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# GHRSSST HW8 SST at ABOM

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GHRSSST XVII, Washington DC, 6<sup>th</sup>-10<sup>th</sup> June 2016



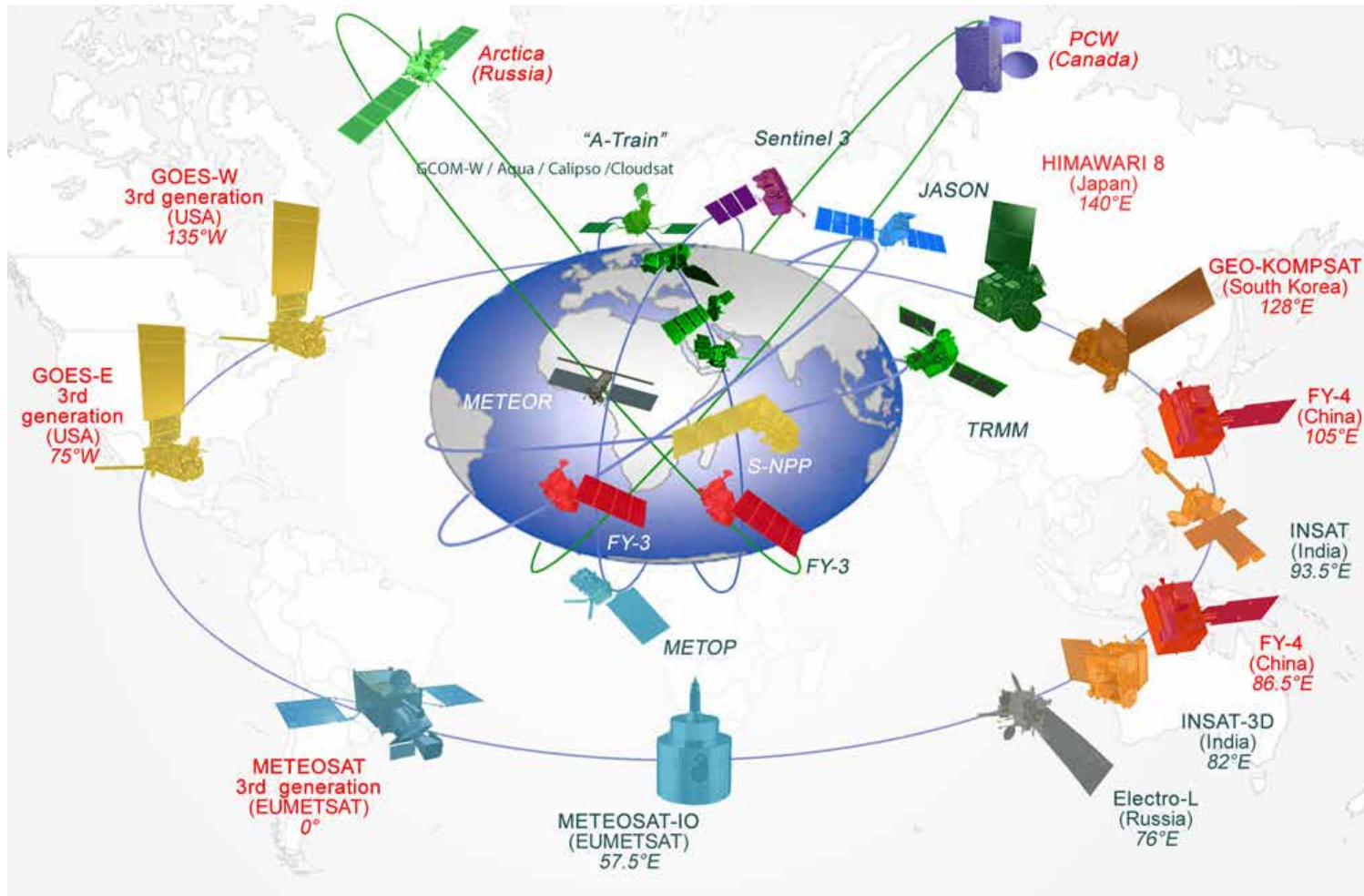
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# World Meteorological Organization

Weather • Climate • Water





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# What is provided

- "Full disk" L2P *skin* SST
  - One per satellite reception (up to every 10 min)
  - Nominally 2km resolution
- "GHRSSST" format
  - Lossless, compressed netCDF4
  - Projection information follows CF conventions
- Pixel by pixel
  - Skin Sea Surface Temperature
  - Quality
  - Bias and standard deviation estimates



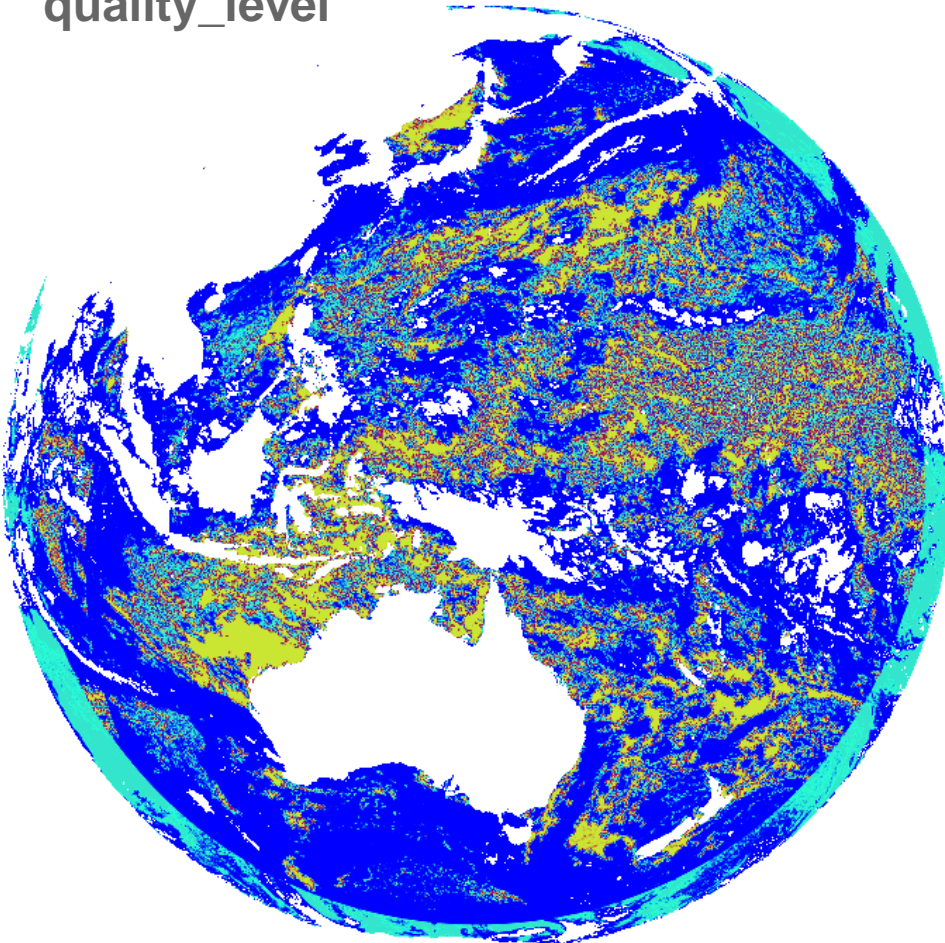


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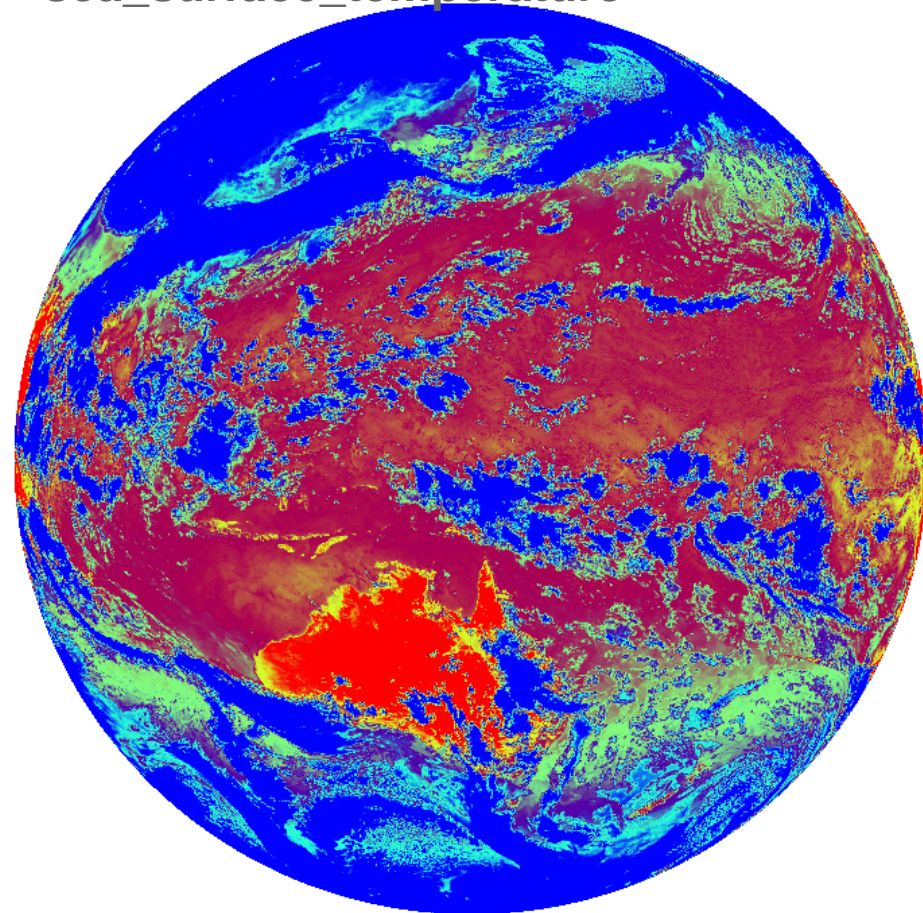
# What is provided

quality\_level



0 (blue) .... 4,5 (yellow/red)

sea\_surface\_temperature



270 K (blue) ...315 K (red)

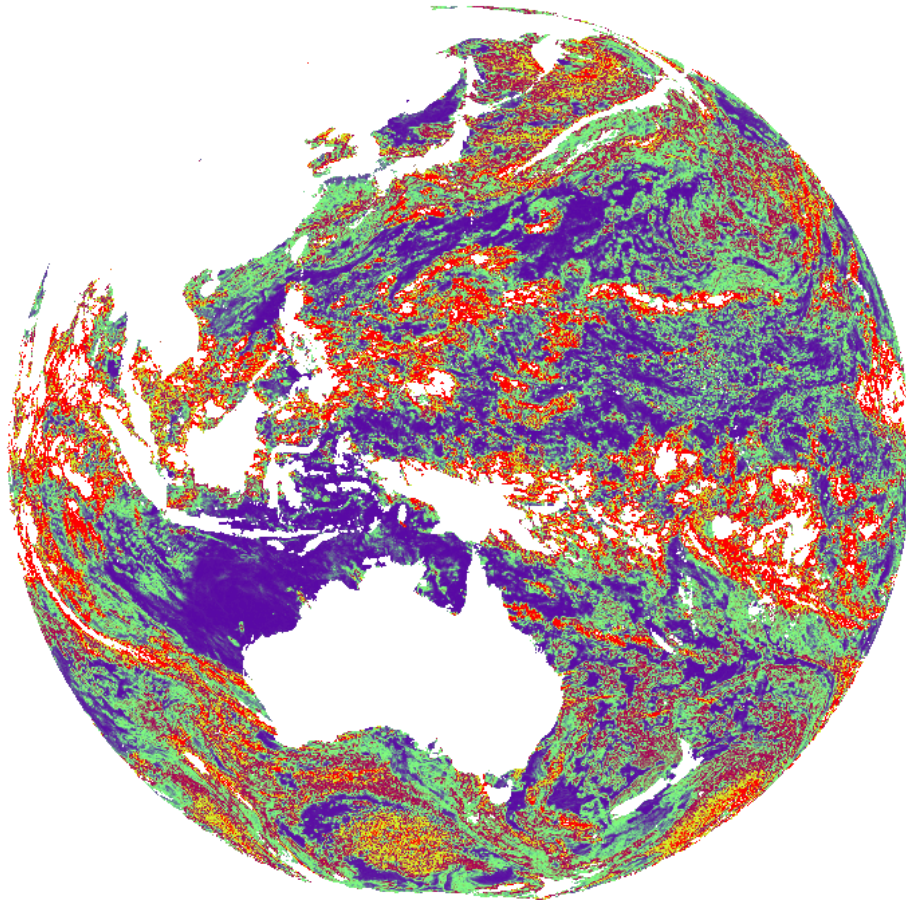


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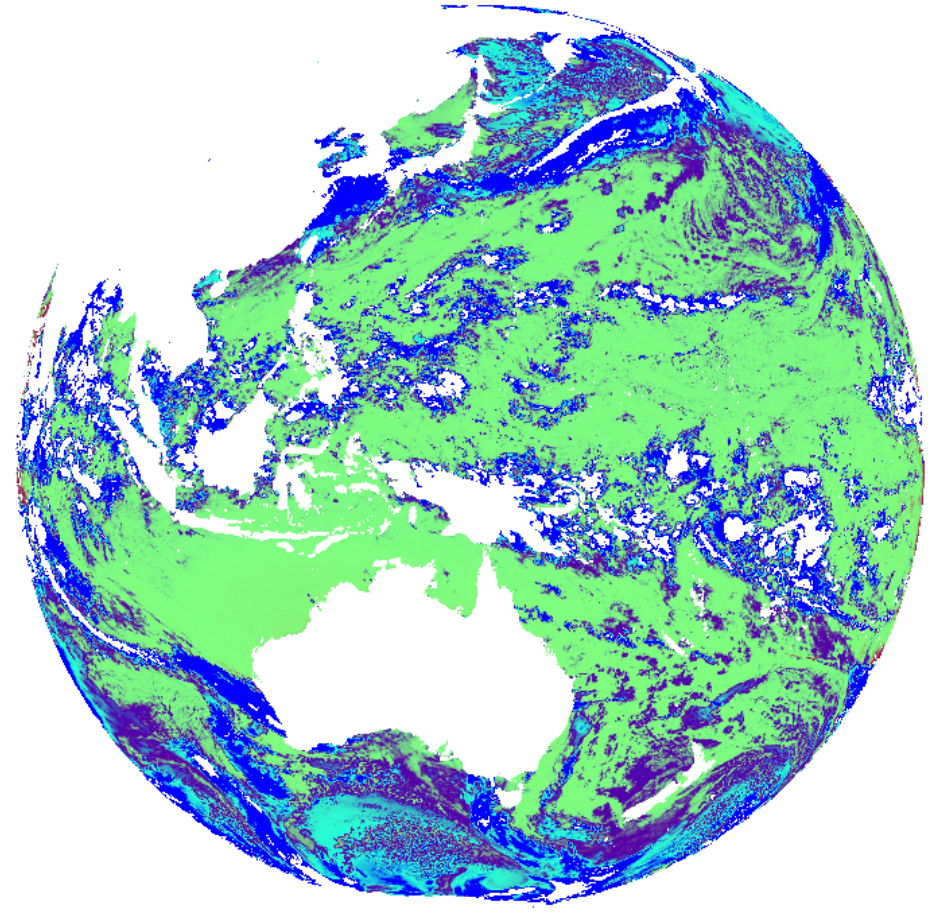
# What is provided

sses\_standard\_deviation



0 K (blue) ... 0.5 K (purple) ... 1.5 K (red)

sses\_bias



-1 K (blue) ... 1 K (red)



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# Our approach

1. TUNE: Use Suomi-NPP VIIRS SST L2P (NOAA-ACSPPO) (apply cool skin correction) as a "standard" for Himawari-8 brightness temperatures
2. RETRIEVE: Determine Himawari-8 SST from the regressed rule(s)
3. SSES: Validate against drifting buoys – model bias and standard deviation. (near real time model)
4. SSES: Validation over longer time series which adjusts bias and standard deviation models. ("delayed" model)
5. Repeat 4 relatively frequently, repeat 1 infrequently



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# Algorithm(s)

- Regressed - Single (LRG2.12)
  - One equation for Day and Night
  - No day/night algebraic discontinuity
  - Long wave length infra-red
- Regressed - Dual (LRG2.16)
  - One algorithm for Day
  - One algorithm for Night
  - Algorithms are independent
  - Shorter wave length infra-red is used at night



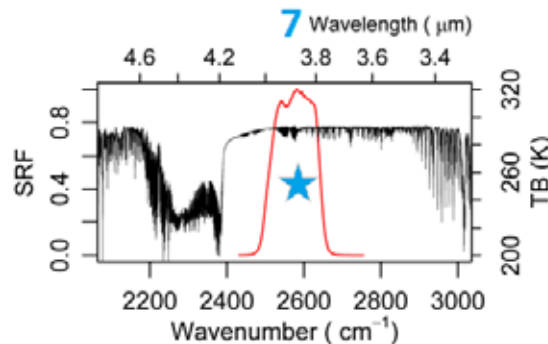
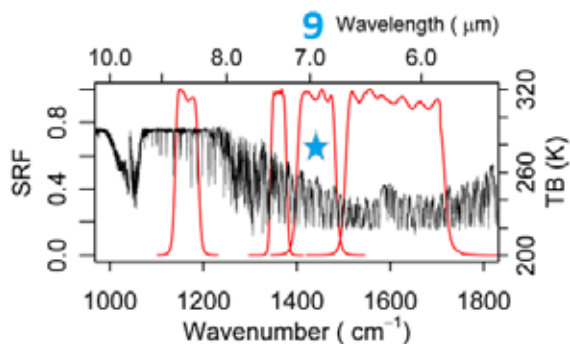
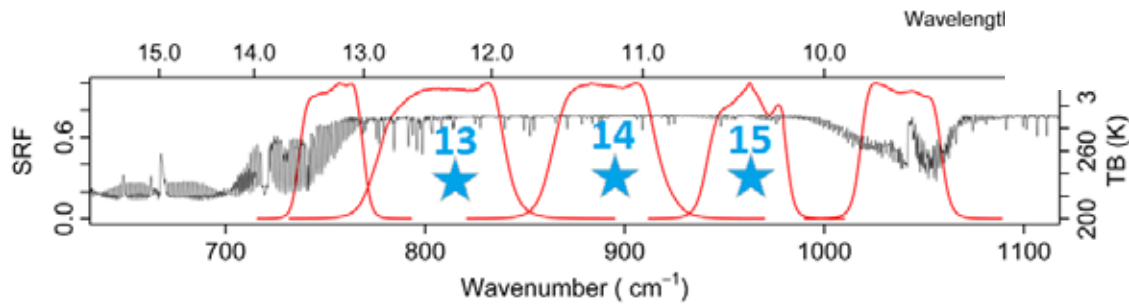
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# Day/Night regression LRG2.12

$$\begin{aligned} \text{SST} = & \text{BT}_9 (a_9 + g_9(\sec \theta_z - 1)) + \\ & \text{BT}_{13} (a_{13} + g_{13}(\sec \theta_z - 1)) + \\ & \text{BT}_{14} (a_{14} + g_{14}(\sec \theta_z - 1)) + \\ & \text{BT}_{15} (a_{15} + g_{15}(\sec \theta_z - 1)) + \\ & T_0 \end{aligned}$$

SRFs of Himawari-8/AHI Infrared Bands (September 2013)







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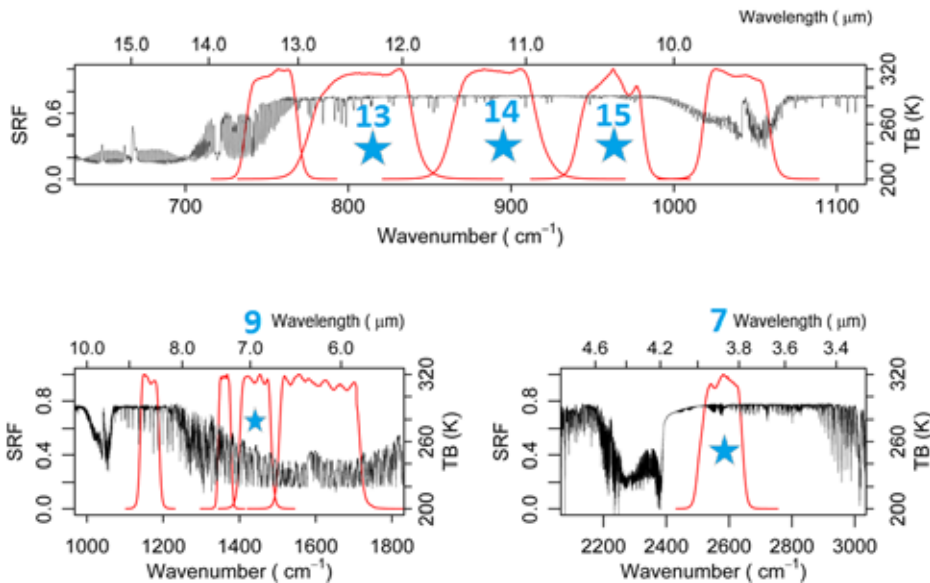
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# Dual regression LRG2.16

$$\begin{aligned} \text{SST}_{\text{day}} = & \text{BT}_9 (d_9 + g_9(\sec \theta_z - 1)) + \\ & \text{BT}_{13} (d_{13} + g_{13}(\sec \theta_z - 1)) + \\ & \text{BT}_{14} (d_{14} + g_{14}(\sec \theta_z - 1)) + \\ & \text{BT}_{15} (d_{15} + g_{15}(\sec \theta_z - 1)) + \\ & T_0 \end{aligned}$$

$$\begin{aligned} \text{SST}_{\text{night}} = & \text{BT}_7 (n_7 + h_7(\sec \theta_z - 1)) + \\ & \text{BT}_9 (n_9 + h_9(\sec \theta_z - 1)) + \\ & \text{BT}_{13} (n_{13} + h_{13}(\sec \theta_z - 1)) + \\ & \text{BT}_{14} (n_{14} + h_{14}(\sec \theta_z - 1)) + \\ & \text{BT}_{15} (n_{15} + h_{15}(\sec \theta_z - 1)) + \\ & T_0 \end{aligned}$$

SRFs of Himawari-8/AHI Infrared Bands (September 2013)





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# Large sample "problem"

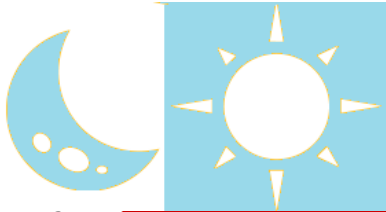
- Huge number of matches
- Fitting is optimized for overall RMS error
- Thinned by simple random sampling
- Matches are weighted based on their frequency in a phase space that includes view angles, brightness temperatures, latitude and sea surface temperatures.



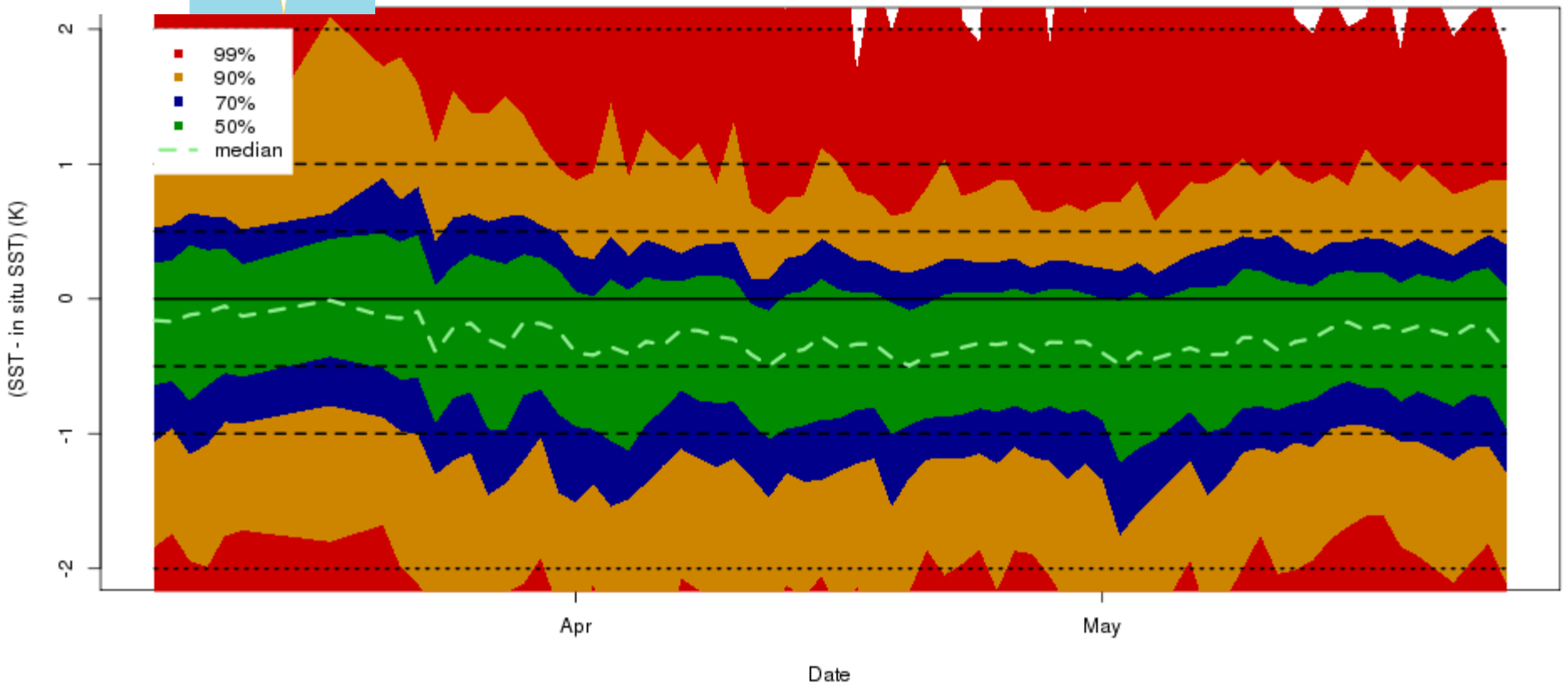
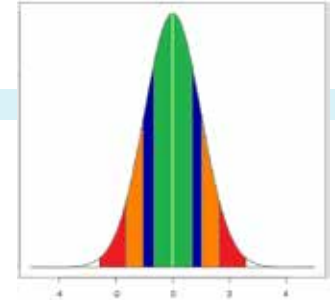
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# Validation - Single regression



GHRSSST L2P LRG2.12 HW8 SST Single (Day and Night) Algorithm, daily  
Distribution Himawari-8 , last 78 days, 2016-03-08 to 2016-05-24

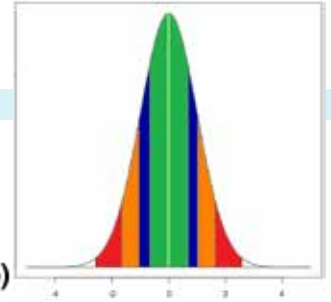




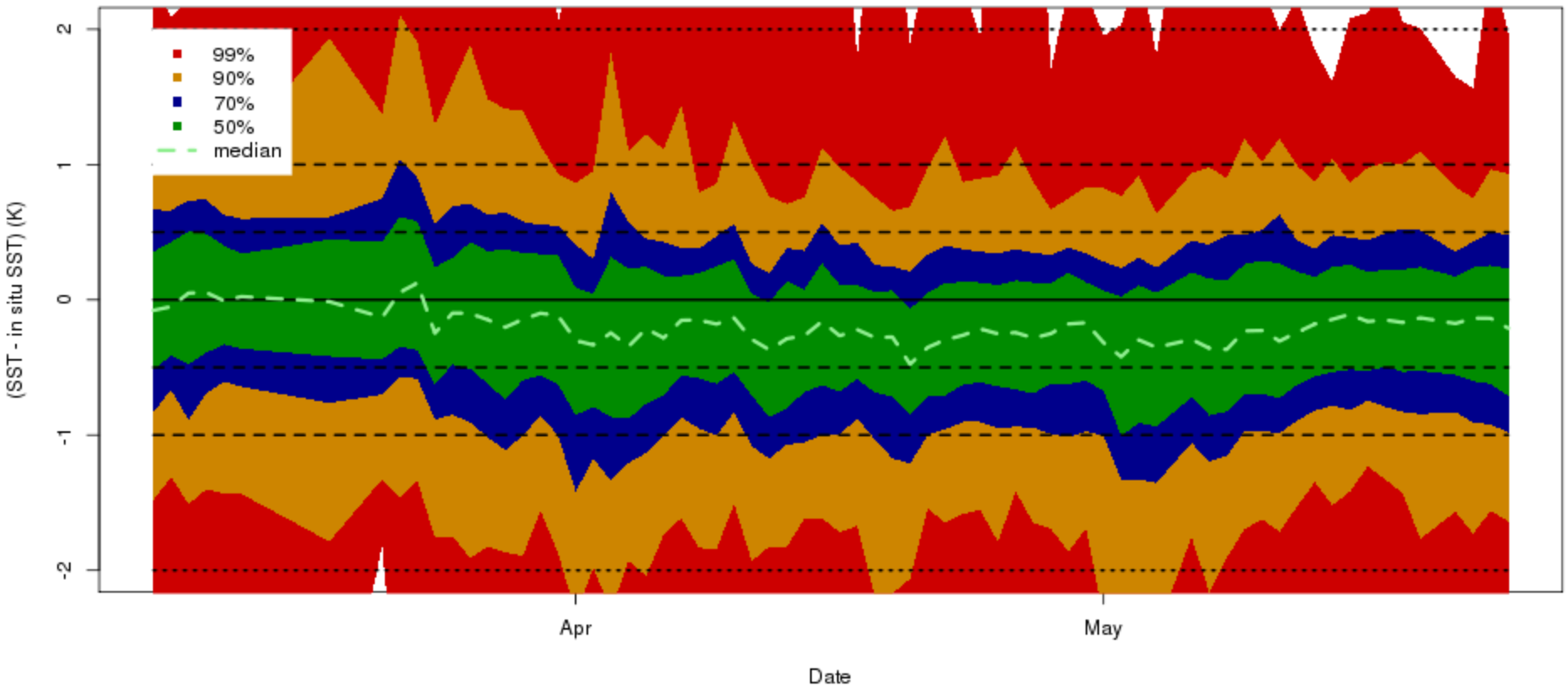
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# Validation - Single regression



GHRSSST L2P LRG2.12 HW8 SST Single (Day and Night) Algorithm, daily (day time)  
Distribution Himawari-8 , last 78 days, 2016-03-08 to 2016-05-24

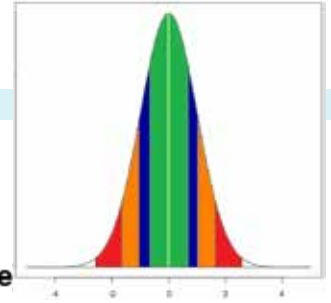




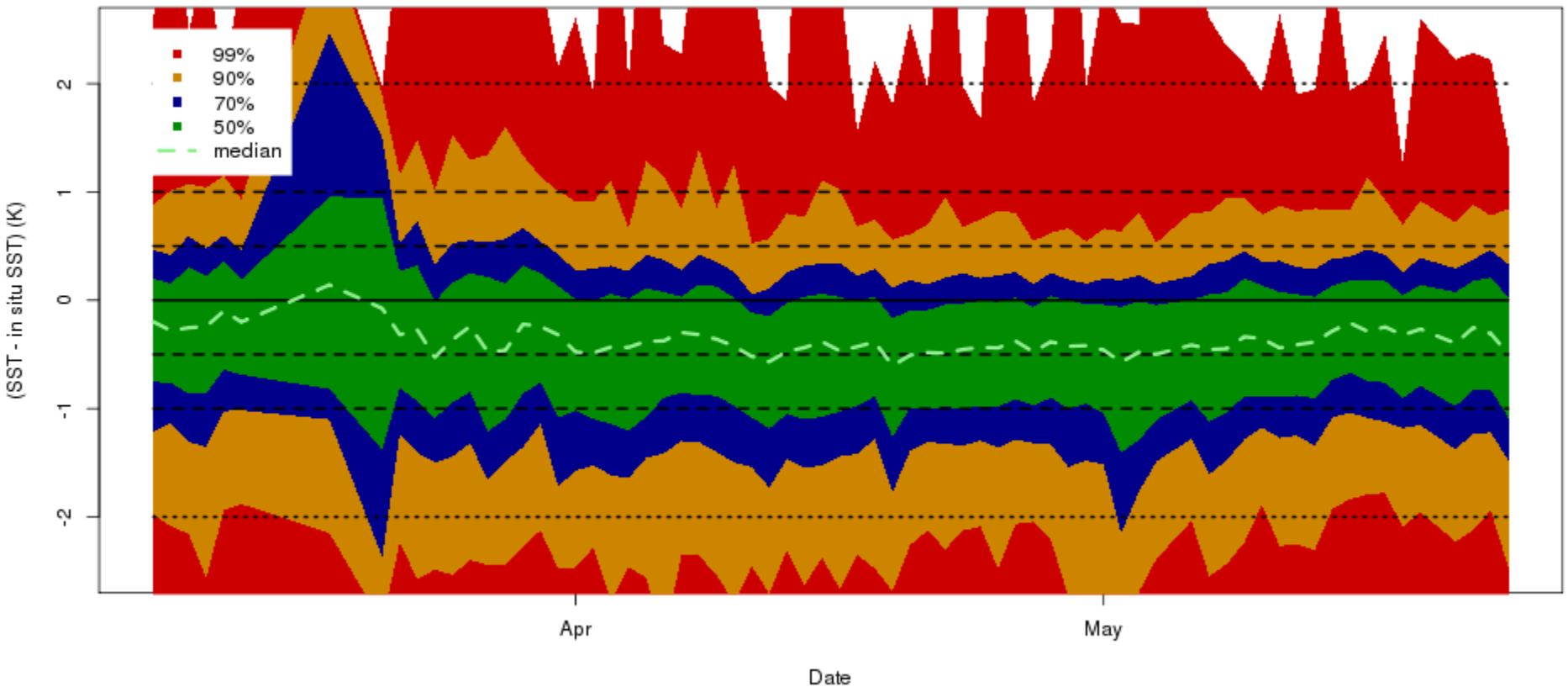
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# Validation - Single regression



GHRSSST L2P LRG2.12 HW8 SST Single (Day and Night) Algorithm, daily (night time)  
Distribution Himawari-8 , last 78 days, 2016-03-08 to 2016-05-24



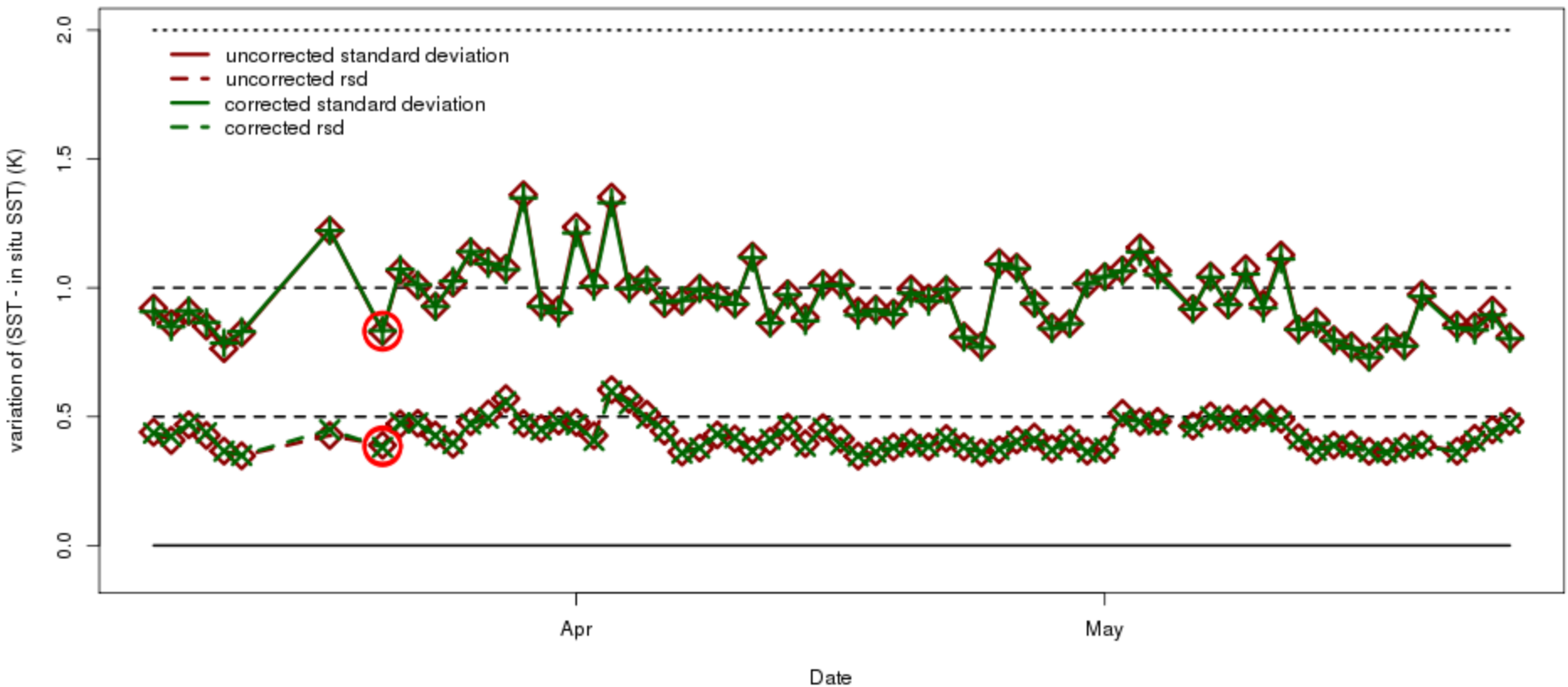


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# Validation - Single regression

GHRSSST L2P LRG2.12 HW8 SST Single (Day and Night) Algorithm, daily (day time)  
Deviations Himawari-8 , last 78 days, 2016-03-08 to 2016-05-24



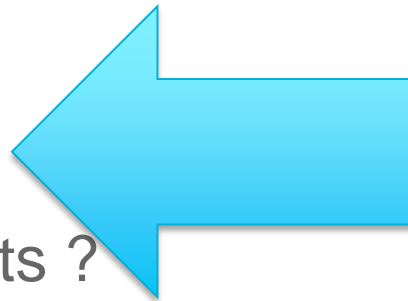


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# Products ?

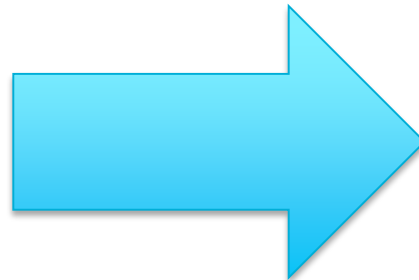
- Hourly
  - Median SST ?
  - With diurnal components ?
  - With indications of cloud coverage ?



- Daily (especially night)
  - 15 to 5 degrees before local sunrise

• Interpolated

• Gap filled



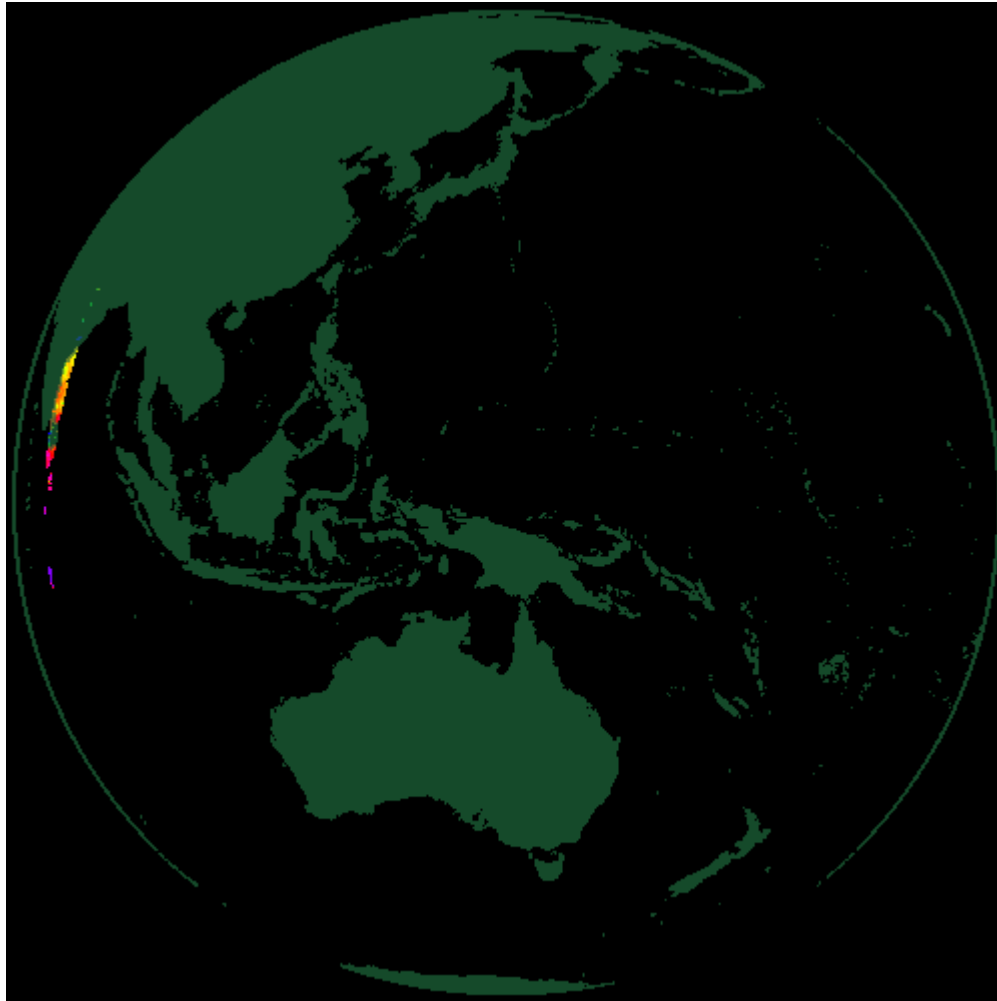
Preserve measurements



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# Products ?







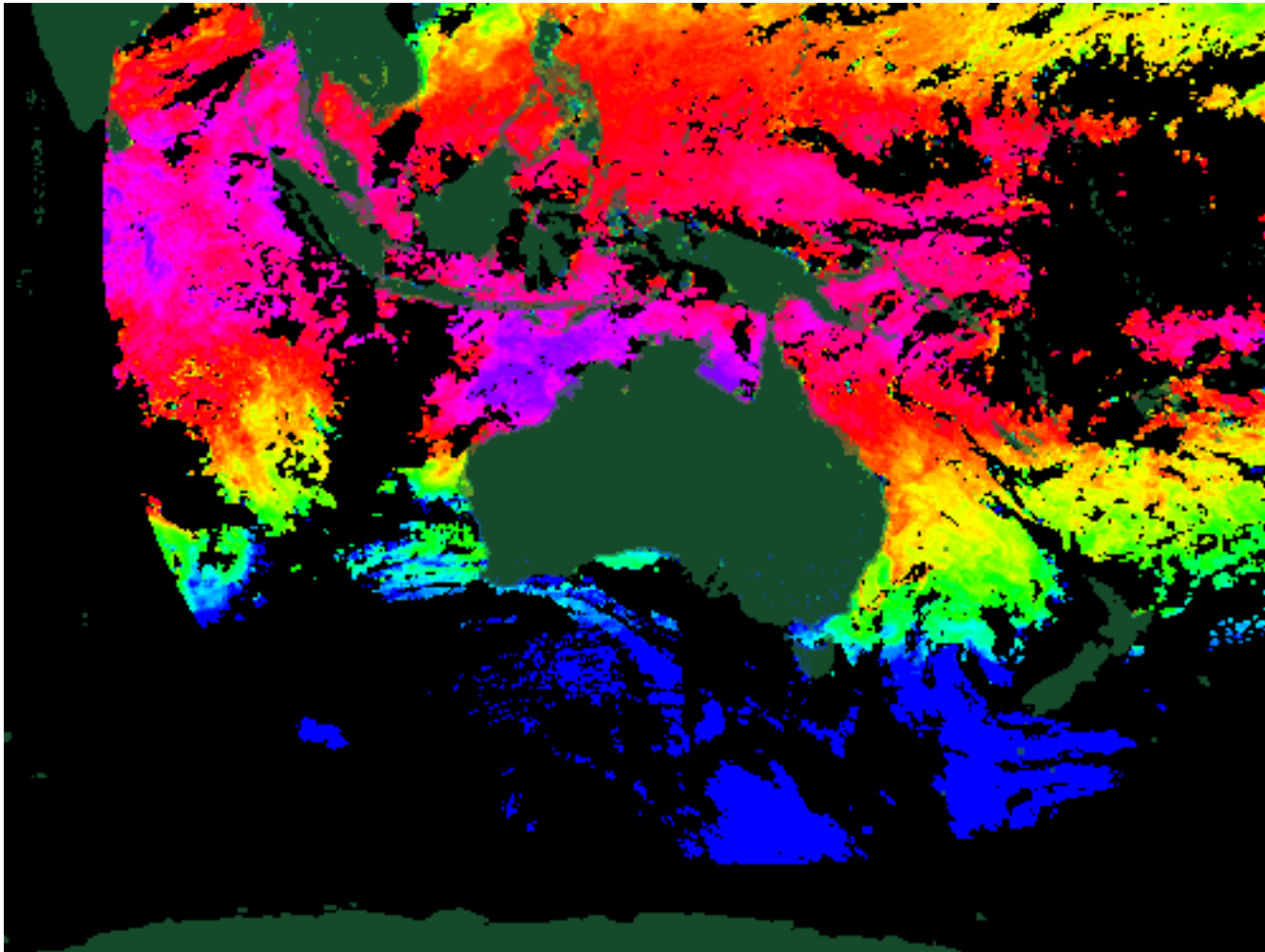
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# Products ?



Integrated **Marine**  
**Observing** System





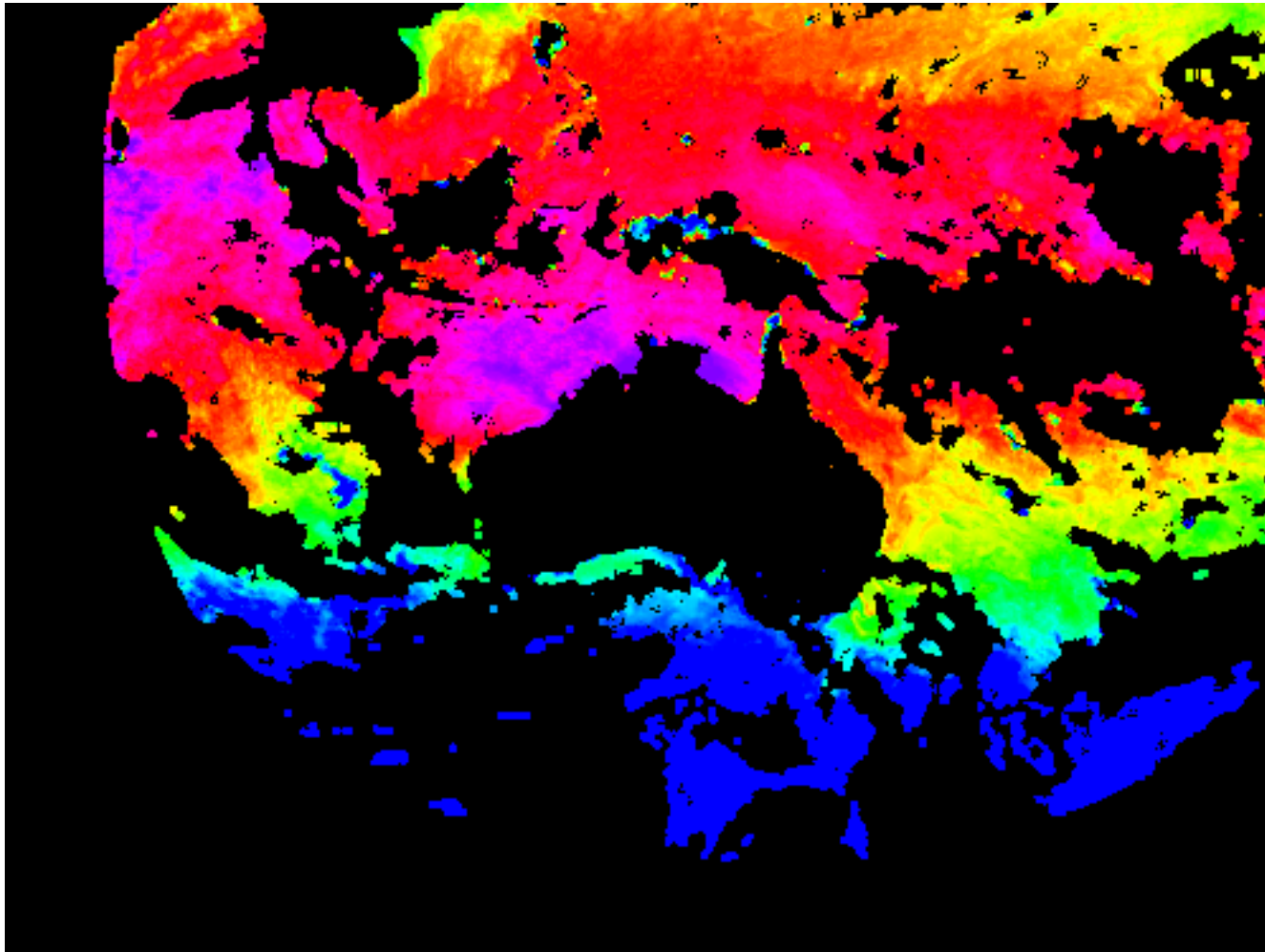
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# Products ?



Integrated **Marine**  
**Observing** System

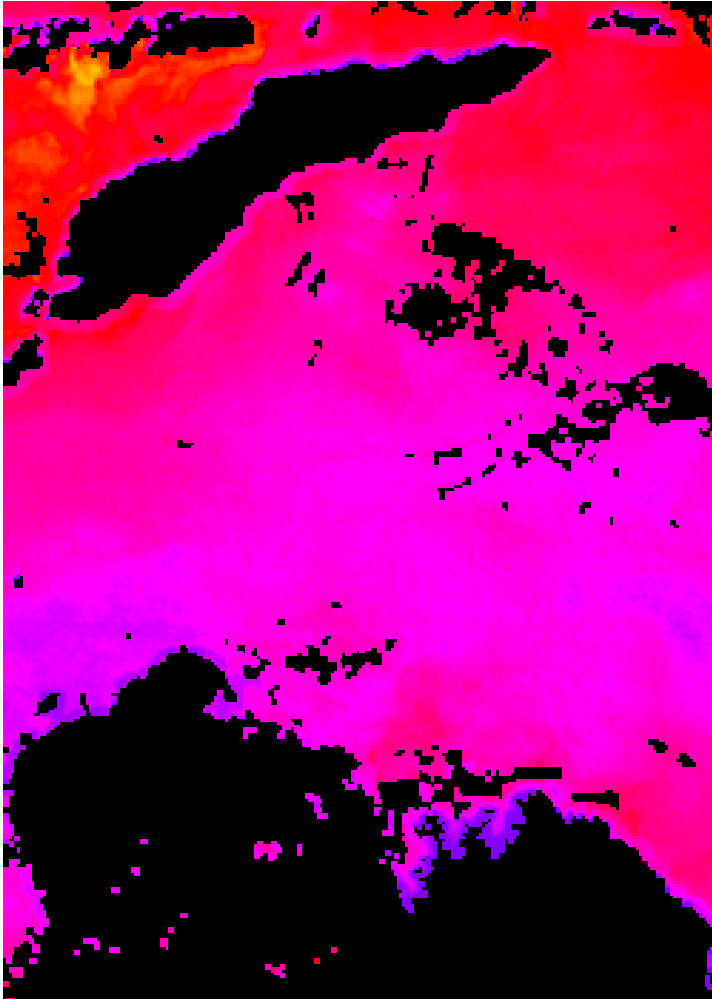




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# Areas for improvement



- Coastal warming is (somewhat ??) resolved.
- Diurnal warming is seen.

However:

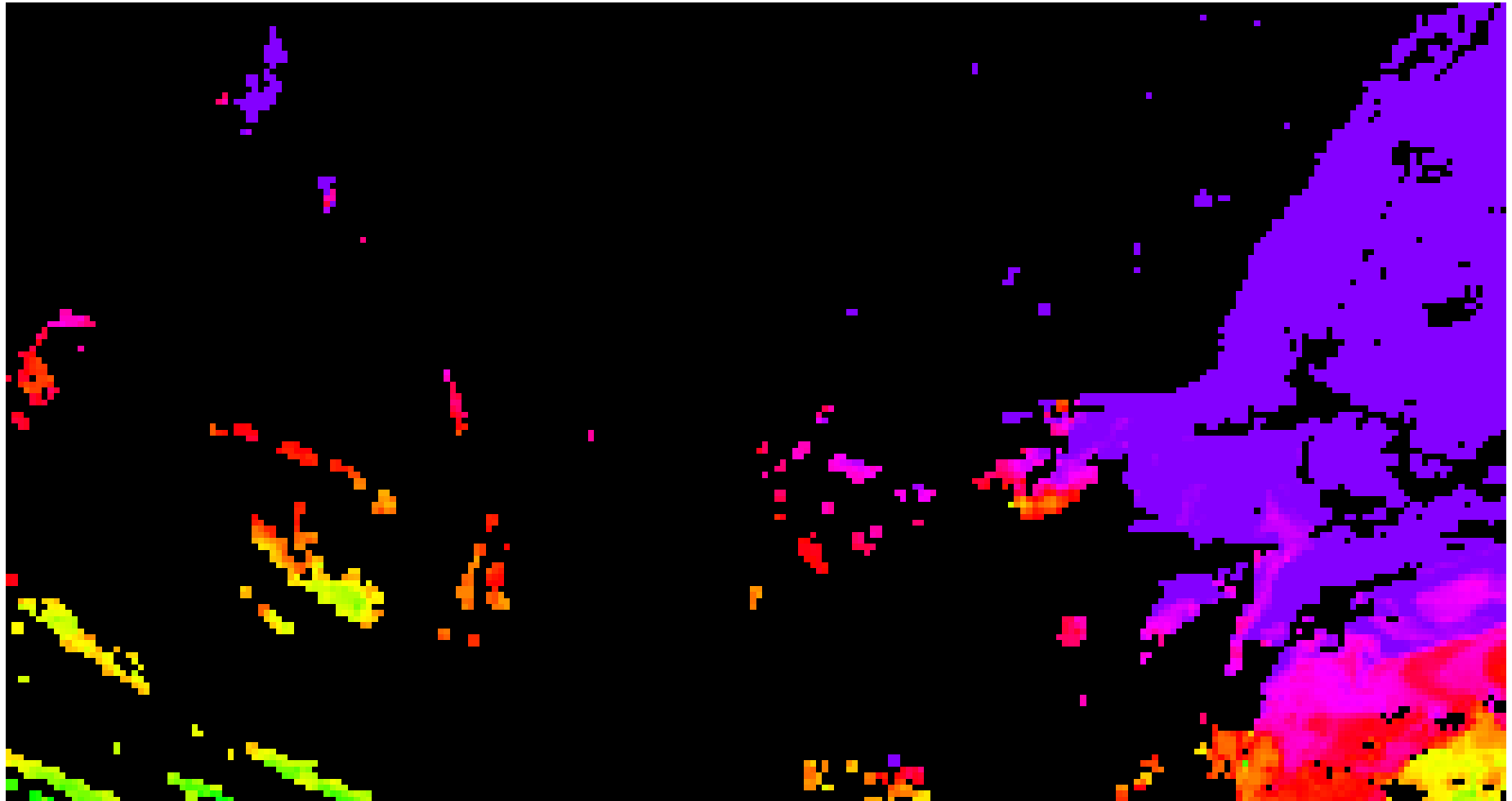
- Cloud identification is problematic.
- The baseline SEVIRI cloud mask (as implemented in GEOCAT) is in the process of being tuned.
- Better use of temporal information



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# Areas for improvement





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# Access

Access: Limited at the moment

General GHRSSST / IMOS contact:

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General HW8 / Validation contact:

Chris Griffin: [C.Griffin@bom.gov.au](mailto:C.Griffin@bom.gov.au)



**KEEP  
CALM  
AND  
WATCH THIS  
SPACE!**



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# Questions ?

*Thank  
You*

**Christopher Griffin [cgriffin@bom.gov.au](mailto:cgriffin@bom.gov.au)**