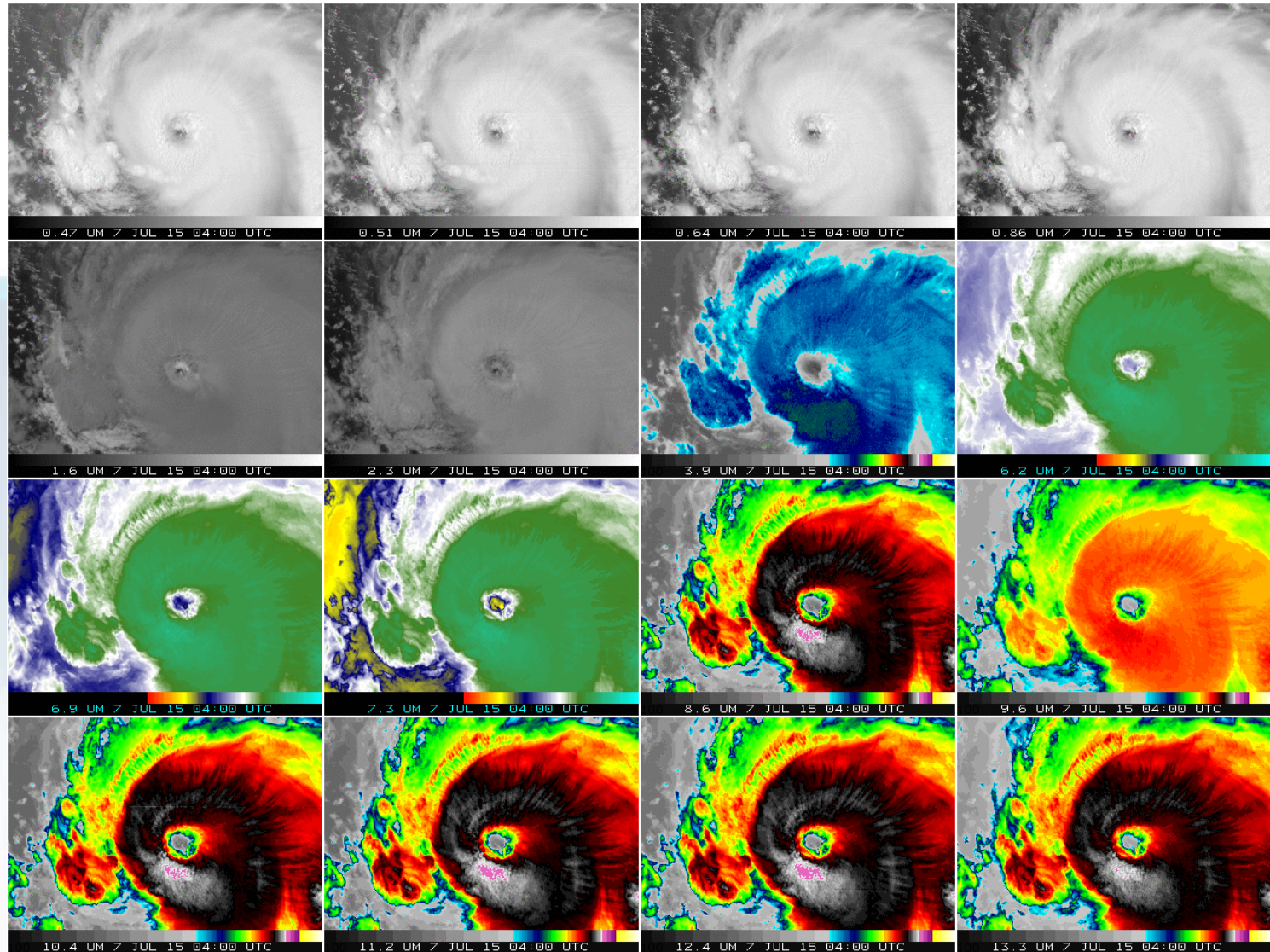
| Band | Central Wavelength [μm] | Spatial Resolution |
|------|-------------------------|--------------------|
| 1 | 0.43 - 0.48 | 1Km |
| 2 | 0.50 - 0.52 | 1Km |
| 3 | 0.63 - 0.66 | 0.5Km |
| 4 | 0.85 - 0.87 | 1Km |
| 5 | 1.60 - 1.62 | 2Km |
| 6 | 2.25 - 2.27 | 2Km |
| 7 | 3.74 - 3.96 | 2Km |
| 8 | 6.06 - 6.43 | 2Km |
| 9 | 6.89 - 7.01 | 2Km |
| 10 | 7.26 - 7.43 | 2Km |
| 11 | 8.44 - 8.76 | 2Km |
| 12 | 9.54 - 9.72 | 2Km |
| 13 | 10.3 - 10.6 | 2Km |
| 14 | 11.1- 11.3 | 2Km |
| 15 | 12.2 - 12.5 | 2Km |
| 16 | 13.2 - 13.4 | 2Km |

| Band | Central Wavelength [μm] | Spatial Resolution |
|------|-------------------------|--------------------|
| 1 | 0.55 - 0.90 | 1Km |
| 2 | 3.50 - 4.00 | 4Km |
| 3 | 6.50- 7.00 | 4Km |
| 4 | 10.3 - 11.3 | 4Km |
| 5 | 11.5 - 12.5 | 4Km |

The 16 channels of Himawari-8: Typhoon Nangka

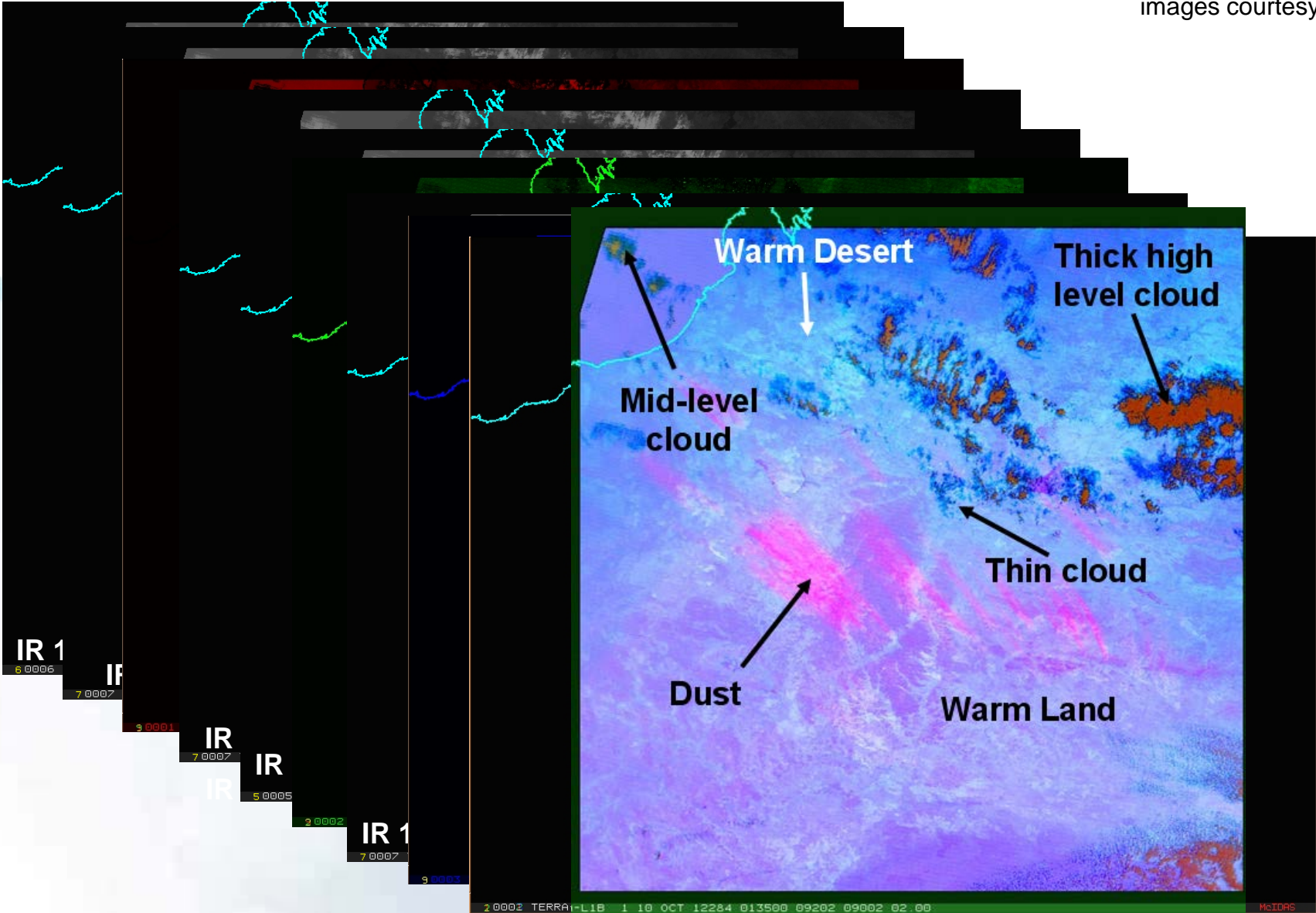
7 July 2015 0400 – 0810UTC

animations courtesy JMA, from the CIMSS Himawari-8 Blog web page



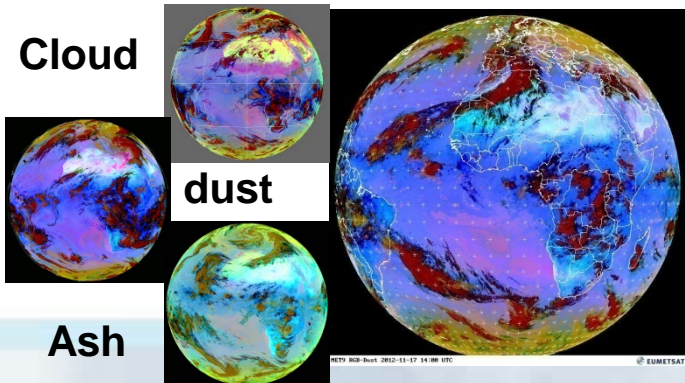
Combining channels into RGB products – the Dust RGB product (NW Australia, 10 October 2012, MODIS data)

images courtesy JMA/BOM

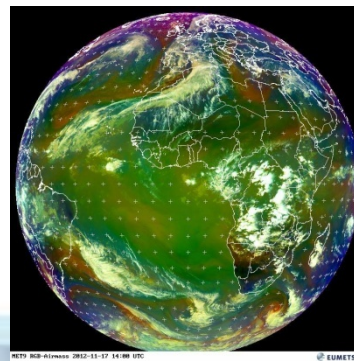


RGB products for Operational Forecasting – EUMETSAT / WMO recommendation

Two RGB composites which complement each other



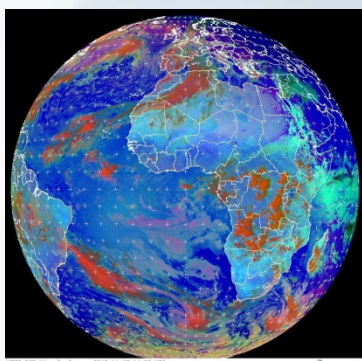
24 hour Microphysical RGB



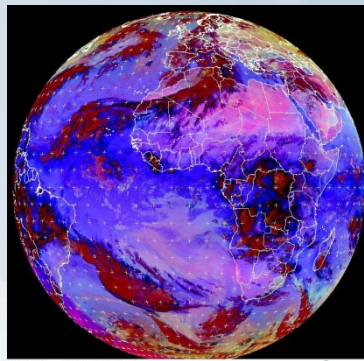
Airmass RGB

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

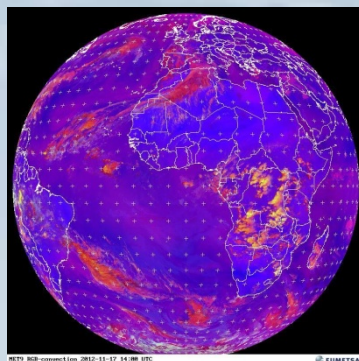
Five application specific RGBs



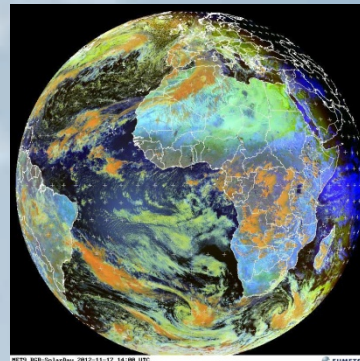
Day
Microphysical
RGB



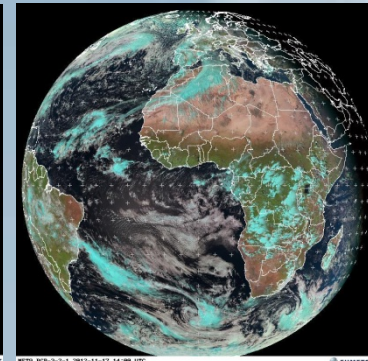
Night
Microphysical
RGB



Day
Convection
RGB



Snow / fog
RGB



Natural
Colours RGB

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/>



RGB Composite Imagery

Satellite imagery contains much of the physical information needed for nephanalysis. However, such analysis requires skills and experience to enable interpretation and extraction of the necessary information from imagery. Red-green-blue (RGB) composite imagery can be easily created by overlapping and displaying color satellite images to present information from several satellite channels.

Note: As work on color interpretation for Himawari-8 remains ongoing, the content of this site may change in the future.

RGB Training Materials

RGB Outline

- [Outline of RGB Composite Imagery \(PDF version\)](#) [approx. 13MB]

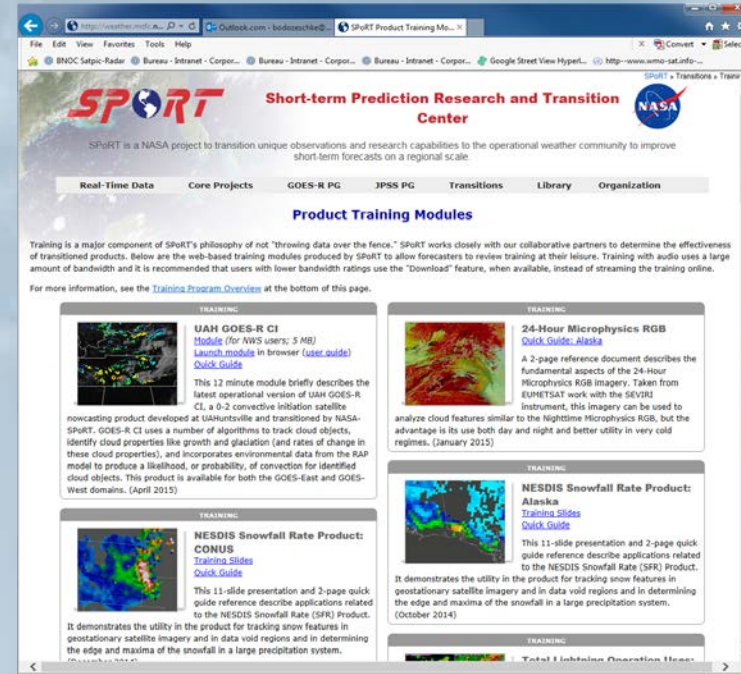
WMO recommended schemes

- Natural Color RGB - Detection of snow/ice, vegetation and clouds -
 - [PowerPoint version](#) [pptx zipped, approx. 16MB]
 - [PDF version](#) [approx. 5MB]

JMA User's Guide to RGB composite imagery (Himawari RGB Training Library)
http://www.data.jma.go.jp/mscweb/en/VR/RL/VLab_RGB/RGBimage.html

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

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



Australian Vlab Centre of Excellence
National Himawari-8
Training Campaign

The Day Convection RGB product

Should you use these resources please acknowledge the Australian Vlab Centre of Excellence. In addition, you need to remain acknowledge the Australian Vlab Centre of Excellence, the Japan Meteorological Agency, the Bureau of Meteorology and any other sources of information.

Compiled by Bodo Zeschke, BMTC, Australian Bureau of Meteorology, using information from various sources, May 2015

Learning Outcomes

At the end of this exercise you will:

- Have a basic knowledge how the Day Convection RGB product is constructed from multiple satellite channels and the physics and meteorology underpinning this.
- Have a better understanding of the advantages and the limitations of the Day Convection RGB product
- Through using the EUMETSAT ePort gain a "hands on experience" in using this RGB product in combination with other observations, Derived Products and Numerical Weather Prediction (NWP) models.
- Have a better appreciation of using the Day Convection RGB product when monitoring, nowcasting and short term forecasting of thunderstorms.
- Note – corresponding WMO-1083 Capabilities and BOM Enabling skills are given in Appendix 1.

Contents

Introduction

- The many channels of Himawari-8
- The seven WMO endorsed RGB products

Familiarisation with the RGB product

- Colour blindness test
- How the RGB product is created (channel combination recipe, beams explained)
- Identifying features in the RGB product and relating this to the palette
- Complications in the imagery

Case Study

- Displaying the data (EUMETSAT ePort)
- Comparing the RGB product with single channel data, overlaying model fields, Derived products etc.
- Examining the RGB product in animation

Summary and Appendix – useful reference material

The Japanese Geostationary Satellites Himawari 8/9

| Beam | Central Wavelength (nm) | Spatial Resolution |
|------|-------------------------|--------------------|
| 1 | 2.43 - 2.48 | 50km |
| 2 | 3.50 - 3.52 | 50km |
| 3 | 3.63 - 3.66 | 0.5km |
| 4 | 3.65 - 3.67 | 50km |
| 5 | 3.70 - 3.72 | 20km |
| 6 | 3.74 - 3.76 | 20km |
| 7 | 3.74 - 3.76 | 20km |
| 8 | 3.90 - 3.93 | 20km |
| 9 | 3.93 - 3.95 | 20km |
| 10 | 3.95 - 3.97 | 20km |
| 11 | 3.98 - 4.00 | 20km |
| 12 | 3.98 - 4.00 | 20km |
| 13 | 3.98 - 4.00 | 20km |
| 14 | 3.98 - 4.00 | 20km |
| 15 | 3.98 - 4.00 | 20km |
| 16 | 3.98 - 4.00 | 20km |

Full Disk Image

気象庁
JMA







Accessing RGB resources on the Australian Vlab Centre of Excellence Web page

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

Red-Green-Blue (RGB) Product reference information.


In response to the stakeholder feedback during Phase 1 of the Campaign, below are easy-to-use resources pertaining to the RGB products. These .pdf files include:

- How the RGB products are constructed
- Uses and limitations of the products.
- EUMETSAT ePort exercises for you to try in order to gain familiarisation with the products.

| | | |
|--|--|--|
|  Dust RGB |  Ash RGB |  Airmass RGB |
|  Additional RGB (to be added) |  Night Microphysics RGB |  Day Convection RGB |

A very useful and relevant Himawari-8 RGB Composite Imagery resource from the Japan Meteorological Agency

- **RGB product reference .pdf files for easy Forecaster reference.**
- **Most include EUMETSAT ePort exercise.**




Australian VLab Centre of Excellence
National Himawari-8
Training Campaign

The Day Convection RGB product

Should you use these resources please acknowledge the Australian VLab Centre of Excellence. In addition, you need to retain acknowledgement in the PowerPoint slides of EUMETSAT, the Japan Meteorological Agency, the Bureau of Meteorology and any other sources of information.

Compiled by Bodo Zeschke, BMTC, Australian Bureau of Meteorology, using information from various sources, May 2015



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- Identifying features in the RGB product and relating this to the palette
- Complications in the imagery


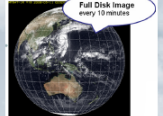
Case Study

- Displaying the data (EUMETSAT ePort)
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| 7 | 3.74 - 3.96 | 2km |
| 8 | 6.06 - 6.43 | 2km |
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| 14 | 11.1 - 11.3 | 2km |
| 15 | 12.2 - 12.5 | 2km |
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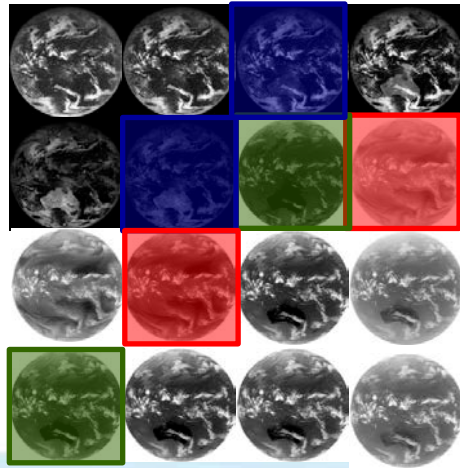



Full Disk Image every 10 minutes

from JMA

Note: JMA and NASA SPORT also has these RGB reference resources





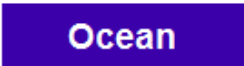

Processing of Himawari-8 data – Day Convection RGB



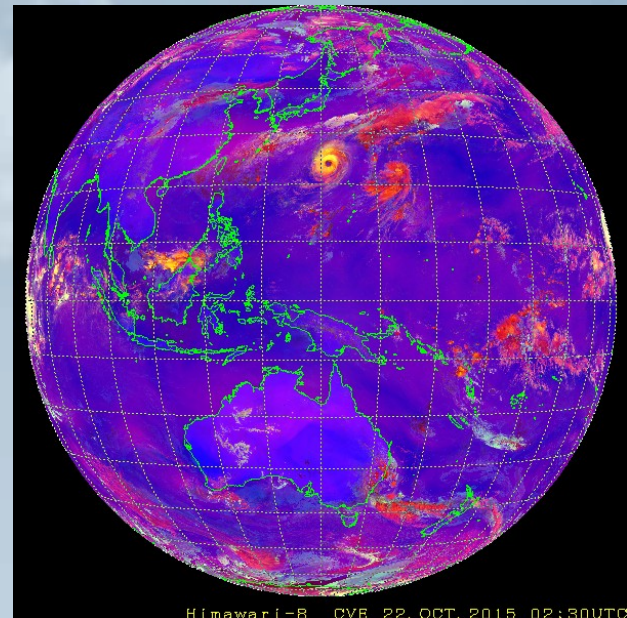
| Recommended Range and Enhancement | | | | |
|-----------------------------------|-----------------|-------------|-------|---------|
| Beam | Channel | Range | Gamma | Gamma 2 |
| Red | WV6.2 – WV7.3 | -35 ... +5 | 1.0 | 1.0 |
| Green | IR3.9 – IR10.8 | -5 ... +60 | 0.5 | 1.0 |
| Blue | NIR1.6 – VIS0.6 | -75 ... +25 | 1.0 | 1.0 |

Channel combination "recipe" (from EUMETSAT)

Himawari-8 channels

| | |
|---|---|
|  |  |
| Thick high level cloud Large ice particles | Cb cloud with strong updrafts Small ice particles |
|  |  |
| Thin Cirrus cloud (large ice particles) | Thin Cirrus cloud (small ice particles) |
|  |  |
| Ocean | Land |

Colour interpretation palette

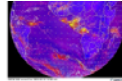


Day Microphysics RGB product

Other information on each RGB web resource page

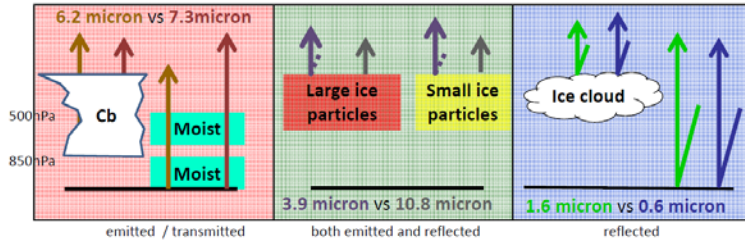
Physics of the RGB product

Convection RGB
(For more details see Appendix 2)



Recommended Range and Enhancement

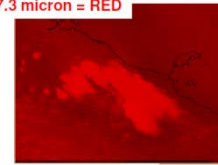
| Beam | Channel | Range | Gamma | Gamma 2 |
|-------|-----------------|-------------|-------|---------|
| Red | WV6.2 – WV7.3 | -35 ... +5 | 1.0 | 1.0 |
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| Blue | NIR1.6 – VIS0.6 | -75 ... +25 | 1.0 | 1.0 |



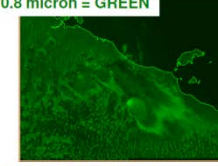
The beams composing the RGB product

| Recommended Range and Enhancement | | | | | |
|-----------------------------------|-----------------|-------------|-------|---------|--|
| Beam | Channel | Range | Gamma | Gamma 2 | |
| Red | WV6.2 – WV7.3 | -35 ... +5 | 1.0 | 1.0 | |
| Green | IR3.9 – IR10.8 | -5 ... +60 | 0.5 | 1.0 | |
| Blue | NIR1.6 – VIS0.6 | -75 ... +25 | 1.0 | 1.0 | |

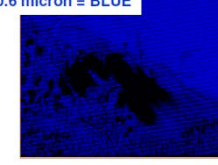
6.2-7.3 micron = RED



3.9-10.8 micron = GREEN



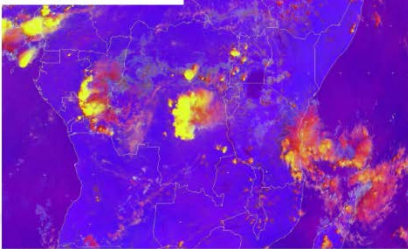
1.6-0.6 micron = BLUE



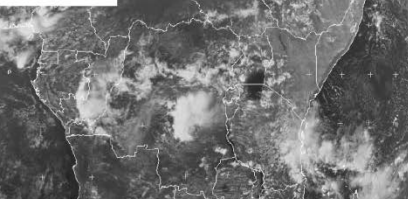
Gulf Country, Queensland
1 November 2009 0435 UTC

images courtesy JMA / BOM

Day Convection RGB product



0.6 micron visible



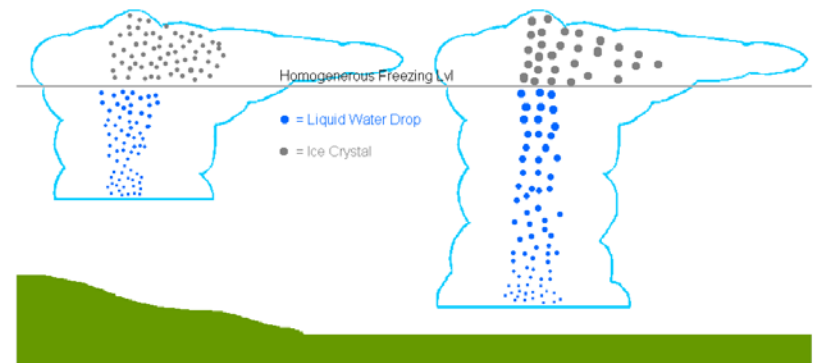
Day Convection RGB product compared to the visible channel – please annotate features

| | |
|--|---|
| | |
| Deep precipitating cloud (precip. not necessarily reaching the ground) | Deep precipitating cloud (Cb cloud with strong updrafts and severe weather) |
| - high-level cloud | - Or thick, high-level lee cloudiness with small ice particles |
| - large ice particles | |
| | |
| Thin Cirrus cloud (large ice particles) | Thin Cirrus cloud (small ice particles) |
| | |
| Ocean | Land |

Central Africa

Limitations in the Day Convection RGB product

„Cloud Depth“ Effect



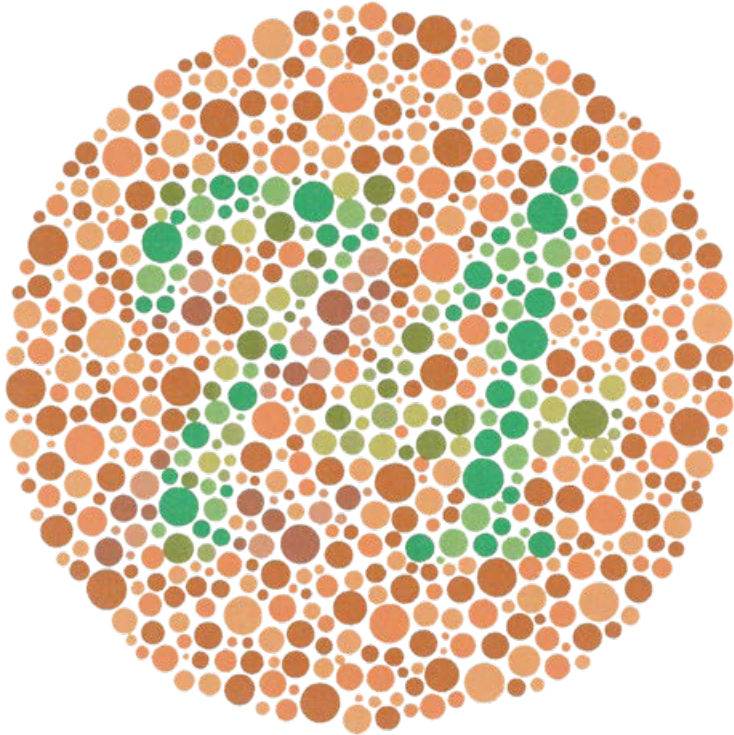
This idea follows from results from multiple papers by D. Rosenfeld, and Heymsfield et al. (2005)

Comparison with other satellite data

Limitations in the RGB product

Limitations – people who cannot sense colour

image courtesy Wikipedia



Question: What number can you see within the above pattern?

A:21 B:74 C: 47

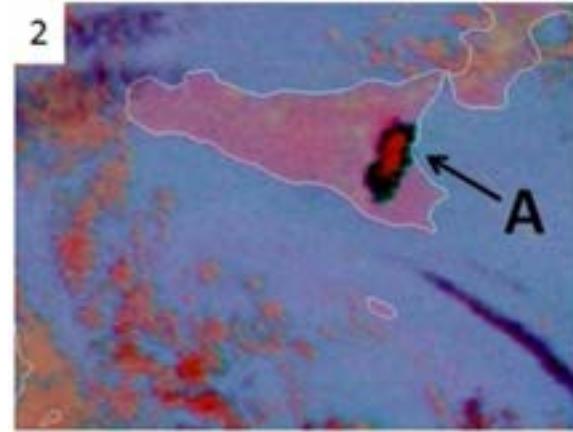


image courtesy BOM/JMA

Question 10
Incorrect
Mark 0.00 out of 1.00
Remove flag

Images from EUMETSAT

| | | | |
|---------------------|---------------------|--------------------------------|------------------------------|
| | | | |
| Volcanic SO2 clouds | Volcanic Ash clouds | Cold, thick, high-level clouds | Thin Cirrus clouds Contrails |

Examine the following scenes in the Ash RGB product showing the eruption of Etna volcano in Sicily, Italy on the 5th January 2012. What does the red signal annotated by (A) correspond to? (select one)

Select one:

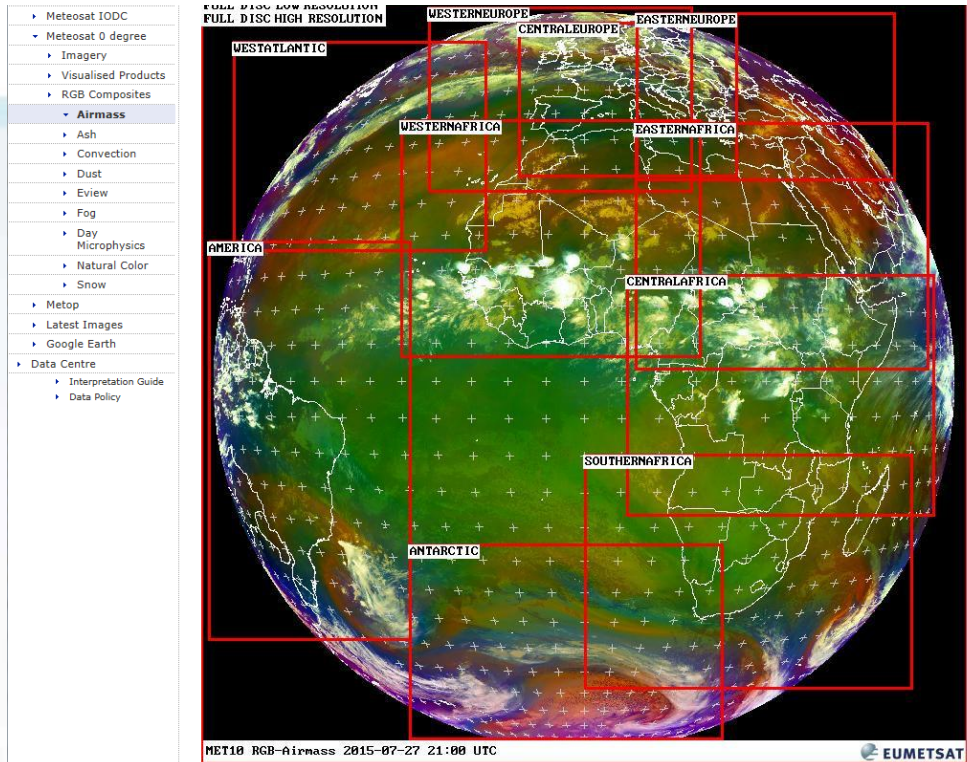
- a. This is not the volcanic eruption at all, it is actually a Cb cloud generated by topography. The main volcanic eruption occurred later that day.
- b. It is most likely the thick volcanic ash cloud possibly coated with ice.
- c. According to the colour palette it is clearly thin cirrus cloud with the surface of the earth showing through in red in the centre of this cloud.
- d. The volcanic ash cloud as shown in the Ash RGB product palette **X** Please check the notes pertaining to the Ash RGB product in the "Red-Green-Blue (RGB) Product reference information" section on the National Himawari-8 Training Campaign web page.

Particular web pages for comparing Himawari-8 with METEOSAT-10 RGB products

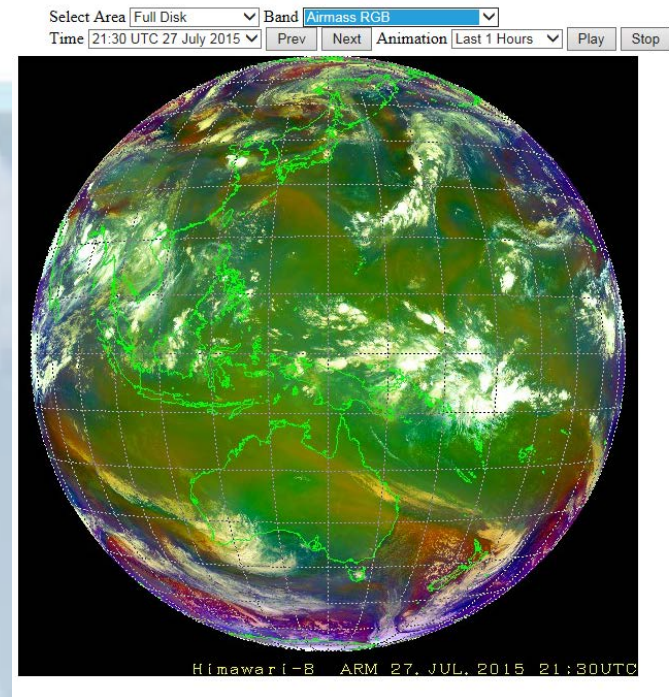
Eumetsat RGB Composites

<http://oiswww.eumetsat.org/IPPS/html/MSG/RGB/>

METEOSAT-10



Himawari-8



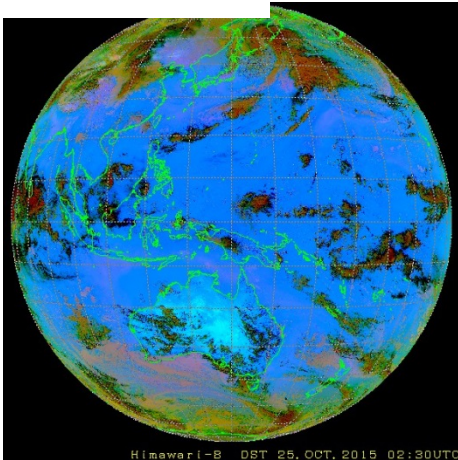
JMA RGB Composites

http://ds.data.jma.go.jp/mscweb/data/himawari/sat_img.php?area=fd_

Exercise 1: RGB products from Himawari-8 and Meteosat-10

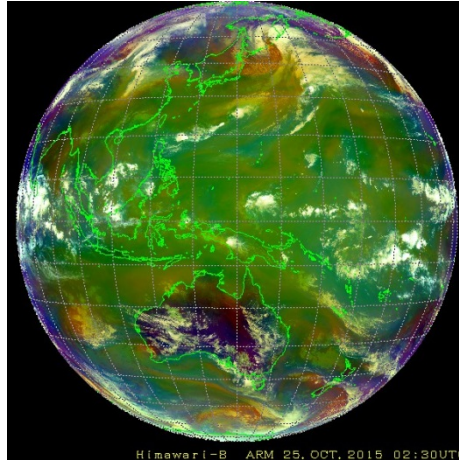
Himawari-8

images courtesy JMA



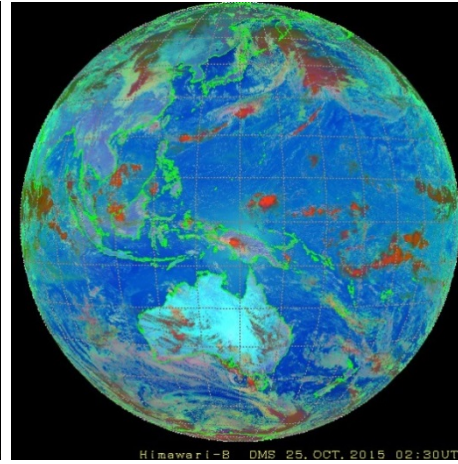
Himawari-8 DST 25.OCT.2015 02:30UTC

A: Dust RGB



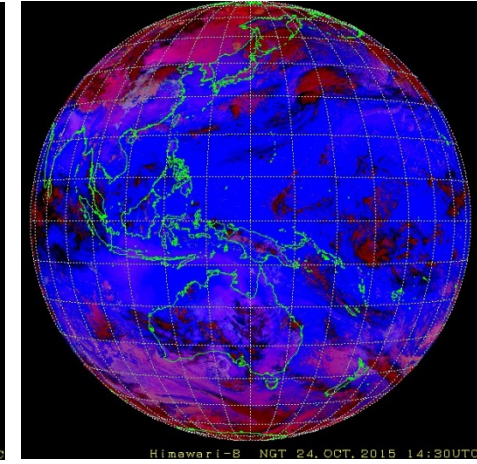
Himawari-8 ARM 25.OCT.2015 02:30UTC

B: Airmass RGB



Himawari-8 DMS 25.OCT.2015 02:30UTC

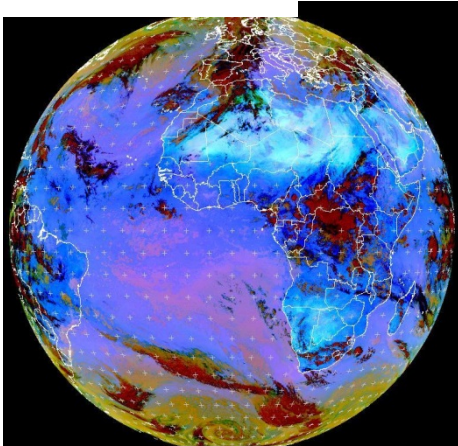
C: Day Microphysics
RGB



Himawari-8 NGT 24.OCT.2015 14:30UTC

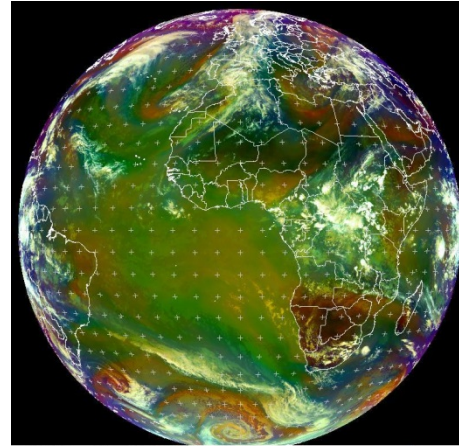
D: Night Microphysics
RGB

METEOSAT-10



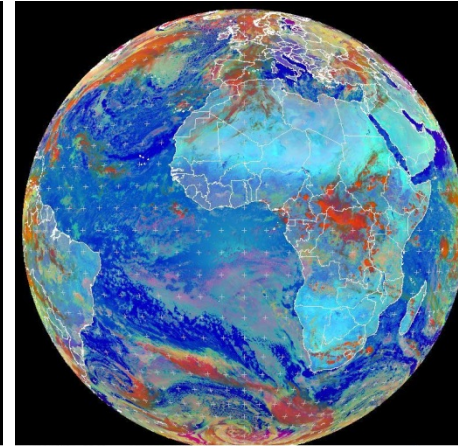
RET10 RGB-Dust 2015-10-24 12:00 UTC

EUMETSAT



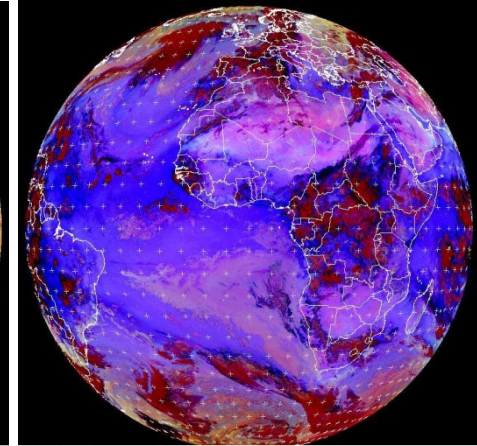
RET10 RGB-Airmass 2015-10-24 12:00 UTC

EUMETSAT



RET10 RGB-Microphysics 2015-10-24 12:00 UTC

EUMETSAT



RET10 RGB-Fog 2015-10-25 00:00 UTC

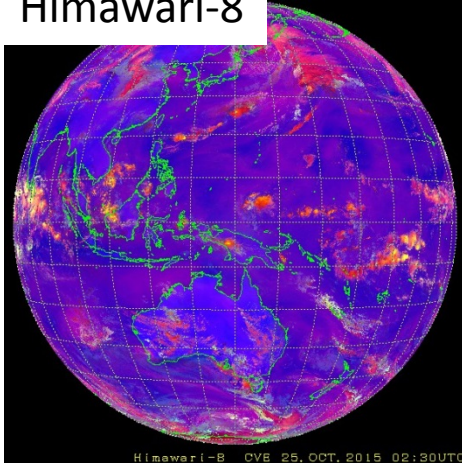
EUMETSAT

images courtesy EUMETSAT

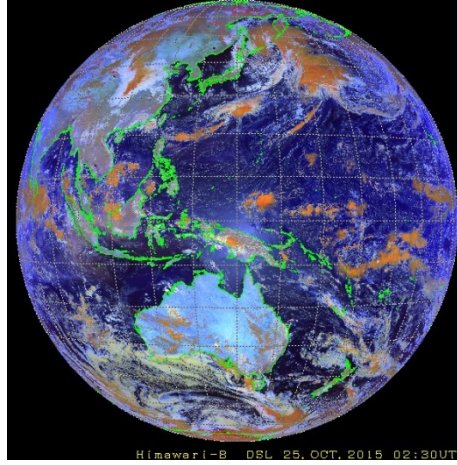
Question: which of these Himawari-8 RGB products require the greatest adjustment?
Rank from 1 (most adjustment) to 4 (least adjustment)

Exercise 2: RGB products from Himawari-8 and Meteosat-10

Himawari-8

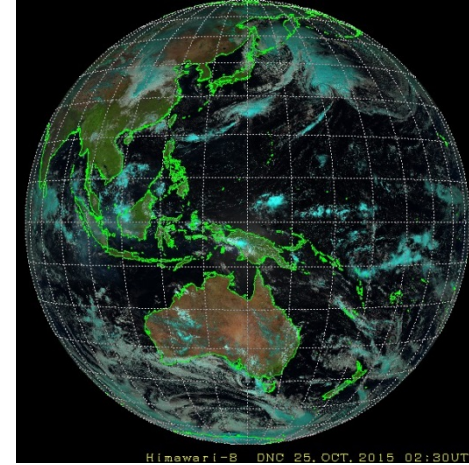


E: Day Convection RGB



F: Snow/Fog RGB

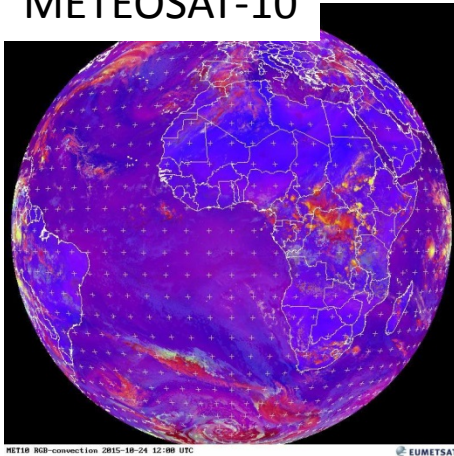
images courtesy JMA



G: Natural Colour RGB

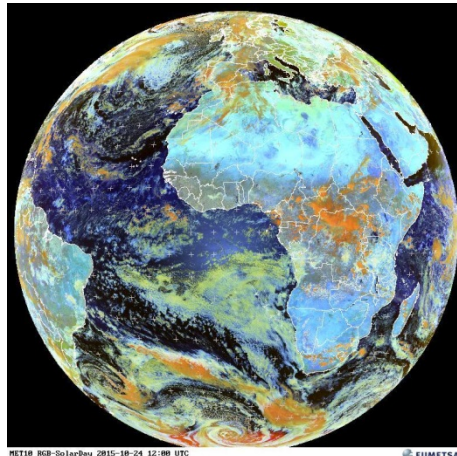
images courtesy EUMETSAT

METEOSAT-10



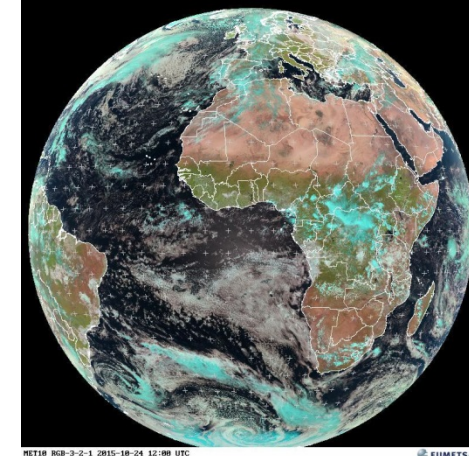
MET10 RGB-connect10w 2015-10-24 12:00 UTC

EUMETSAT



MET10 RGB-SolarDay 2015-10-24 12:00 UTC

EUMETSAT



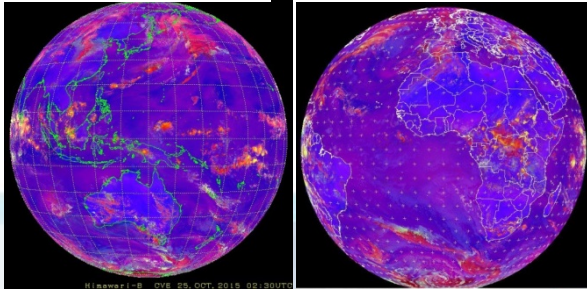
MET10 RGB-3-2-1 2015-10-24 12:00 UTC

EUMETSAT

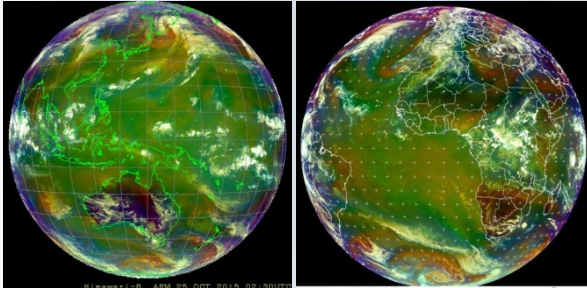
Question: which of these Himawari-8 RGB products require the greatest adjustment?
Rank from 1 (most adjustment) to 3 (least adjustment)

Summary: Which RGB products need most adjustment?

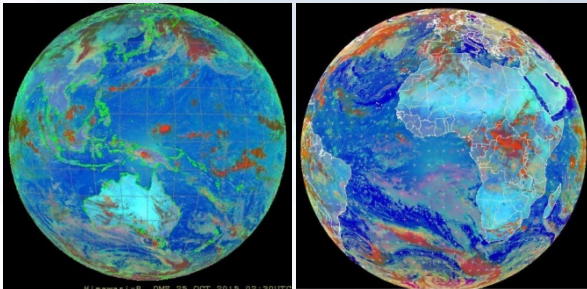
Himawari-8 METEOSAT-10



Day
Convection
RGB

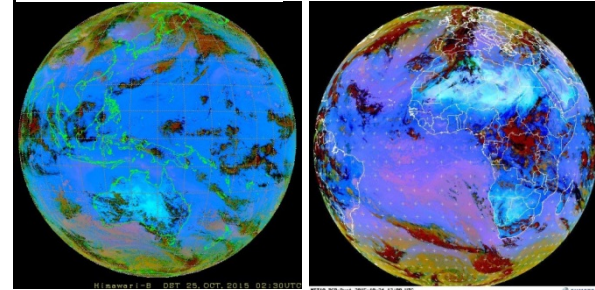


Airmass
RGB

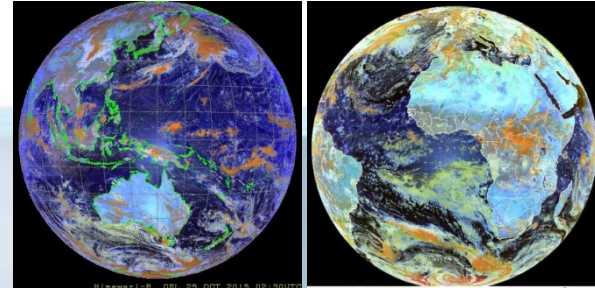


Day
Microphysics
RGB

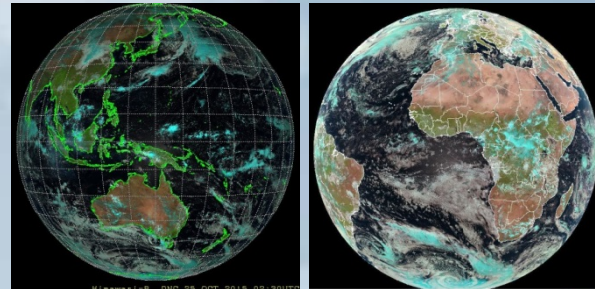
Himawari-8 METEOSAT-10



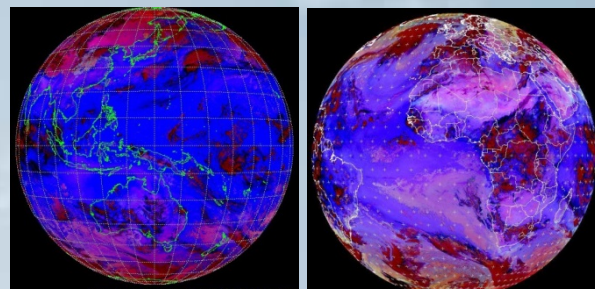
Dust RGB



Snow/Fog
RGB



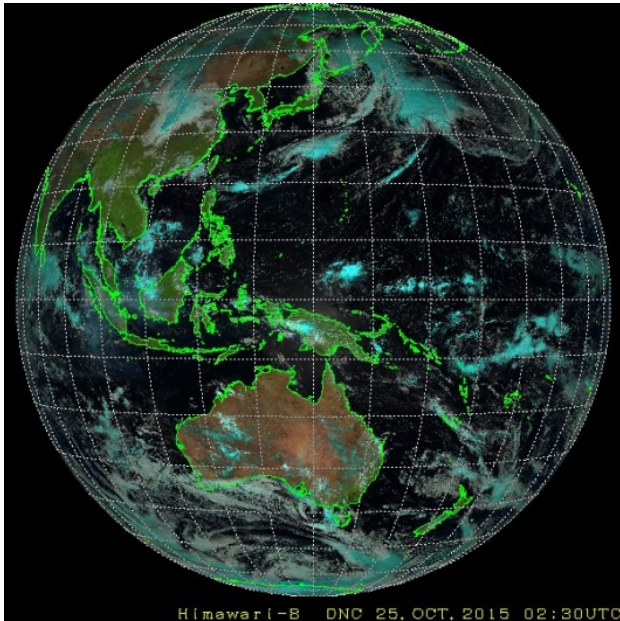
Natural
Colour RGB



Night
Microphysics
RGB

Correction: Adjusting for solar zenith angle (24/25 October)

image courtesy JMA



Himawari-8
JMA web page

Natural Colour RGB

Himawari-8 Natural Colour RGB
Valid Sun, 25 Oct 2015 02:20 UTC

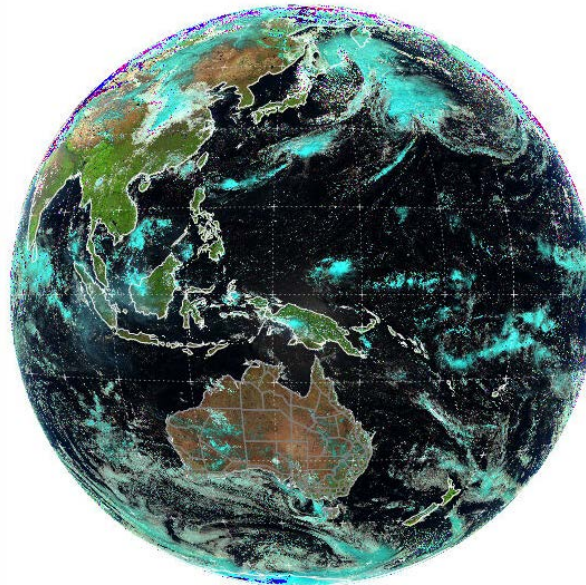
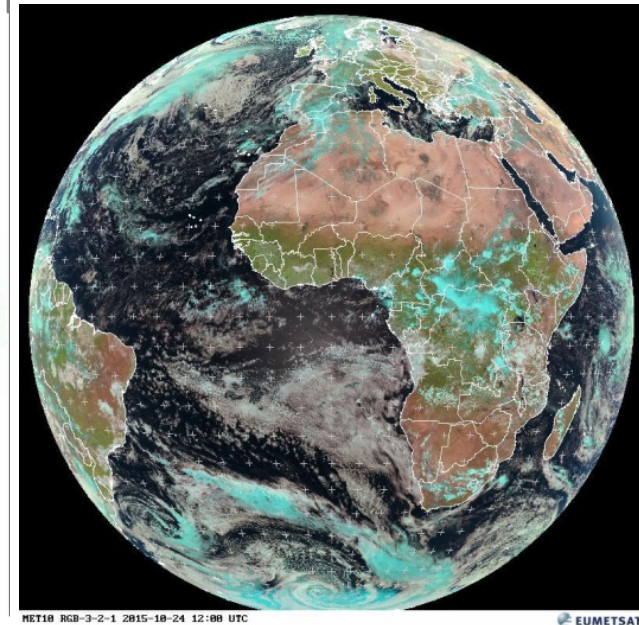


image courtesy BOM/JMA
Himawari-8
Visual Weather
(VICRO RFC)

image courtesy EUMETSAT



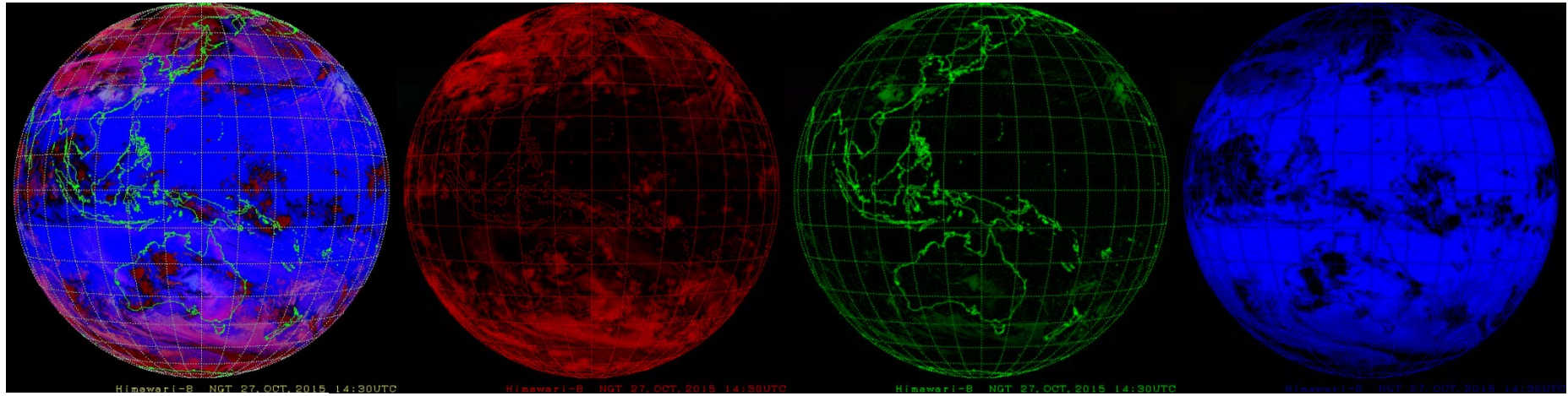
Meteosat-10,
EUMETSAT web page

Correction: Comparing the Beams – the Night Microphysics

RGB product (27/28 October)

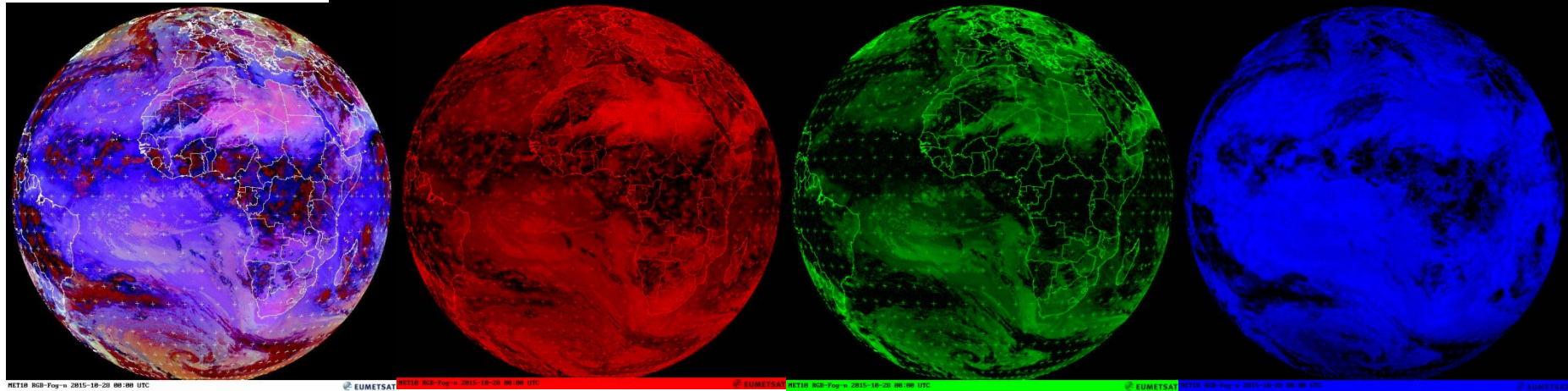
Himawari-8

images courtesy JMA



Meteosat-10

images courtesy EUMETSAT



IR12-IR10.8

IR10.8-IR3.9

IR10.8

Correction: Tuning the Night Microphysics RGB (27/28 October)

image courtesy JMA

Himawari-8 JMA web site

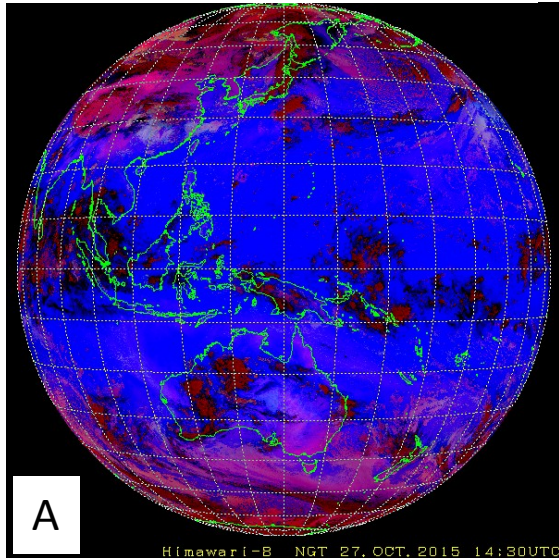
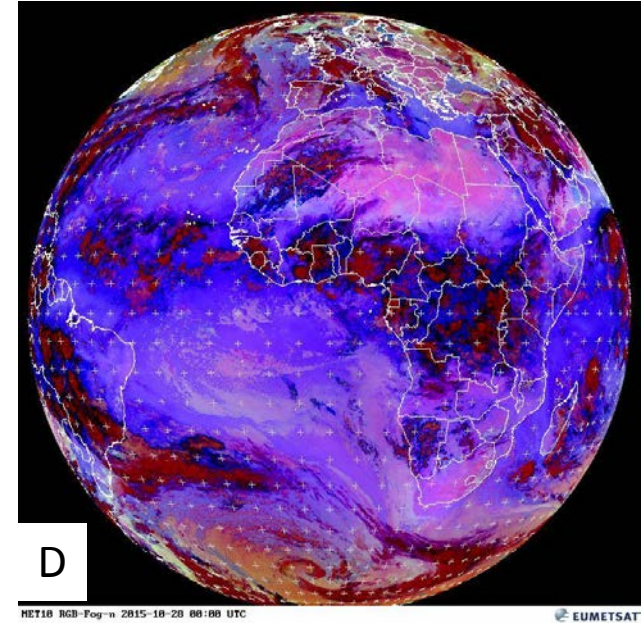
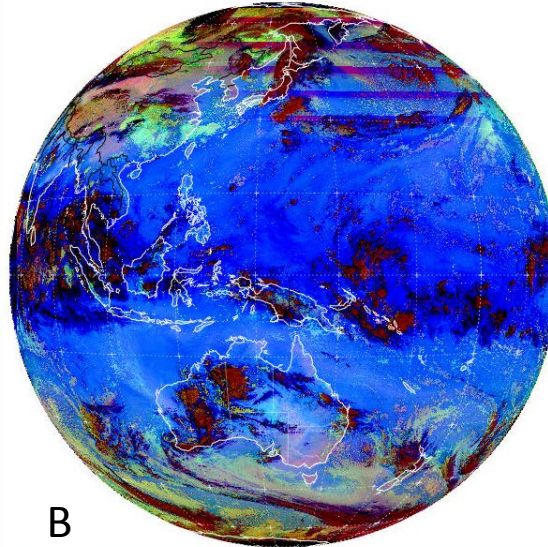
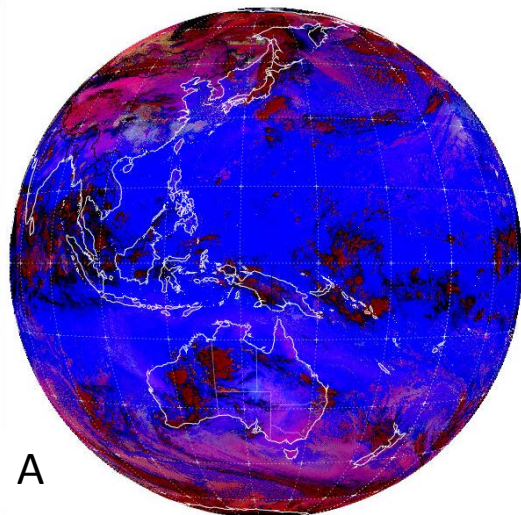


image courtesy BOM/JMA

Himawari-8 Kerkmann modification



Himawari-8 Bureau Visual Weather



Himawari-8 BOM modification

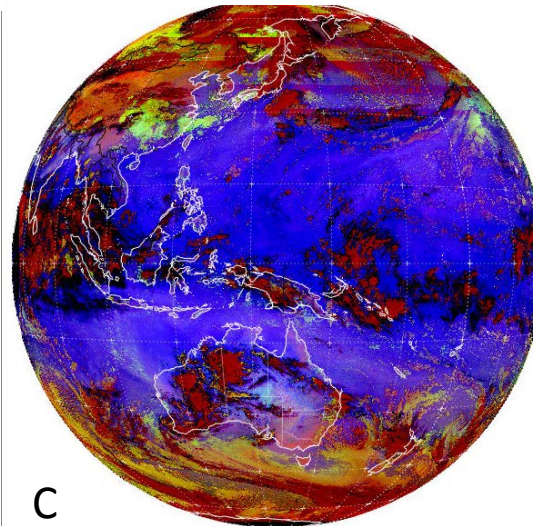


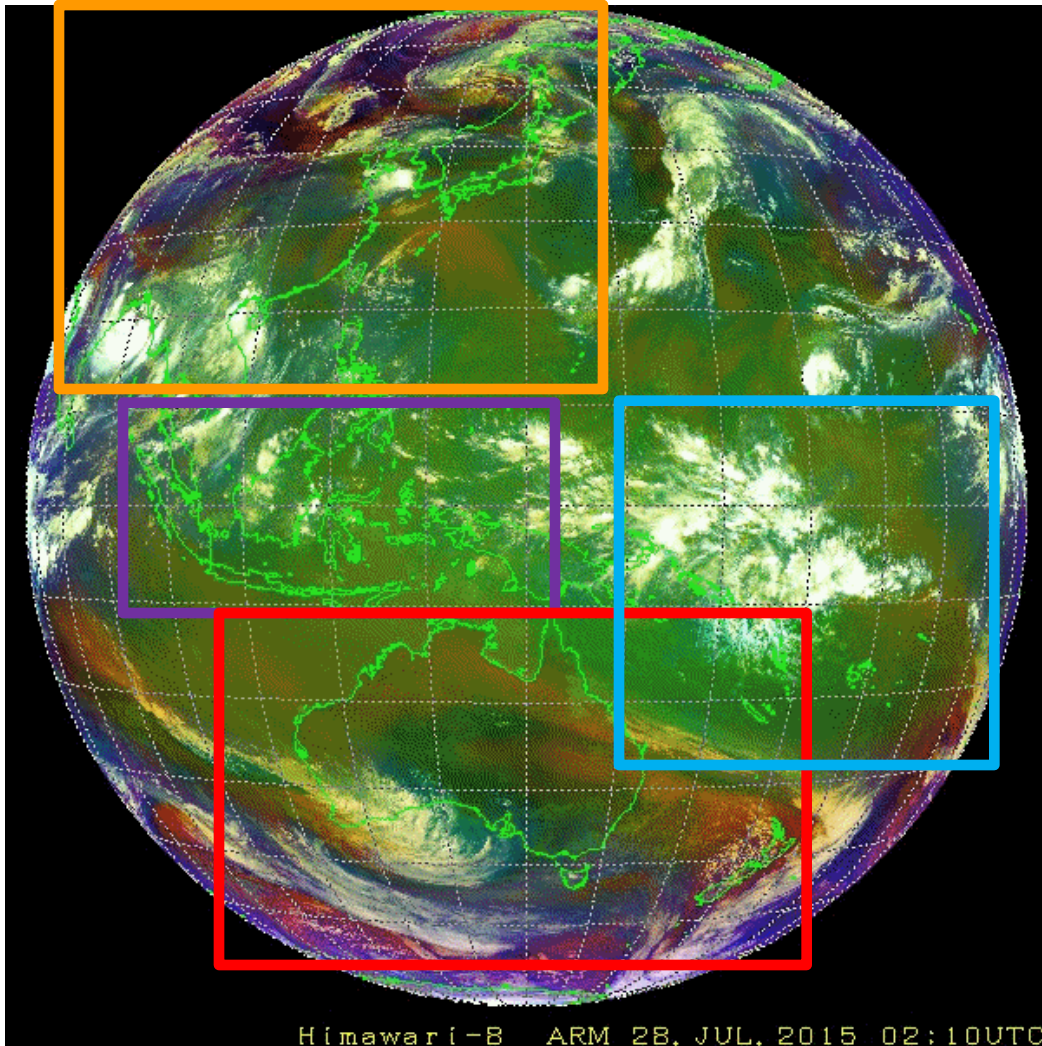
image courtesy EUMETSAT

| | RED | GREEN | BLUE (C) |
|---|---------|---------|-----------|
| A | -4 to 2 | 0 to 10 | -30 to 20 |
| B | -4 to 2 | -5 to 5 | -30 to 20 |
| C | -6 to 2 | -2 to 5 | -5 to 25 |
| D | -4 to 2 | 0 to 10 | -30 to 20 |

image courtesy JMA/BOM

Exercise 3: Assess the information content of the Airmass RGB product for the following domains (annotate by ✓ or x)

animations courtesy JMA



Himawari-B ARM 28. JUL. 2015 02:10UTC

28th July 2015

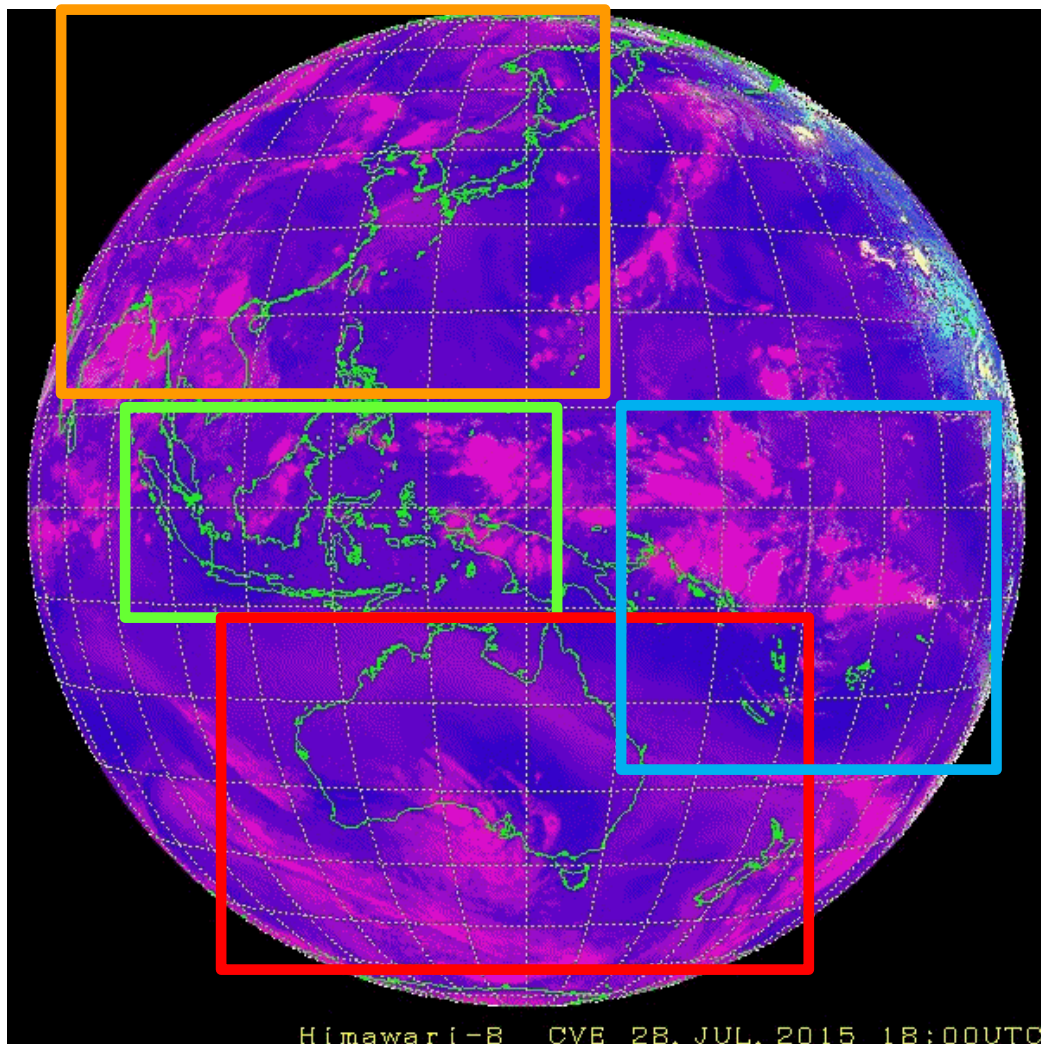
- **Australia-New Zealand Region**
- **Indonesian region**
- **Southwest Pacific**
- **East Asia**

| | |
|--|--|
| | |
| Thick, high-level clouds | Thick, mid-level clouds |
| Jet (high PV) | Cold Airmass |
| | |
| Thick, low-level clouds (warm airmass) | Thick, low-level clouds (cold airmass) |
| Warm Airmass | Warm Airmass |





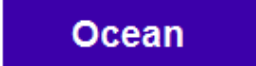

Exercise 4: Assess the information content of the Day Convection RGB product for the following domains

(annotate by ✓ or x)

animations courtesy JMA



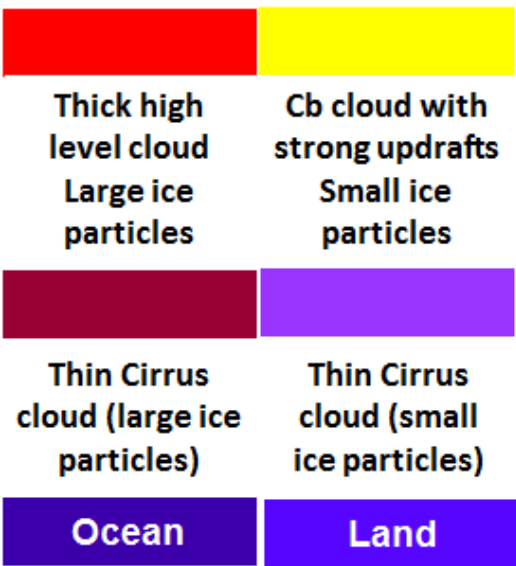
- **Australia-New Zealand Region (winter)**
- **Indonesian region**
- **Southwest Pacific**
- **East Asia (summer)**

| | |
|---|---|
|  |  |
| Thick high level cloud Large ice particles | Cb cloud with strong updrafts Small ice particles |
|  |  |
| Thin Cirrus cloud (large ice particles) | Thin Cirrus cloud (small ice particles) |
|  |  |
| Ocean | Land |

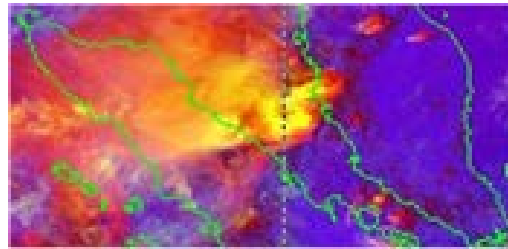
28th July 2015

Investigating the Day Convection RGB product

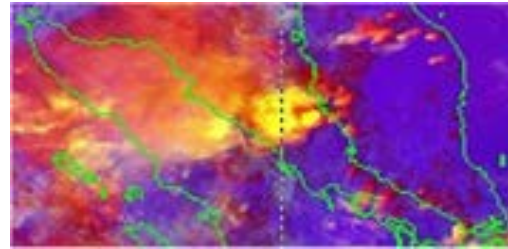
Exercise 5: where is the Day Convection giving more information?



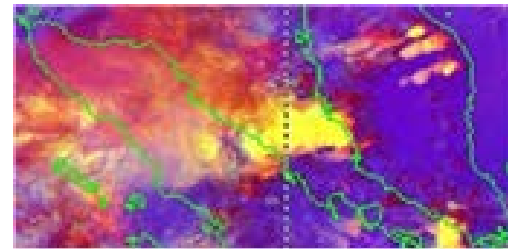
**Sumatra / Malaysia convection
11th August 2015**



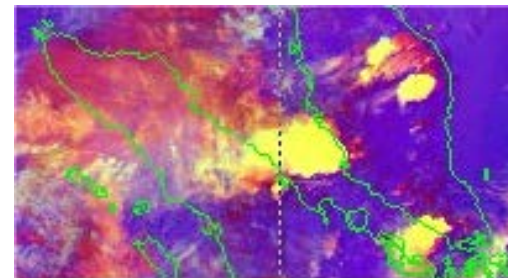
0530UTC



0630UTC

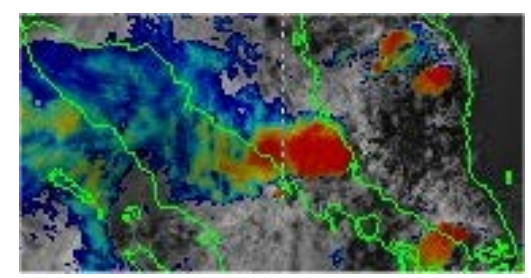
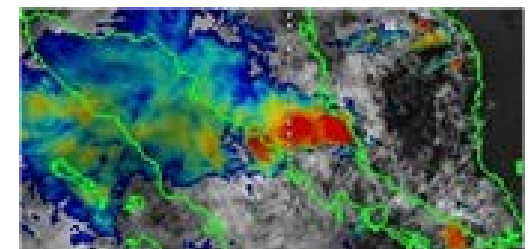
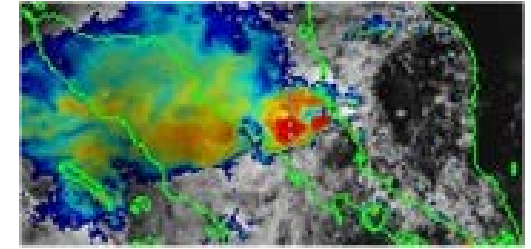
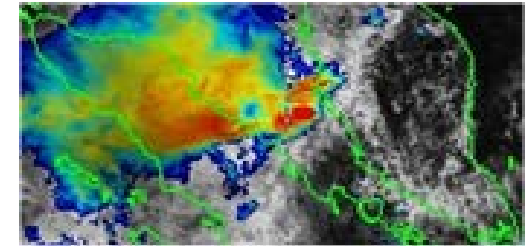


0730UTC



0830UTC

Himawari-8 Day convection RGB



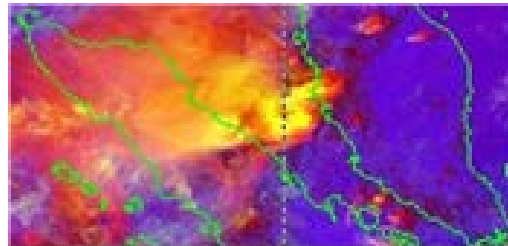
Himawari-8 Sandwich product

Investigating the Day Convection RGB product

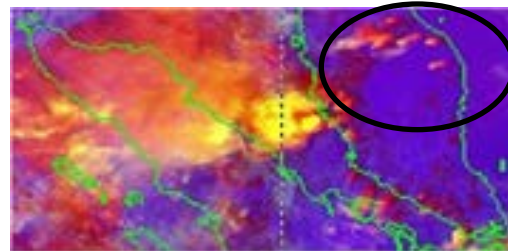
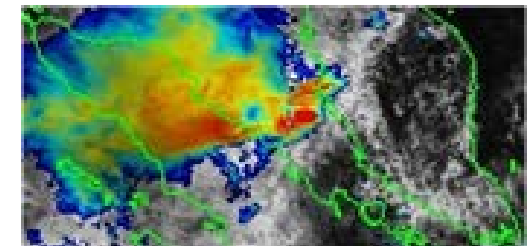
Advantage in the method – **detection of new convection**

| | |
|---|--|
| | |
| Thick high level cloud Large ice particles | Cb cloud with strong updrafts Small ice particles |
| | |
| Thin Cirrus cloud (large ice particles) | Thin Cirrus cloud (small ice particles) |
| Ocean | Land |

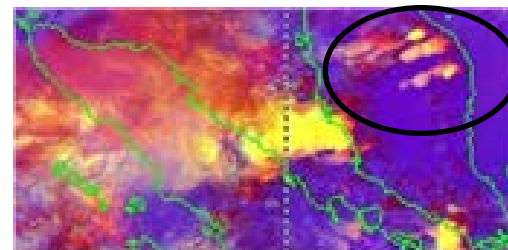
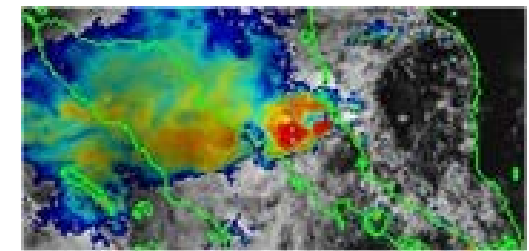
Sumatra / Malaysia convection
11th August 2015



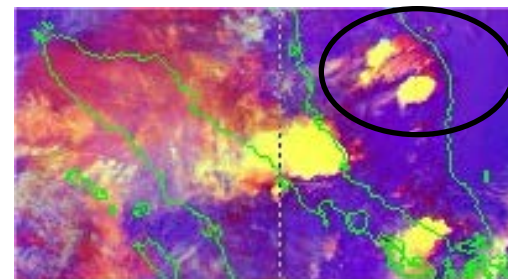
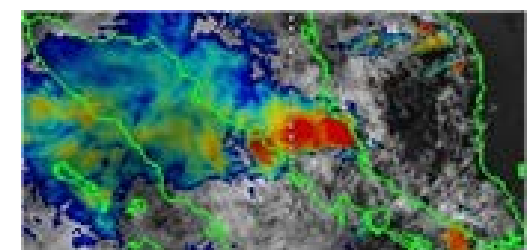
0530UTC



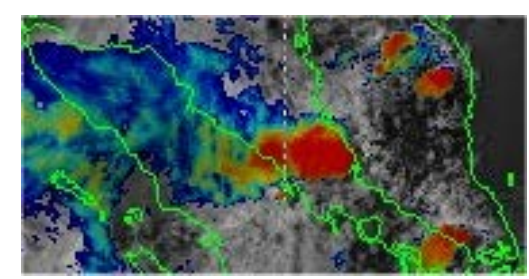
0630UTC



0730UTC



0830UTC

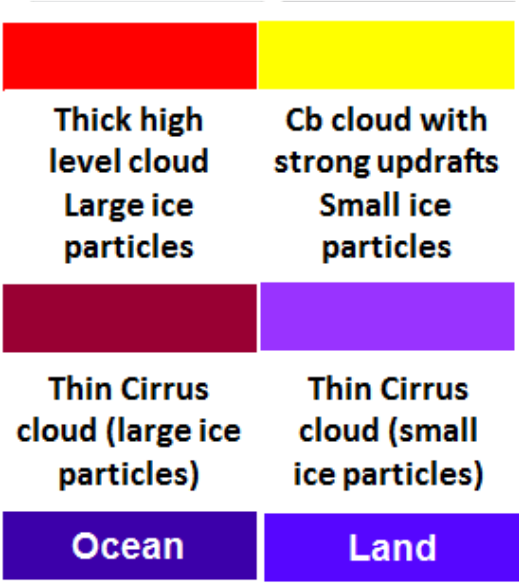


Himawari-8 Day convection RGB

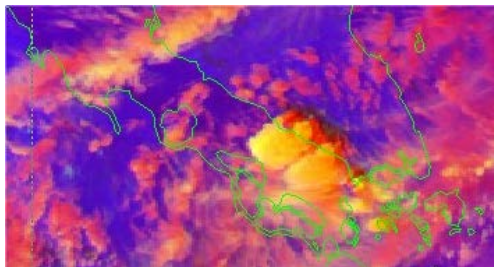
Himawari-8 Sandwich product

Investigating the Day Convection RGB product

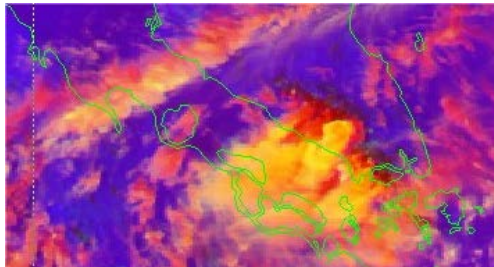
Limitation in the method – monitoring storm outflow boundaries



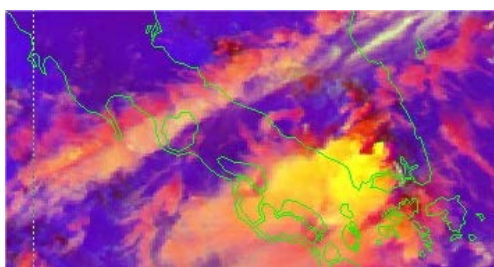
Sumatra / Malaysia convection
16th September 2015



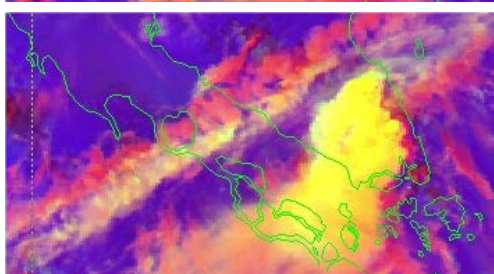
0430UTC



0530UTC

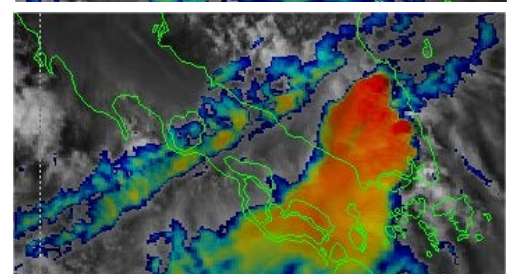
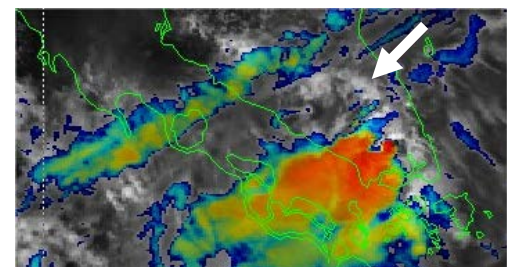
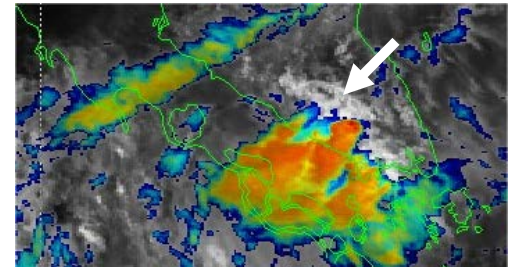
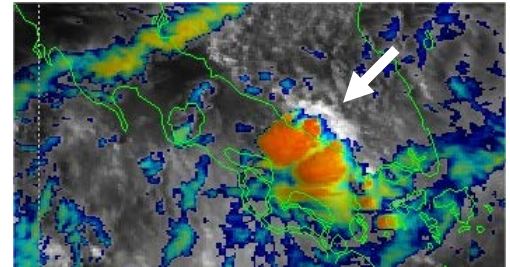


0630UTC

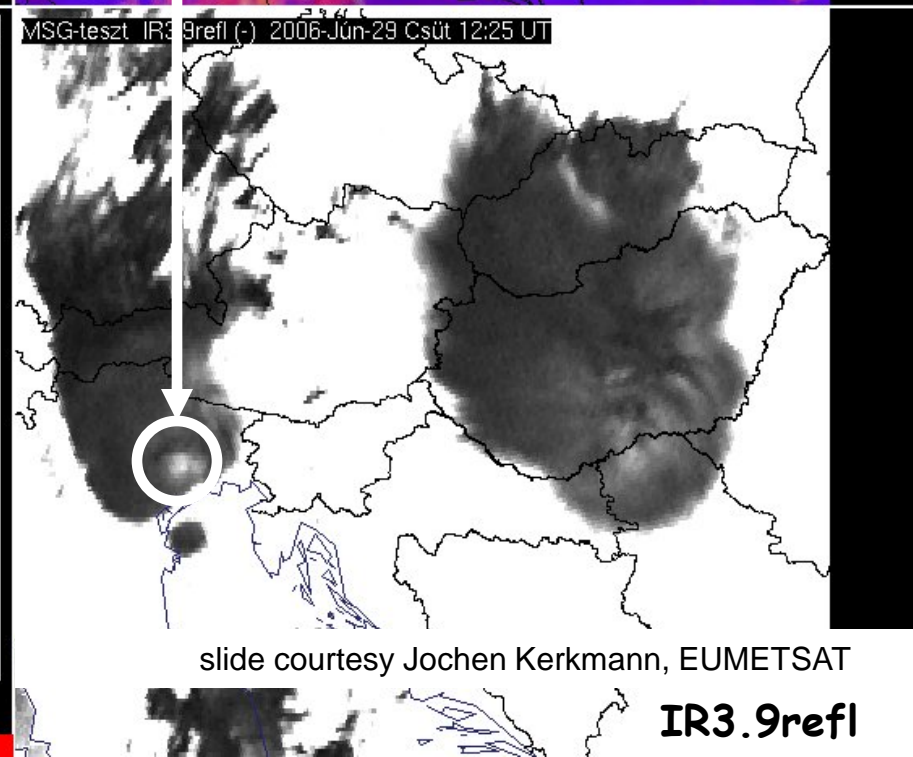
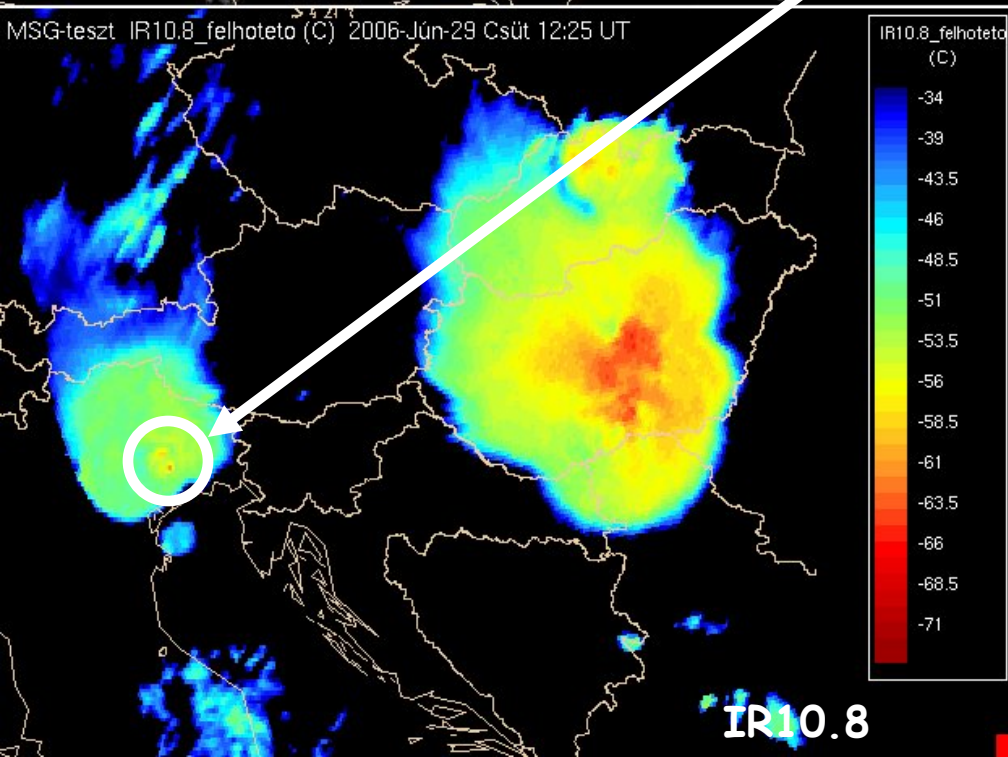
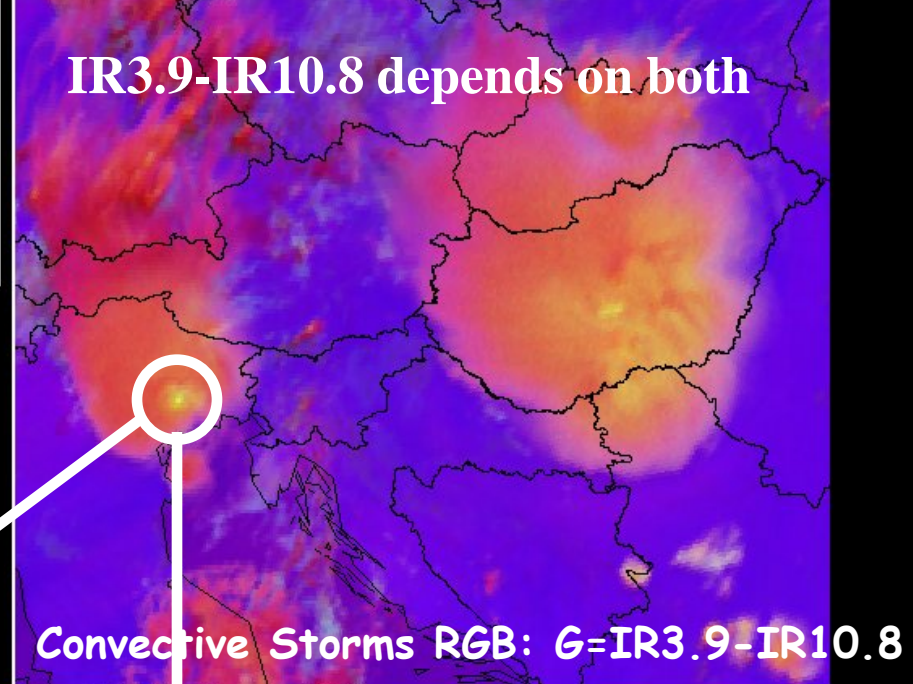
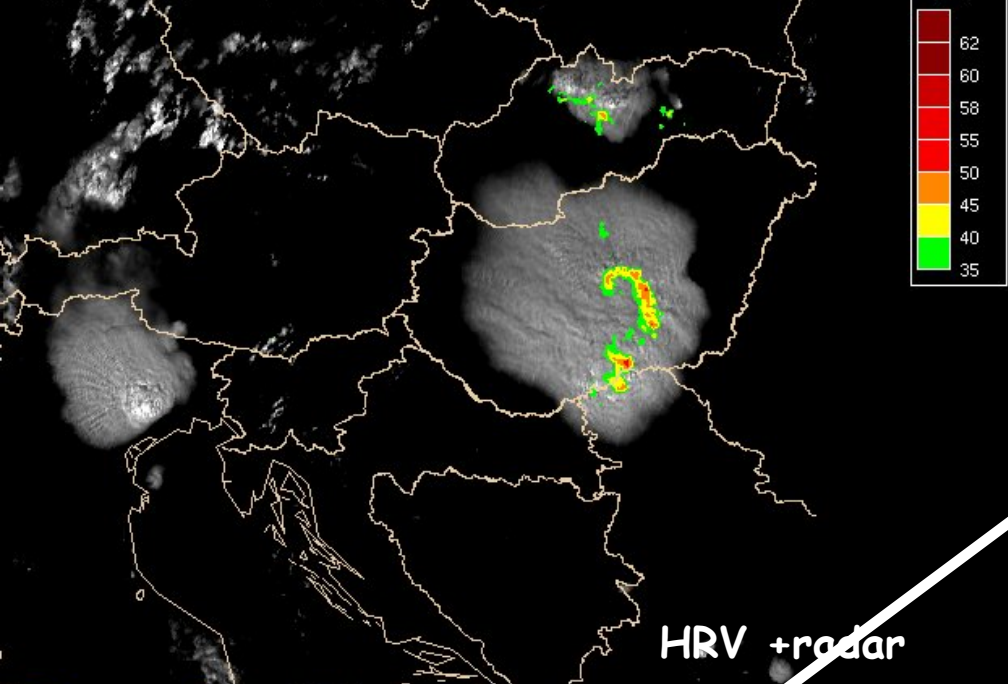


0730UTC

Himawari-8 Day Convection RGB

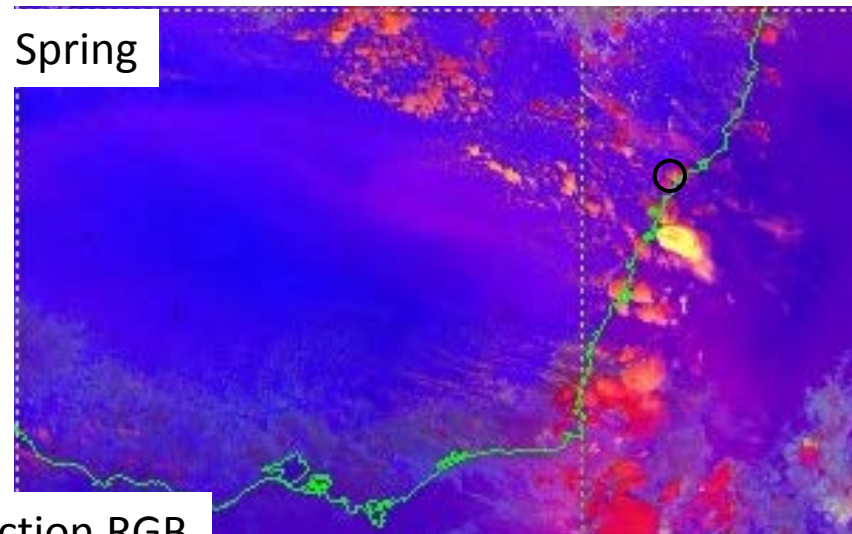
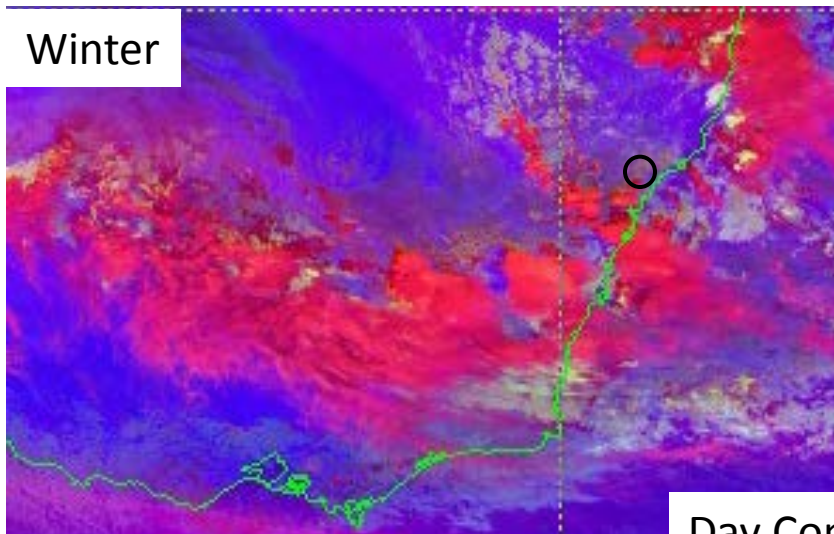


Himawari-8 Sandwich product



Winter vs spring severe storms, Southeast Australia

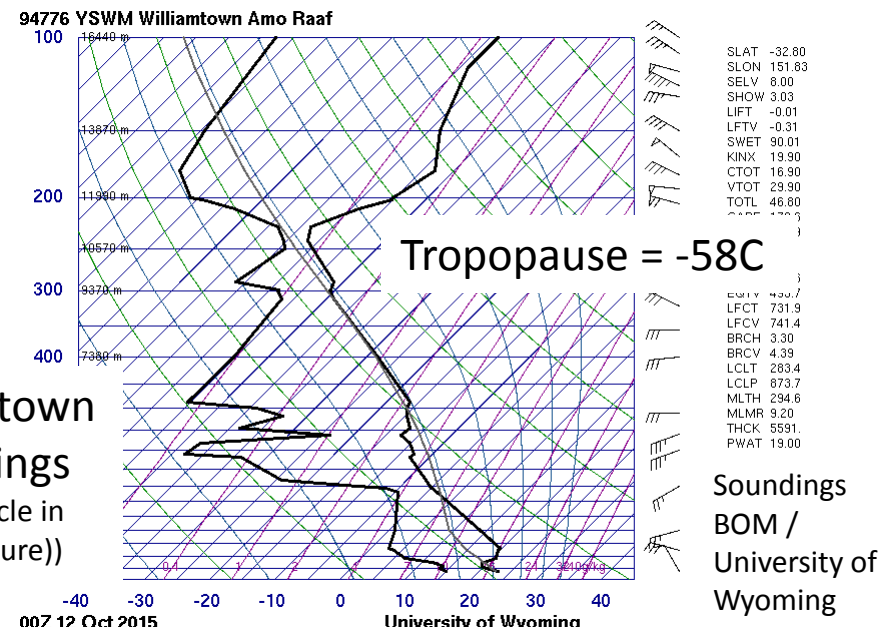
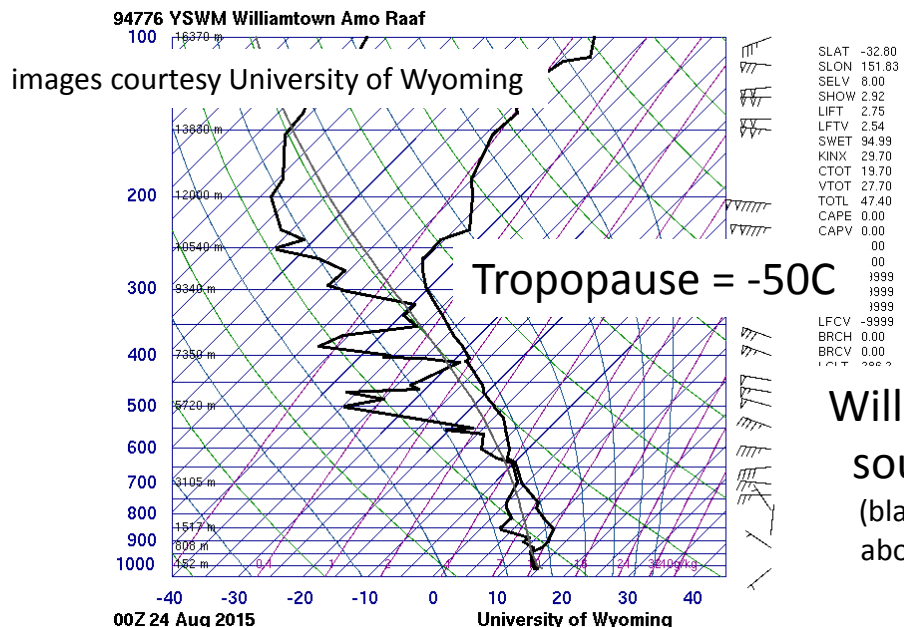
(Himawari-8 data)



Day Convection RGB

24 August 2015, 0300UTC

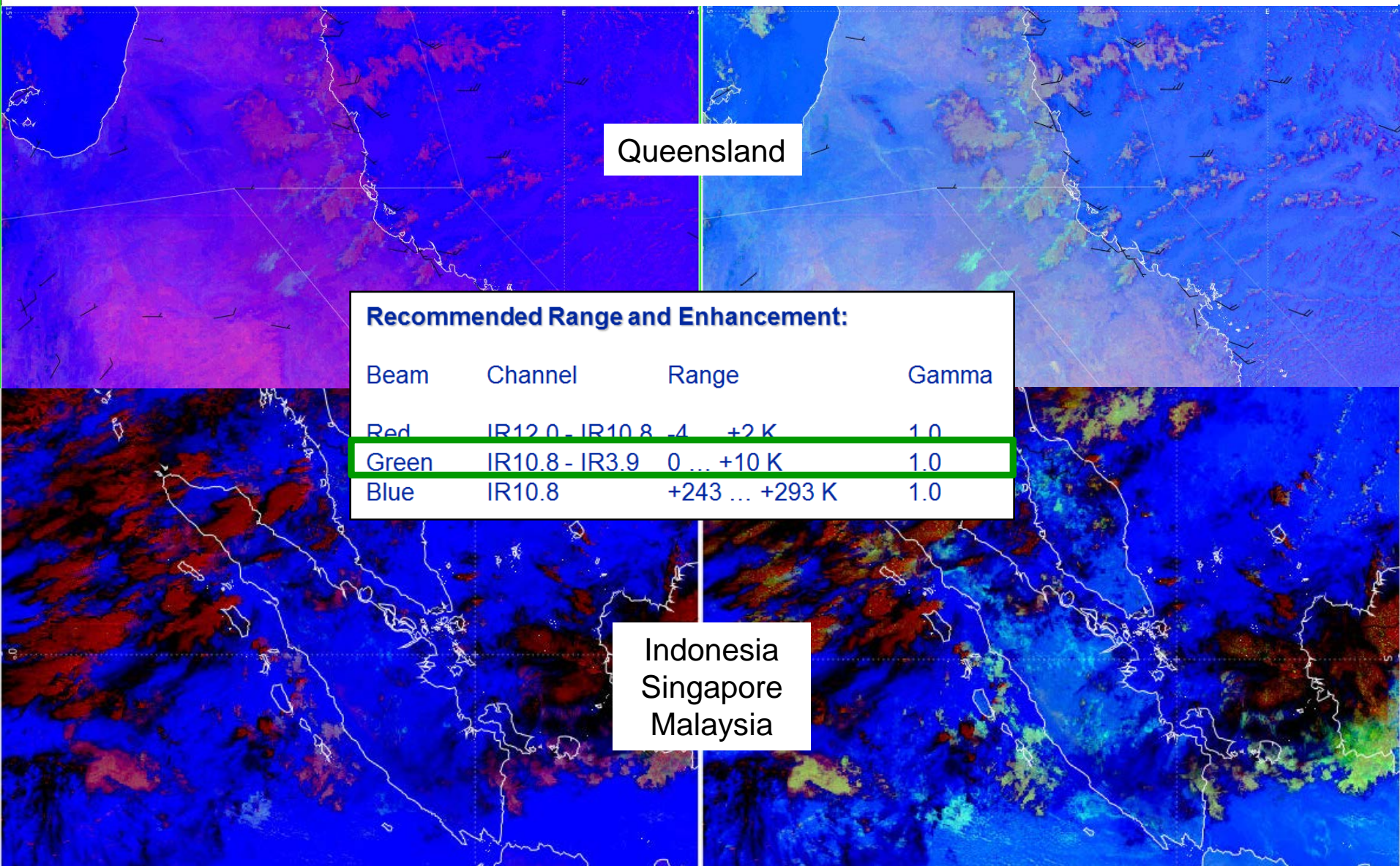
12 October 2015 0430UTC



Tuning the Night Microphysics RGB product (J.Kerkmann EUMETSAT)

Standard Night Microphysics (Seviri Recipe)

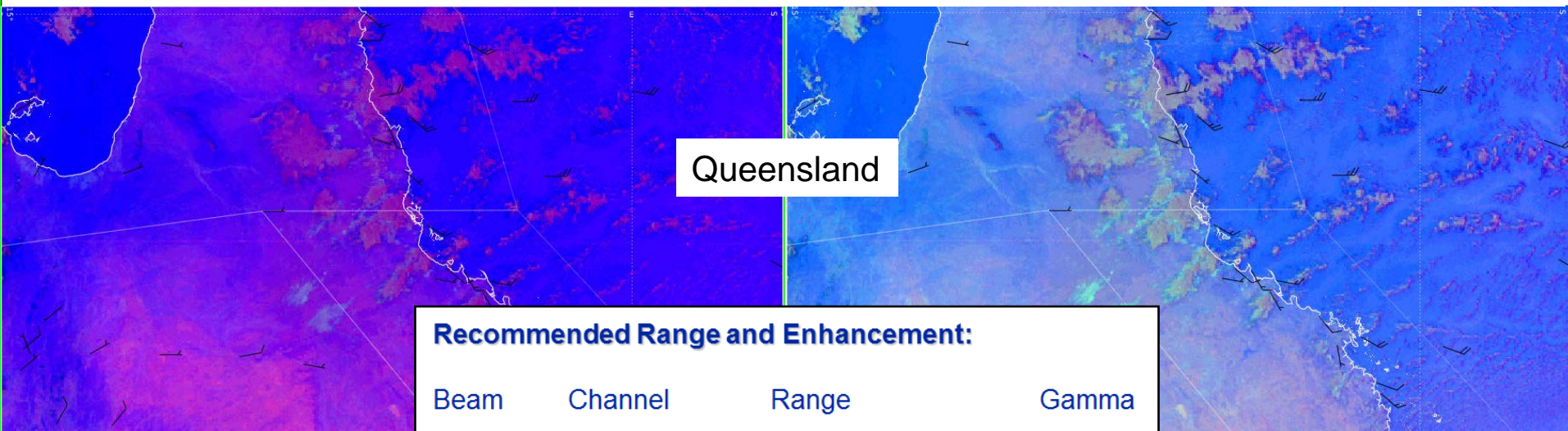
Tuned Night Microphysics (**Green beam -5 to +5**)



Tuning the Night Microphysics RGB product (J.Kerkmann EUMETSAT)

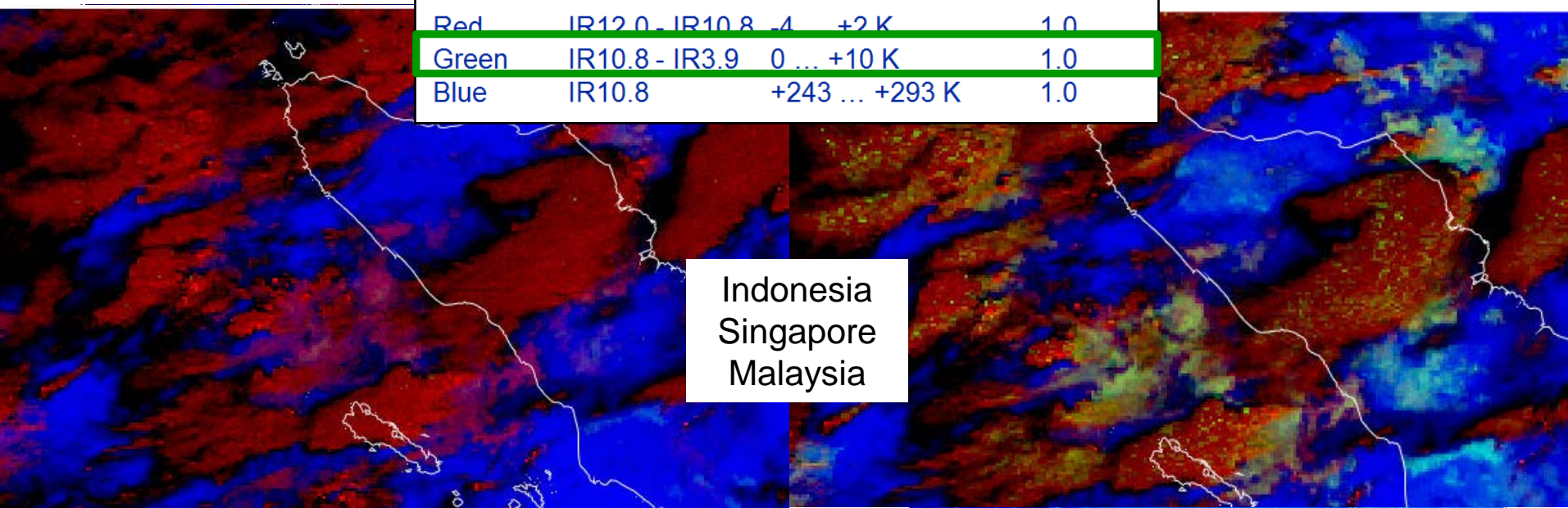
Standard Night Microphysics (Seviri Recipe)

Tuned Night Microphysics (**Green beam -5 to +5**)



Recommended Range and Enhancement:

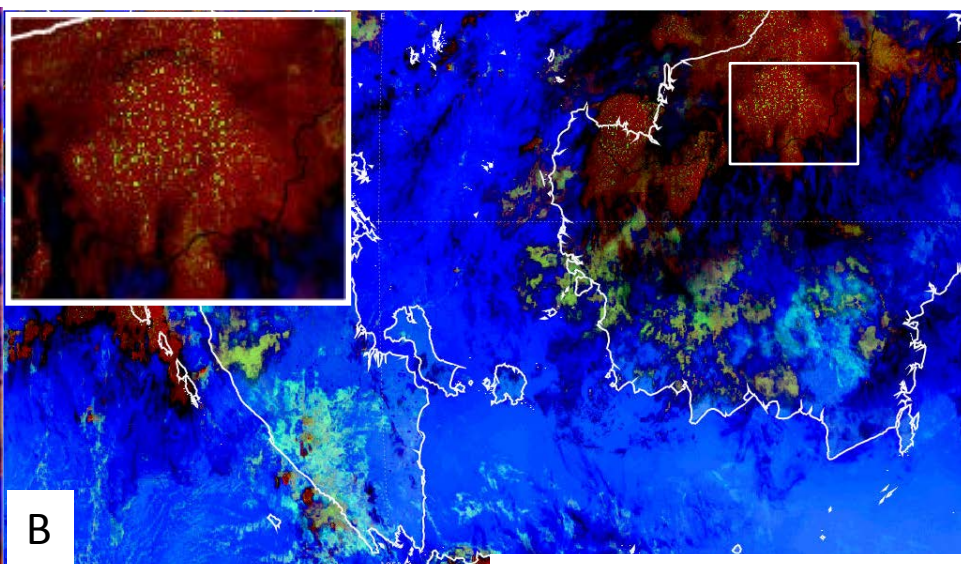
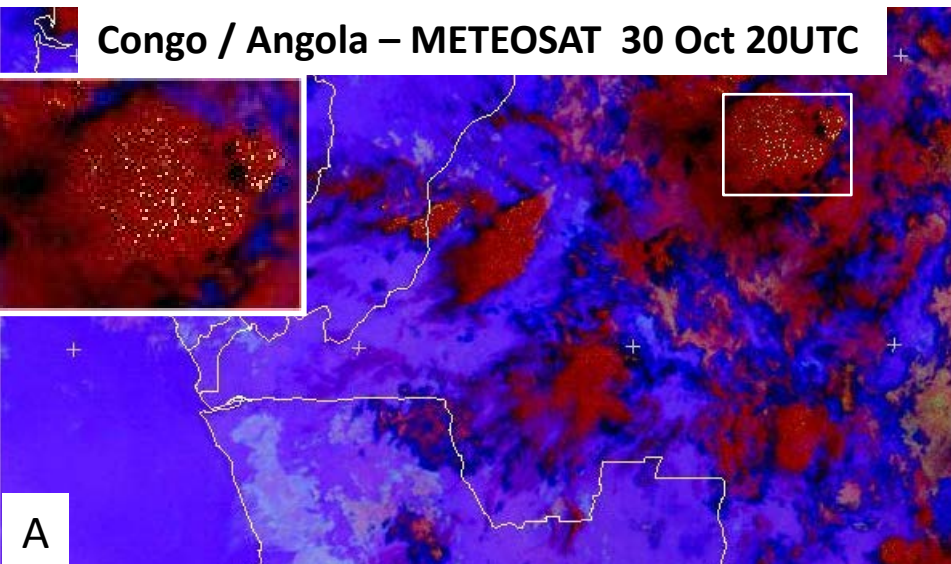
| Beam | Channel | Range | Gamma |
|-------|-----------------|-----------------|-------|
| Red | IR12.0 - IR10.8 | -4 ... +2 K | 1.0 |
| Green | IR10.8 - IR3.9 | 0 ... +10 K | 1.0 |
| Blue | IR10.8 | +243 ... +293 K | 1.0 |



Tuning Night Microphysics RGB (Indonesia/Malaysia, 2nd November 1730UTC)

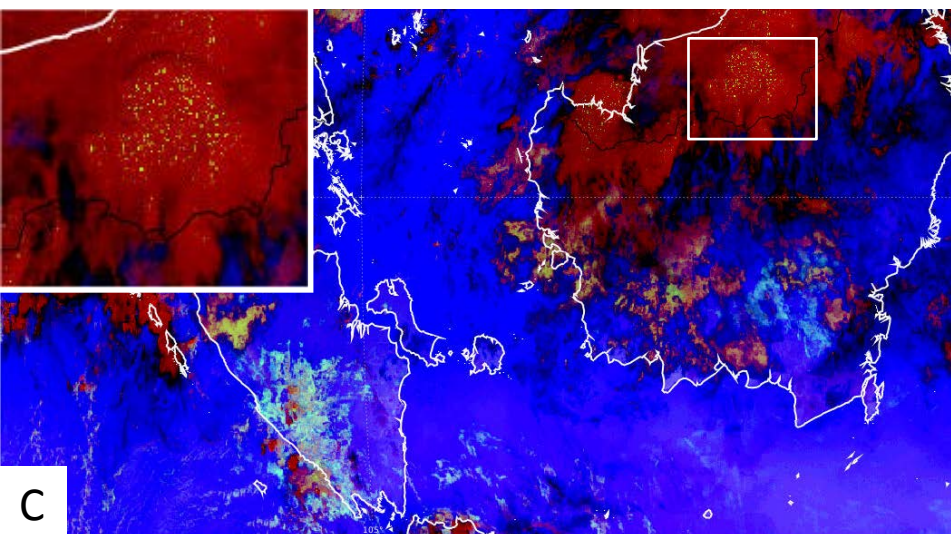
image courtesy JMA

image courtesy BOM/JMA



Exercise 6: Which RGB product do you prefer and why?

Himawari-8 Kerkmann
RGB modification



| | |
|------------------------------------|---|
| | |
| Low-level cloud warm atmosphere | Very cold (< -50°C), thick, high-level cloud |

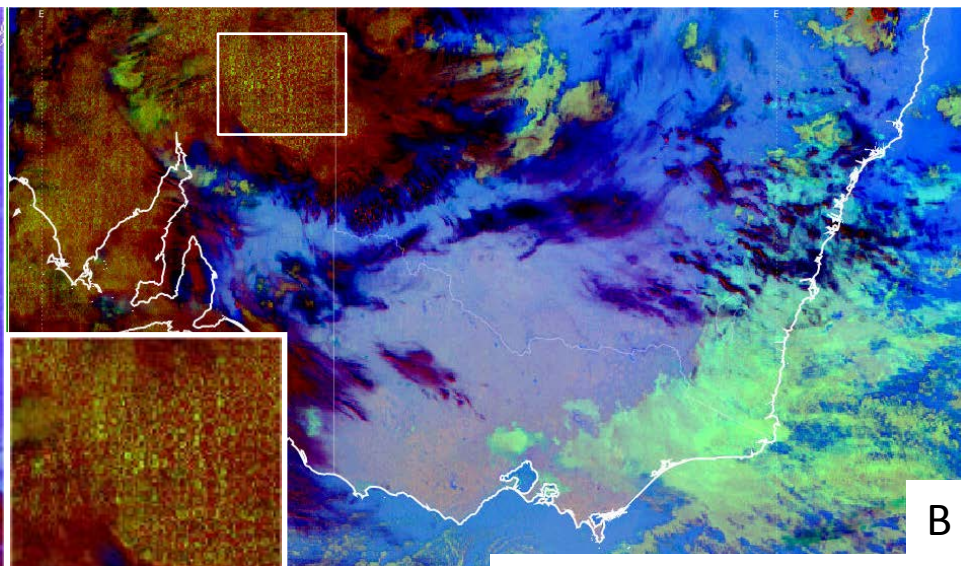
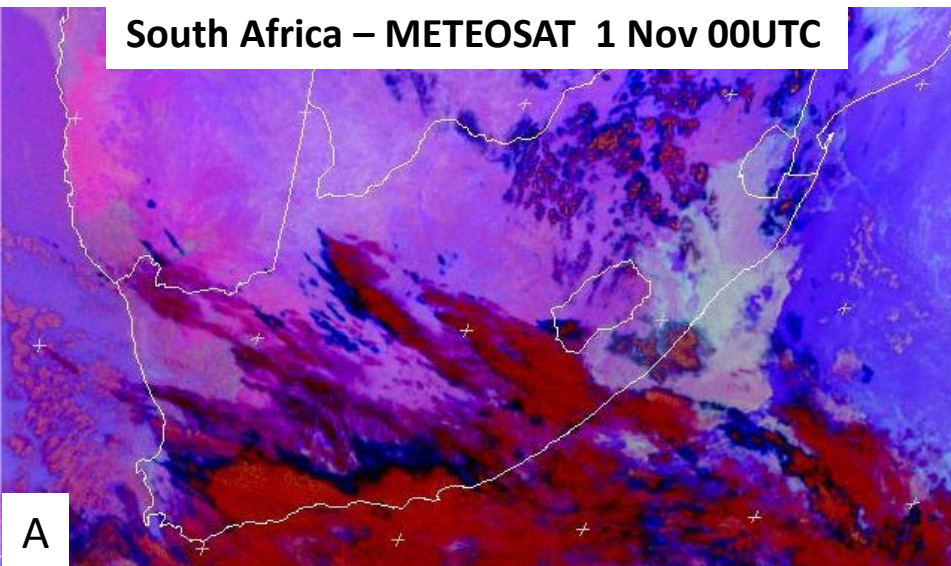
| | RED | GREEN | BLUE (C) |
|-----|---------|---------|-----------|
| B | -4 to 2 | -5 to 5 | -30 to 20 |
| C | -6 to 2 | -2 to 5 | -30 to 20 |
| RGB | -4 to 2 | 0 to 10 | -30 to 20 |

Modified Himawari-8 BOM RGB recipe

Tuning Night Microphysics RGB (SE Australia, 2nd November 1730UTC)

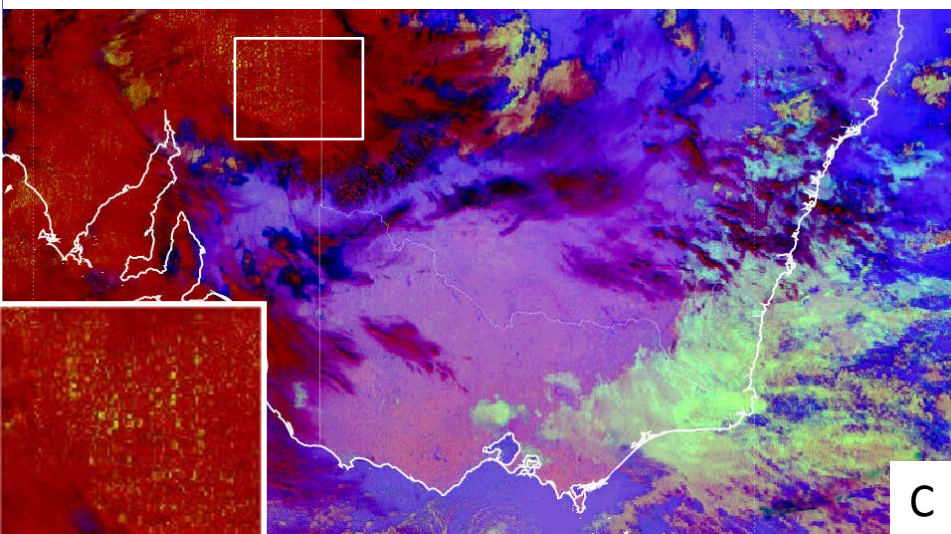
image courtesy JMA

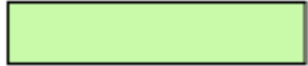

image courtesy BOM/JMA



Exercise 7: Which RGB product do you prefer and why?

Himawari-8 Kerkmann RGB modification



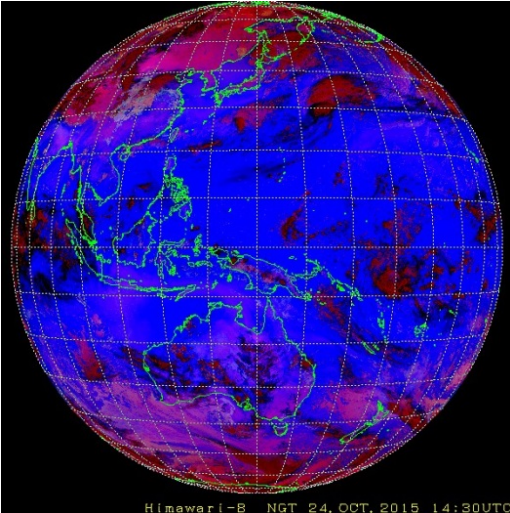
| | |
|---|---|
|  |  |
| Low-level cloud (cold atmosphere) | Very cold (< -50°C), thick, high-level cloud |

| | RED | GREEN | BLUE (C) |
|-----|---------|---------|-----------|
| B | -4 to 2 | -5 to 5 | -30 to 20 |
| C | -6 to 2 | -2 to 5 | -30 to 20 |
| RGB | -4 to 2 | 0 to 10 | -30 to 20 |

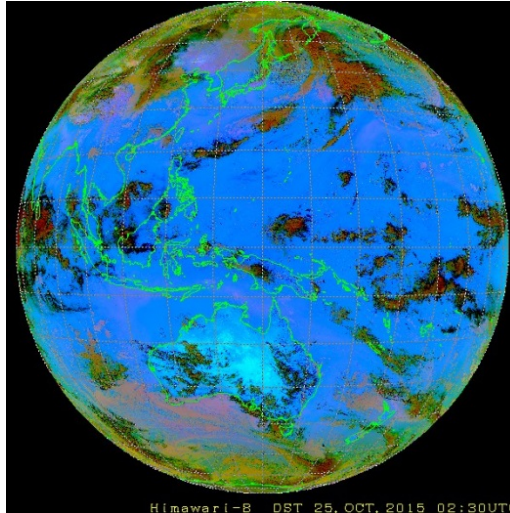
Modified Himawari-8 BOM RGB recipe

Summary: The most popular RGB products from Forecaster feedback at BOM

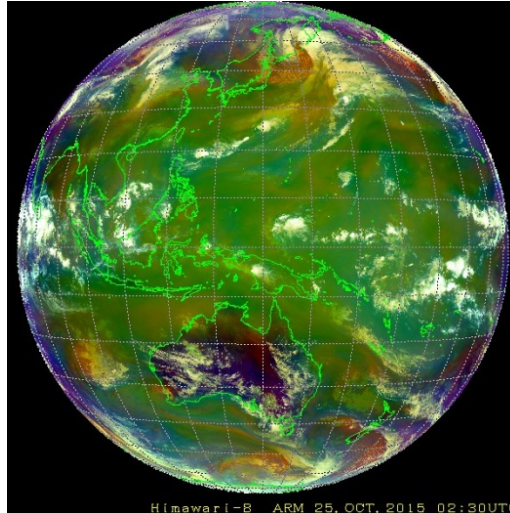
Images courtesy JMA



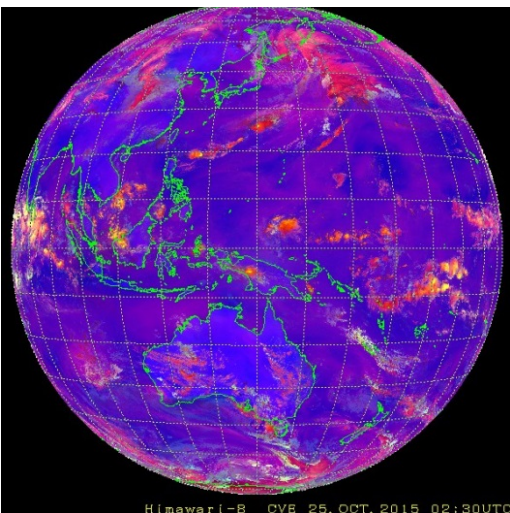
Night Microphysics RGB



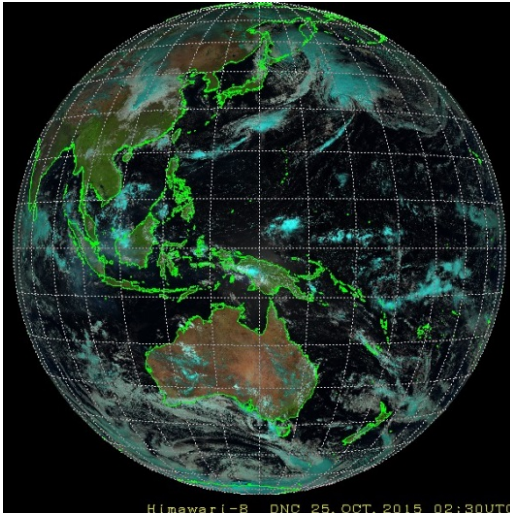
Ash / Dust RGB



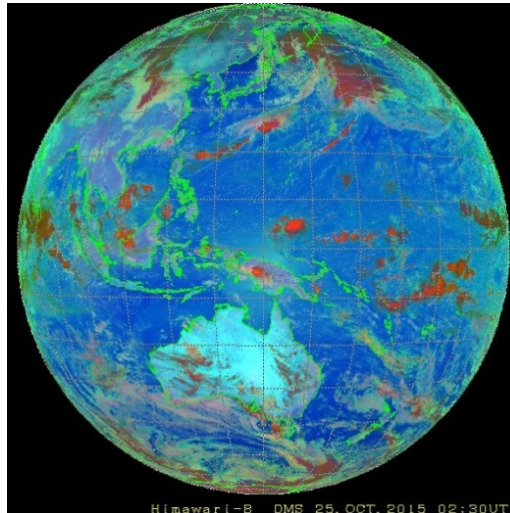
Airmass RGB



Day Convection RGB



Natural Colour RGB



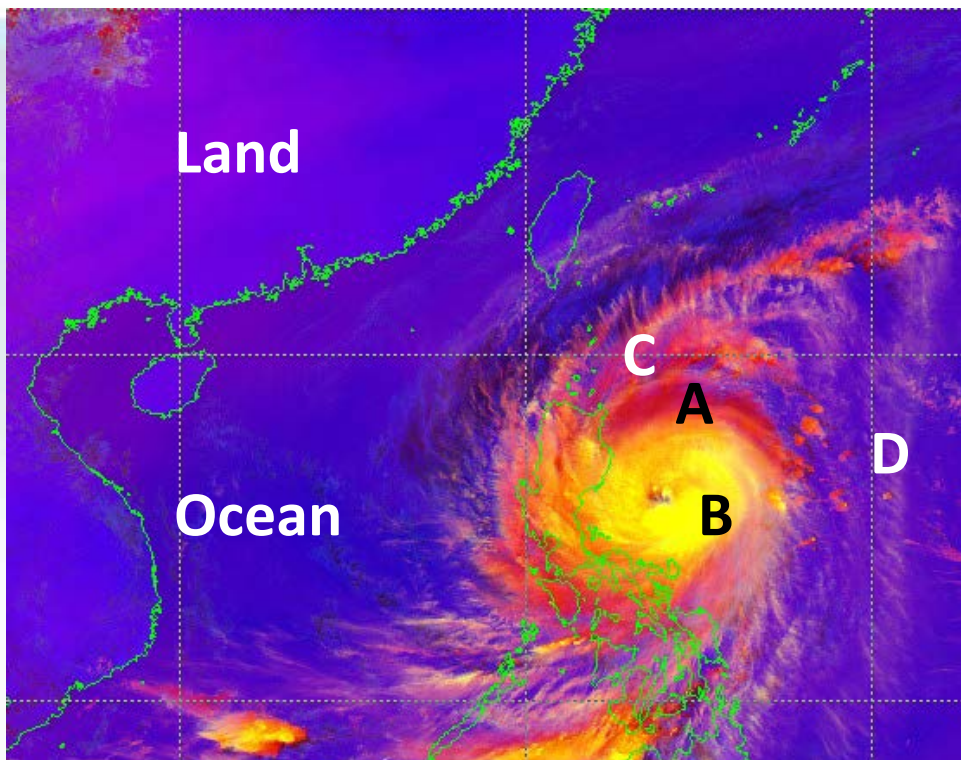
Day Microphysics RGB

Day Convection RGB "Forecaster friendly" sheet

(see also web address <http://www.virtuallab.bom.gov.au/training/hw-8-training/introduction-resources-and-case-studies/> for further reference)

| Beam | Channel (band) | Range | Gamma |
|-------|-----------------------|----------------|-------|
| Red | WV6.2(8) – WV7.3(10) | -35 to +5 | 1.0 |
| Green | IR3.9(7) – IR10.8(13) | -5 to +60 | 1.0 |
| Blue | NIR1.6(5) – VIS0.6(3) | -0.75 to +0.25 | 1.0 |

Channel combination "recipe" (from EUMETSAT)



| | |
|---|--|
| A | B |
| Thick high level cloud Large ice particles | Cb cloud with strong updrafts Small ice particles |
| C | D |
| Thin Cirrus cloud (large ice particles) | Thin Cirrus cloud (small ice particles) |
| Ocean | Land |

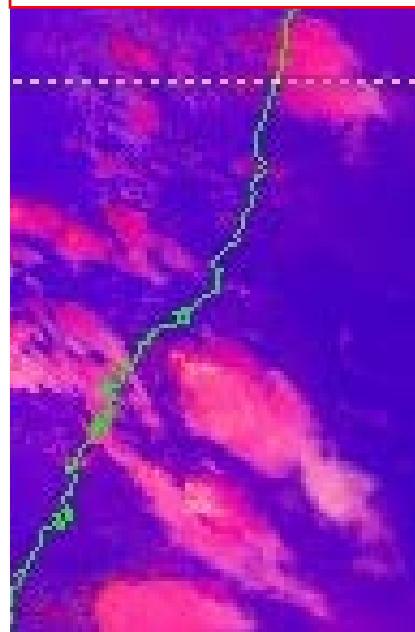
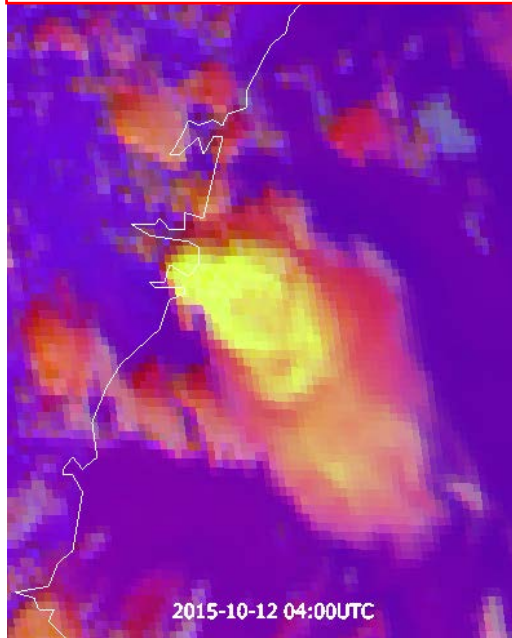
Image courtesy JMA

RGB product image

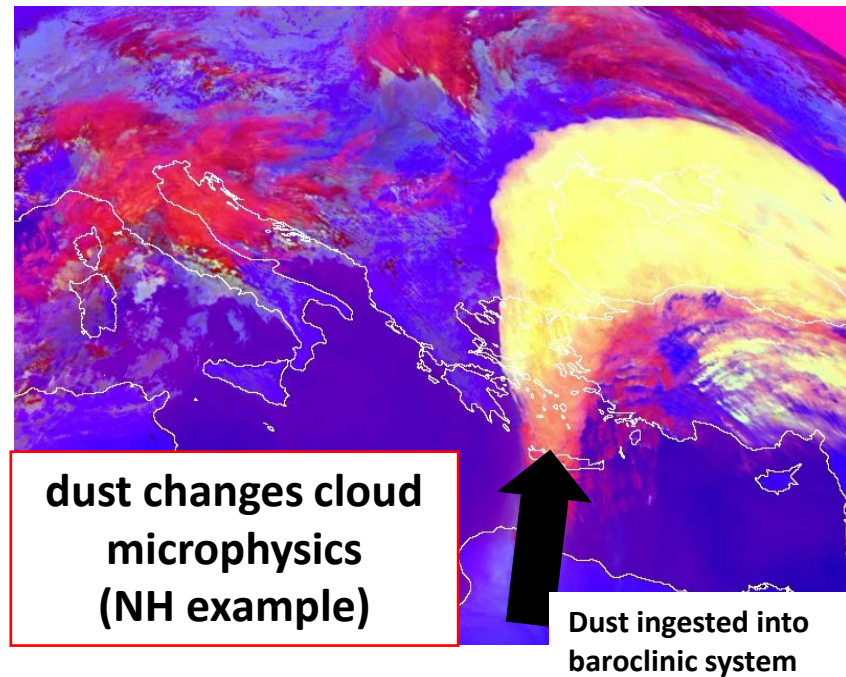
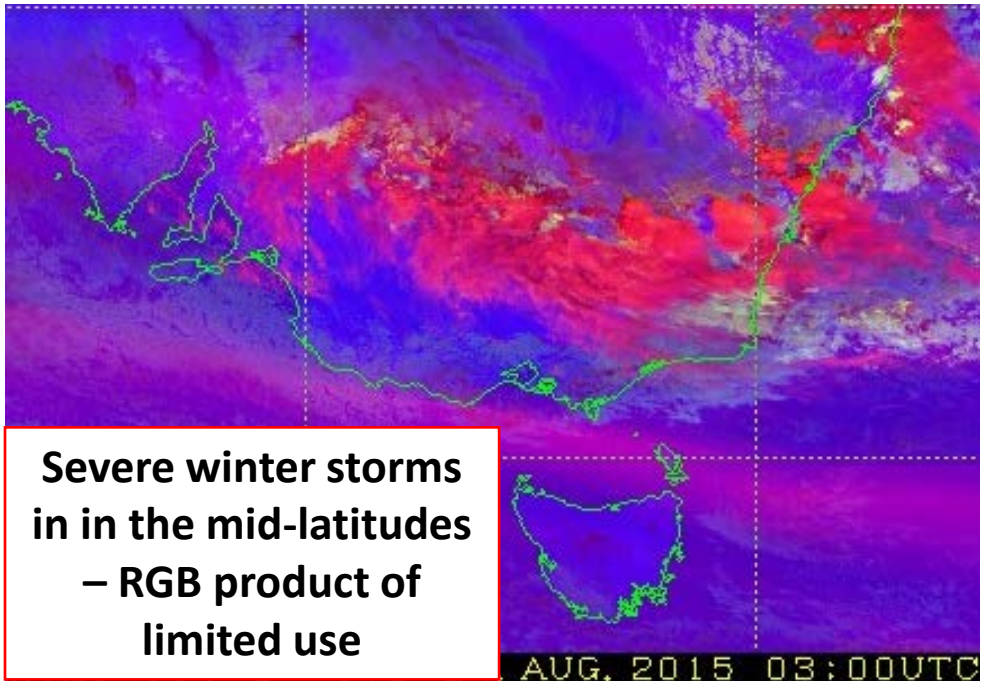
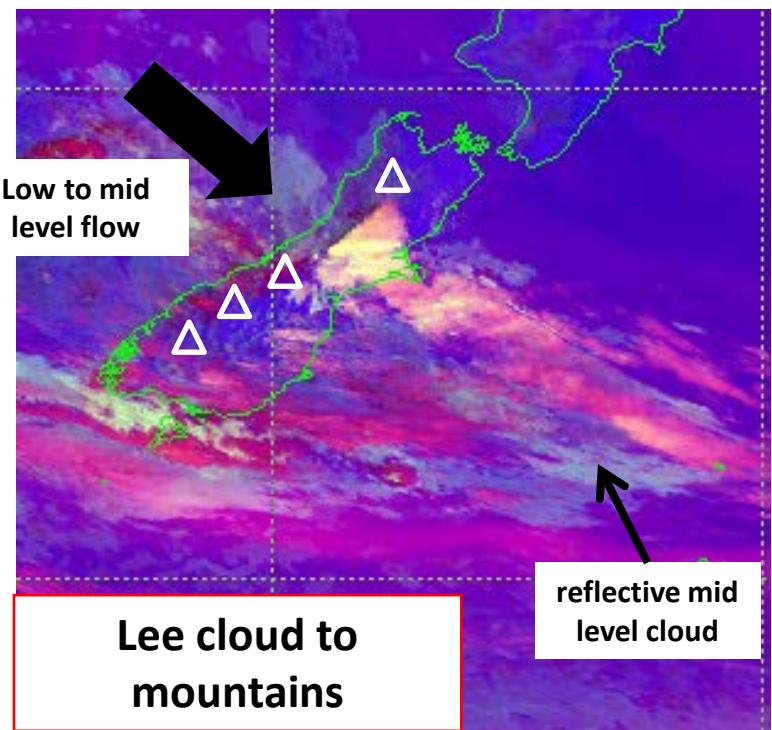
Colour interpretation palette

Daytime

After sunset



Low to mid level flow



Summary

- During this session the RGB products as endorsed by WMO/EUMETSAT were introduced.
- RGB products as generated from Himawari-8 data over the Australasia-Pacific region were compared to METEOSAT RGB products and similarities and differences were noted.
- Animations of the Day Convection RGB product and the Airmass RGB product were assessed for usefulness over the Australasia-Pacific region.
- The Day Convection RGB and Night Microphysics RGB products were examined in greater detail for Australasian case studies.
- As a summary, the RGB products currently favoured by Bureau Forecasters were shown.
- "Forecaster Friendly" RGB reference sheets have been presented.
- Useful resources and references have been presented.