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Harmonized Quality Assessments Using GHR SST SSES

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Problem !

- Our users require gap free, best quality, best accuracy, high resolution, skin, close to the coast, (in bays and inland lakes) SST, based on *real* measurements from operational real-time (= within an hour of reception if possible) systems.
- For research we want this from the beginning of time.
- L4 interpolated products ?
 - Some are ok with level 4 products
 - Some are not, because of the spatial smoothing and interpolation – high frequency detail is washed out, and there is often a longer delay before availability.



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Solution ?

- Geostationary Satellites like Himawari-8, GOES, METEOSAT...



- Polar orbital satellites like MetOP, NPP, legacy NOAA, Sentinel...



World Meteorological Organization
Weather • Climate • Water



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Solution ????

- GHR SST "L3S" multi-sensor composites
 - But for best quality we need to know which measurements are "best"
 - Algorithmic
 - Application
 - Seasonal
 - Platform
 - Sensor





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Best Quality ?

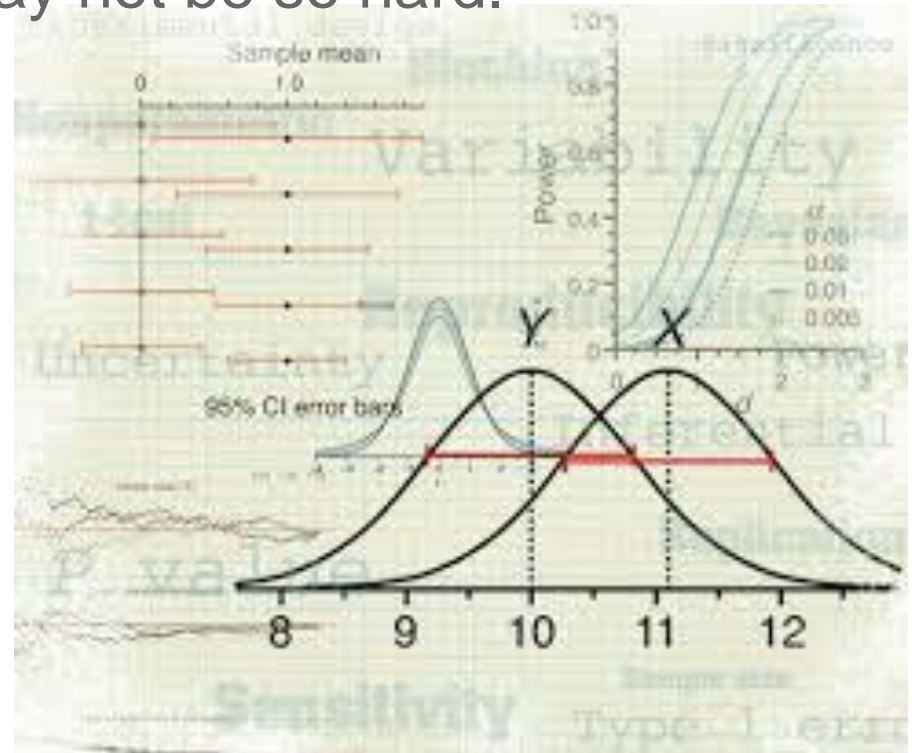
- There should be a solution that is almost statistical
 - GHRSSST products bury the geophysical bits.
 - The first approximation may not be so hard.

sses_bias

sses_standard_deviation

quality_level

ancillary information





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Comparison ?

Only consider the best quality_level...

then do statistics with variances and biases, etc

But...

- How does it change over time ?
- How can high quality from one source be compared to high quality from another source ?
- Given the information we provide, is this a statistical problem or a geophysical one ?



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Toy problem !

- ABOM has a long time series HRIT record of NOAA-AVHRR
 - Has been converted to 1km SST over 20+ years
 - Now past end of life
- NPP-VIIRS and MetOp time series are available
 - ACSPO NPP-VIIRS L3U SST is available in real time
 - Better coverage, similar resolution
 - How do we aggregate it with NOAA ?

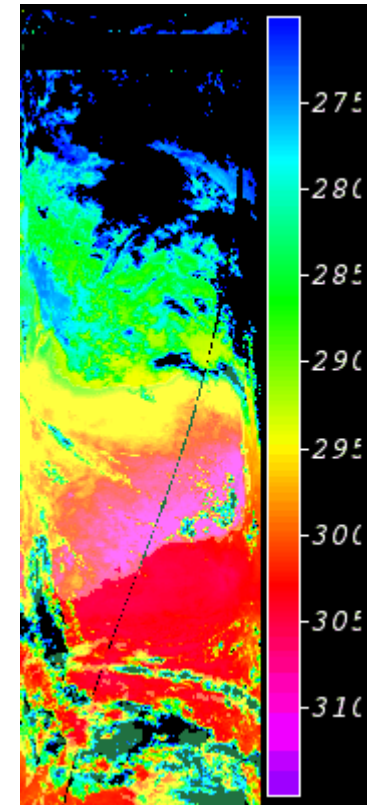
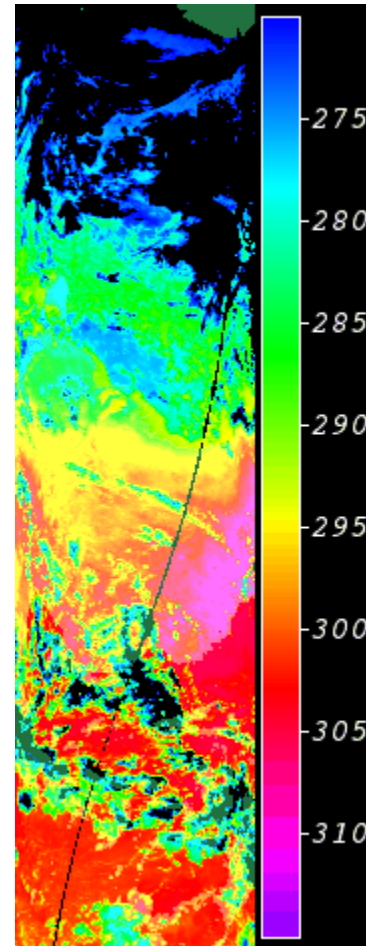
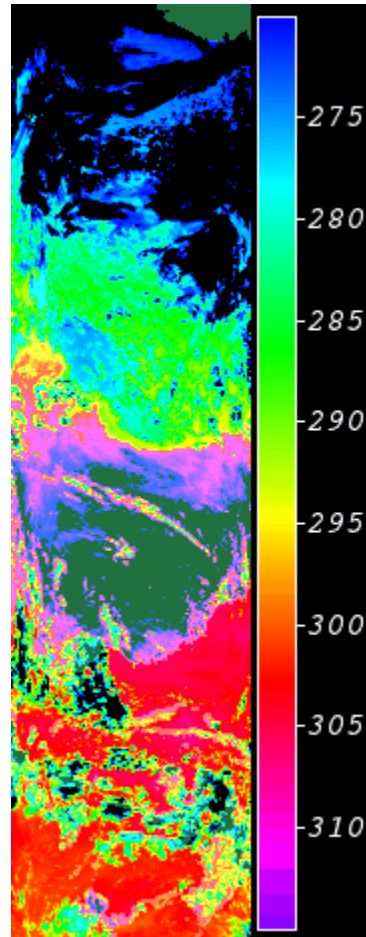




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Toy problem !



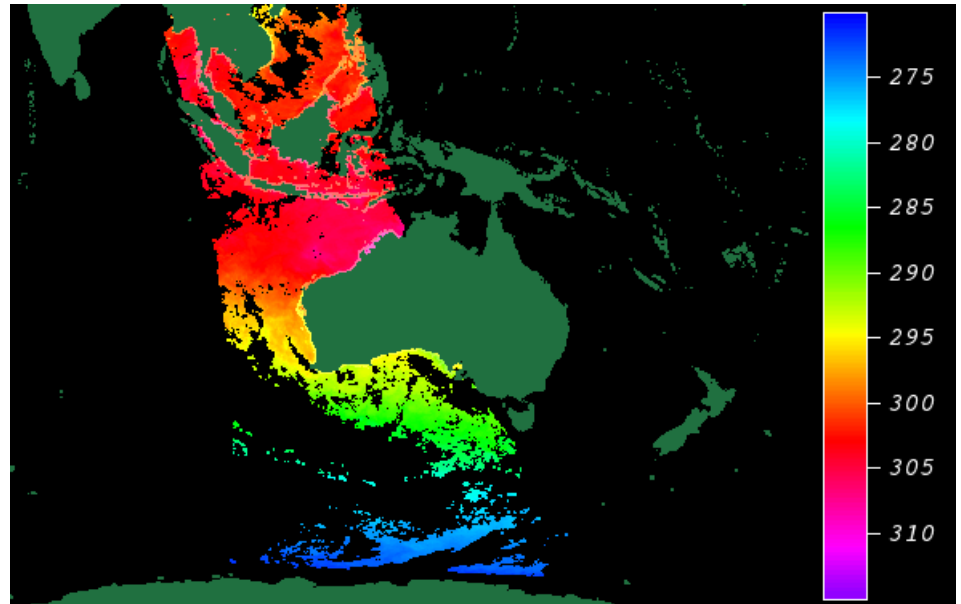
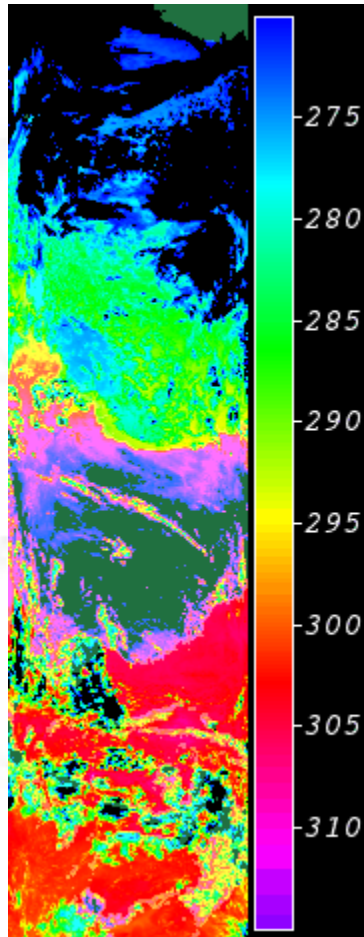
NOAA 19, 18, 15



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Toy problem !





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Toy problem !

- Take the best quality measurements from both images
 - best quality NOAA-15 retrieval of the same value as a best quality NOAA-19 retrieval ?
 - the same value as a best quality NPP-VIIRS retrieval ?
- Need another definition of "quality" that is good over time and platform, that downgrades the view by view quality,

$$\text{quality_level} \rightarrow \min(\text{quality_level}, q_s)$$



A simple proposal

$$q_s = \left[5 \exp^{7q_{sses}} \right]$$

Scale

Bias target is zero

$$q_{sses} = \frac{1}{\sqrt{2}} \sqrt{\max \left(\left(\frac{\sigma_{sses}}{\sigma_0} \right)^2 + \left(\frac{\mu_{sses} - \mu_0}{\sigma_{sses}} \right)^2 - 1, 0 \right)}$$

Lower bound of uncertainty, 0.2K

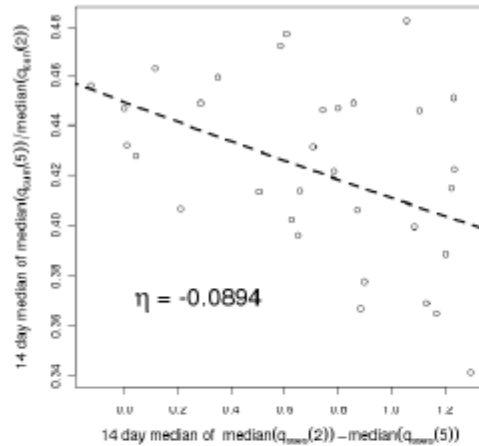


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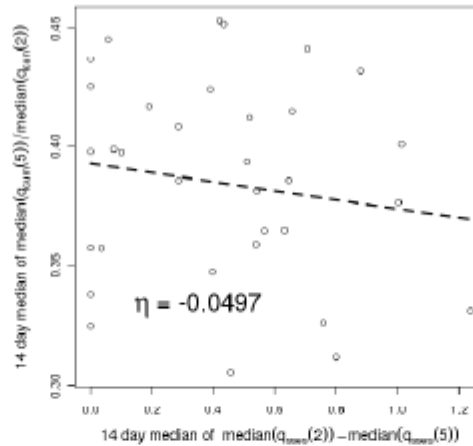
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Setting scale

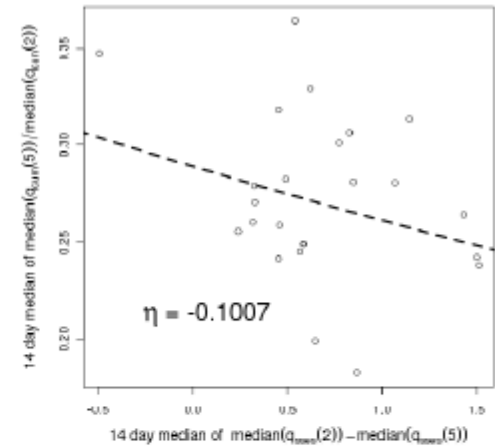
NOAA-19, L2P fv01, Jan 1 2015 to March 31 2016



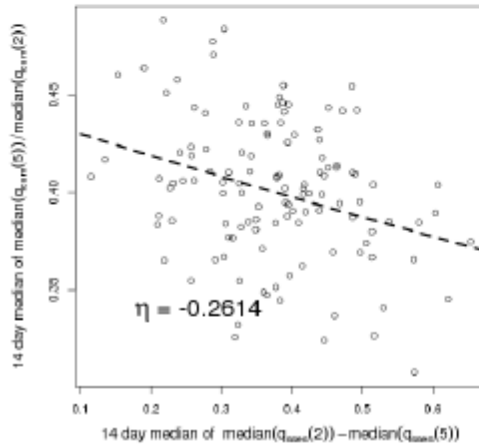
NOAA-18, L2P fv01, Jan 1 2015 to March 31 2016



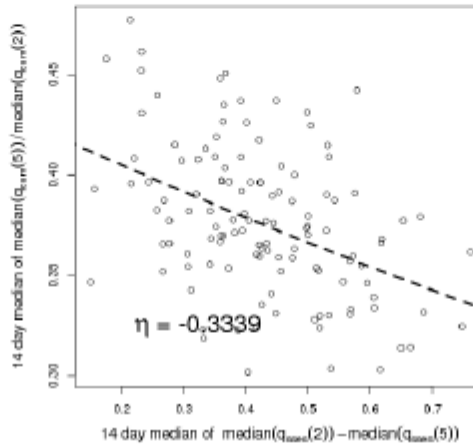
NOAA-15, L2P fv01, Jan 1 2015 to March 31 2016



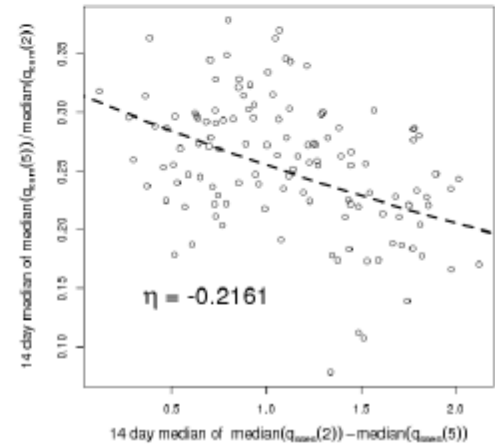
NOAA-19, L2P fv02, Jan 1 2010 to Aug 23 2014



NOAA-18, L2P fv02, Jan 1 2010 to Aug 23 2014



NOAA-15, L2P fv02, Jan 1 2010 to Aug 23 2014

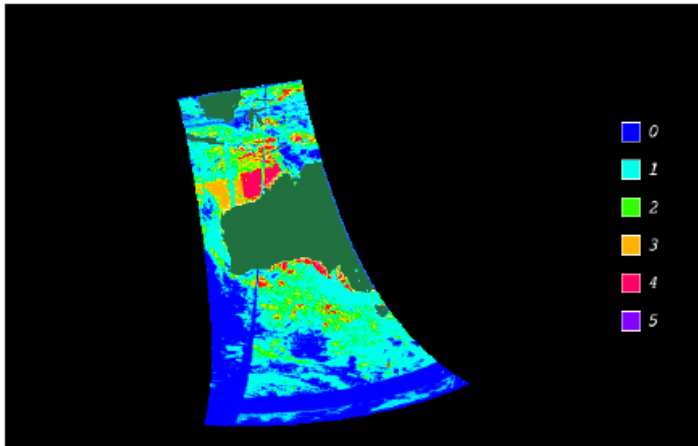




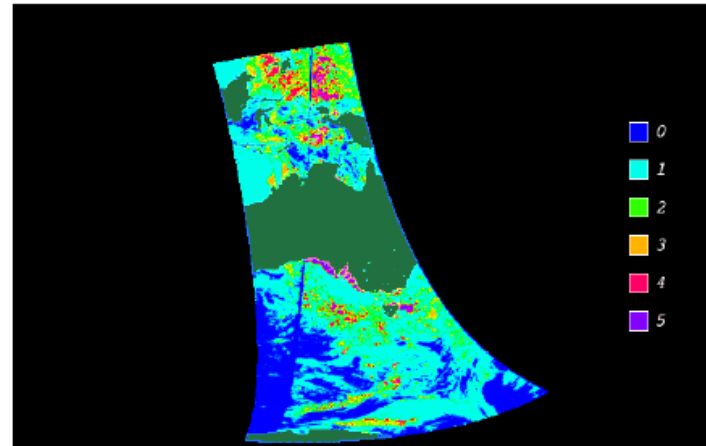
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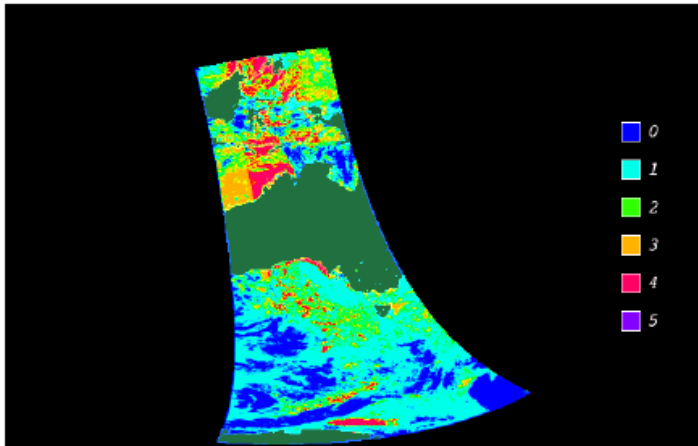
Does it help ?



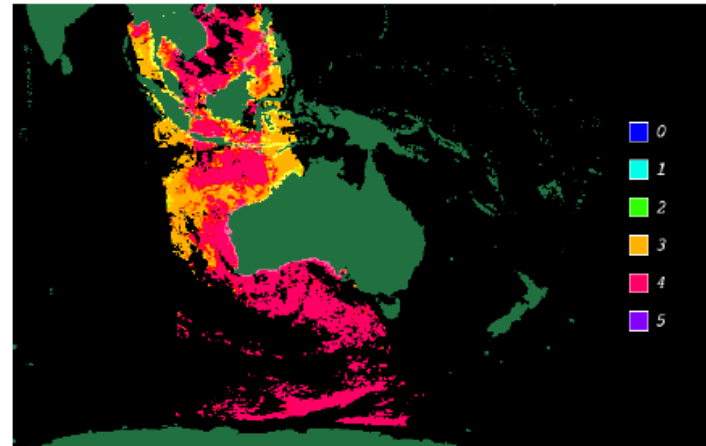
NOAA-15 fv01 L3U



NOAA-18 fv01 L3U



NOAA-19 fv01 L3U



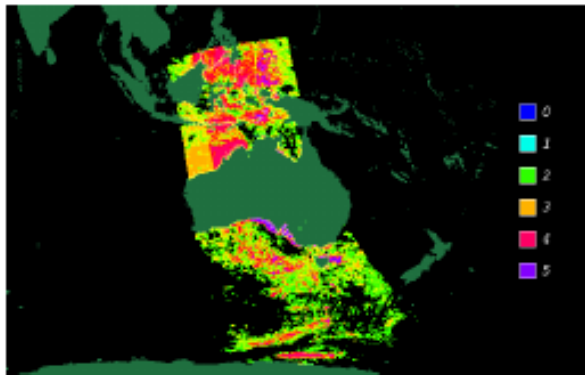
L3U NPP VIIRS



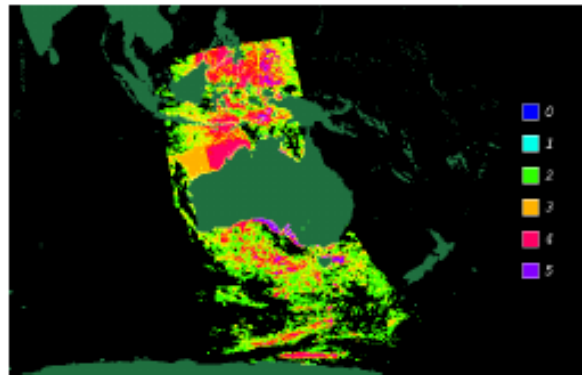
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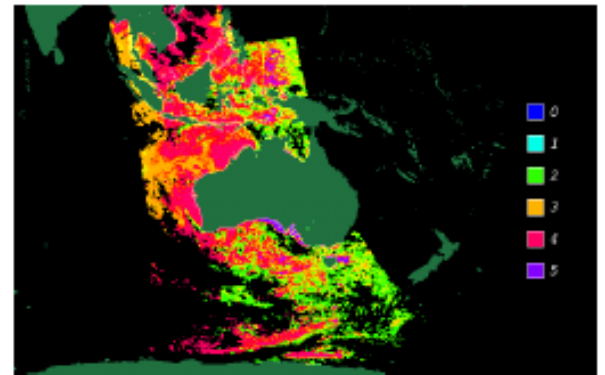
Does it help ?



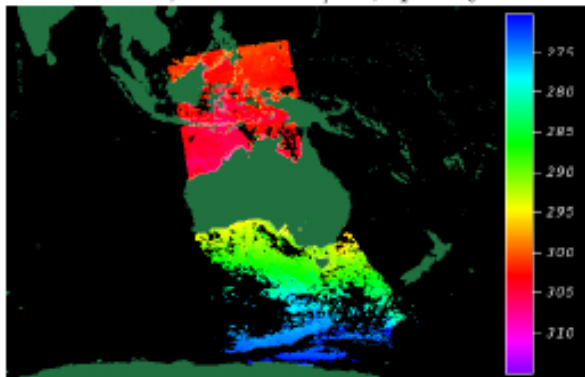
SST, NOAA-18/19, quality



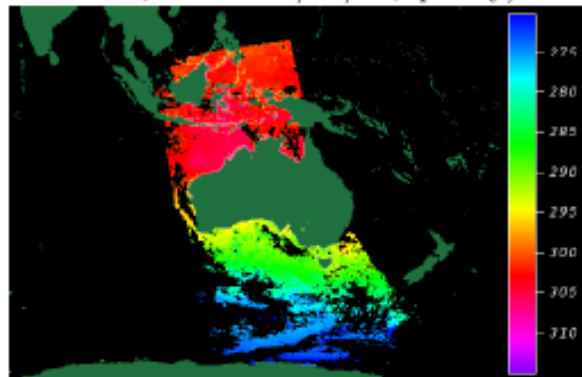
SST, NOAA-15/18/19, quality)



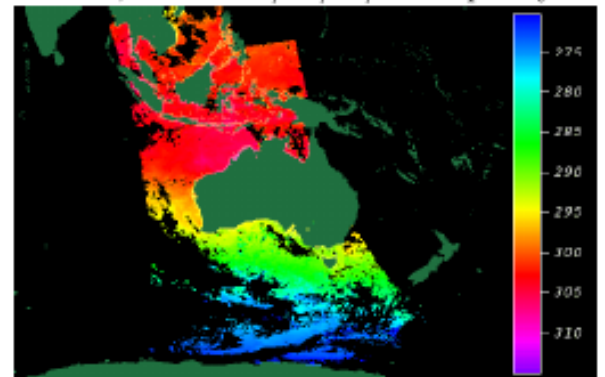
SST, NOAA-15/18/19/NPP quality



SST, NOAA-18/19, SST



SST, NOAA-15/18/19, SST



SST, NOAA-15/18/19/NPP SST



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Does it work ?

- Validation results cannot be worse than any one platform
 - We take the best quality measurements from each.
- Coverage is guaranteed to be greater
 - There are more sources
- Time (and a little more work) will tell how significant the validation results are.
- Similar approach for merging with Himawari-8





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Questions ?

*Thank
You*

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