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IMOS Integrated Marine Observing System

Use of ACSPO VIIRS L3U SST in the Australian Bureau of Meteorology

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Background

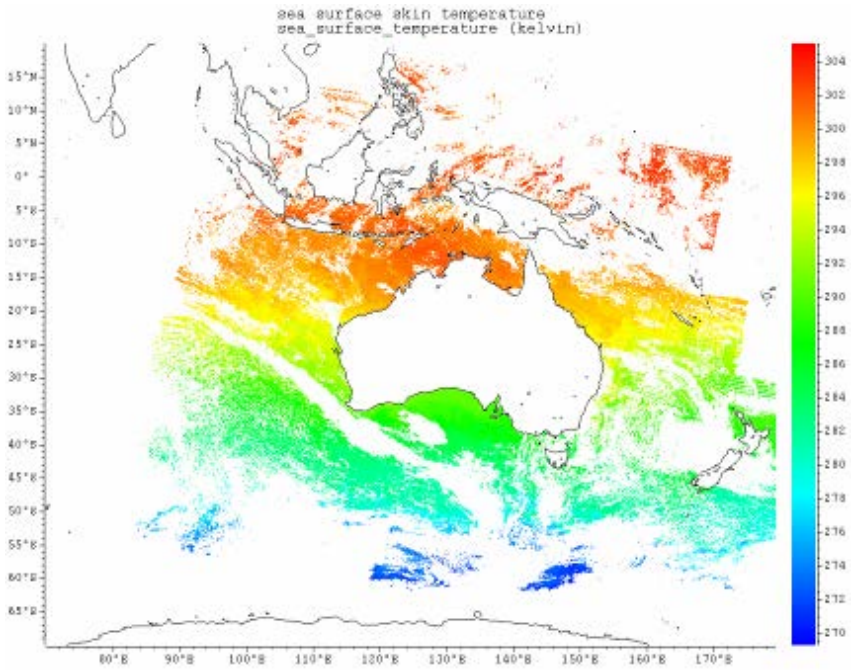
- ABoM currently uses NAVOCEANO's 9 km x 4 km global AVHRR SST data from NOAA-18/19 and METOP-A/B in operational SST analyses and ocean models
- ABoM produces GHRSST L2P, L3U, L3C and L3S products from HRPT AVHRR SST data from NOAA satellites for IMOS Project and operational ABoM systems
- Need Suomi-NPP VIIRS SSTs for above systems as a follow-on to NOAA-19 AVHRR SST
- Unable to access VIIRS L2P SST via FTP in real-time due to high volumes so requested ACSPO produce lower resolution VIIRS L3U files
- NOAA/NESDIS/STAR produces ACSPO VIIRS 0.02º L3U product with grid aligned with IMOS 0.02º L3U product
- ABoM testing these products for operational systems

IMOS HRPT AVHRR SST GHRSST products

http://imos.org.au/sstproducts.html

- ABoM and CSIRO have raw 1 km HRPT AVHRR data from NOAA-11 to NOAA-19 from groundstations in Australia and Antarctica
- As part of IMOS, ABoM has produced GHRSST products (L2P and 0.02º gridded L3U, L3C, L3S) over two domains (Australia and Southern Ocean) from 1992 to present
- Could ACSPO VIIRS 0.02º L3U SST help improve the IMOS L3S spatial coverage?

IMOS 1-night L3S



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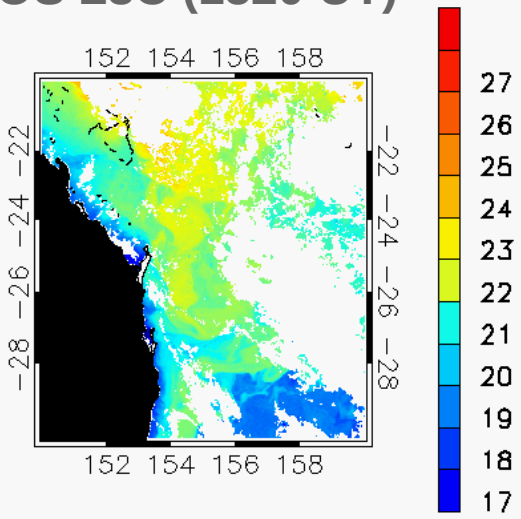
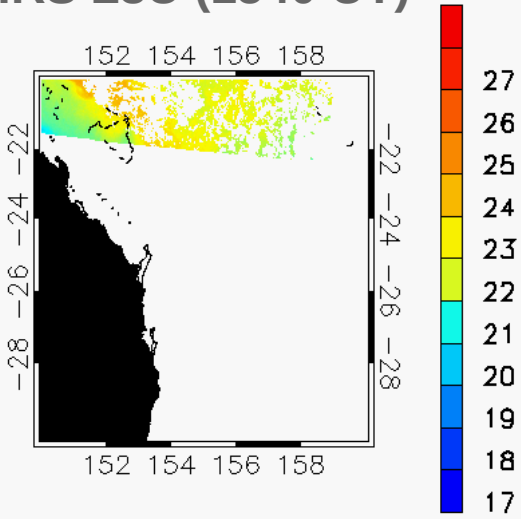
IMOS NOAA-19 fv01 L3C SSTskin vs bias-corrected VIIRS L3U SSTsubskin Queensland Coast: 17 Aug 2015 Night

IMOS L3C (1520 UT)



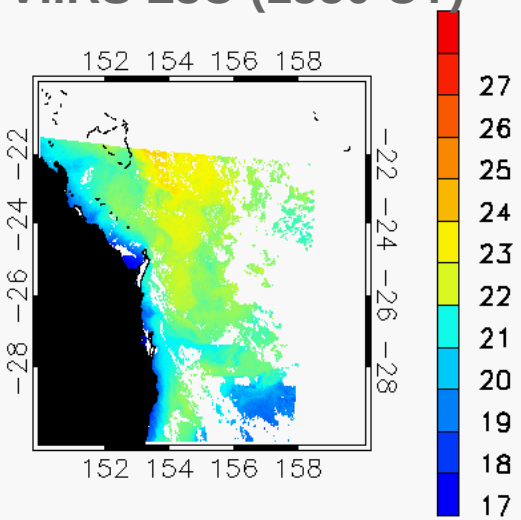
QL ≥ 3

VIIRS L3U (1540 UT)



QL = 5

VIIRS L3U (1550 UT)



QL = 5

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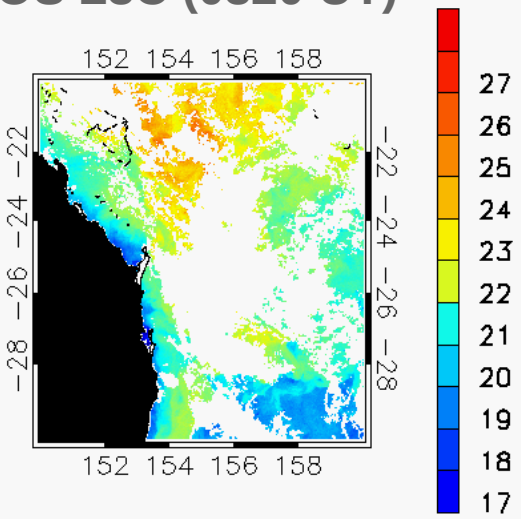
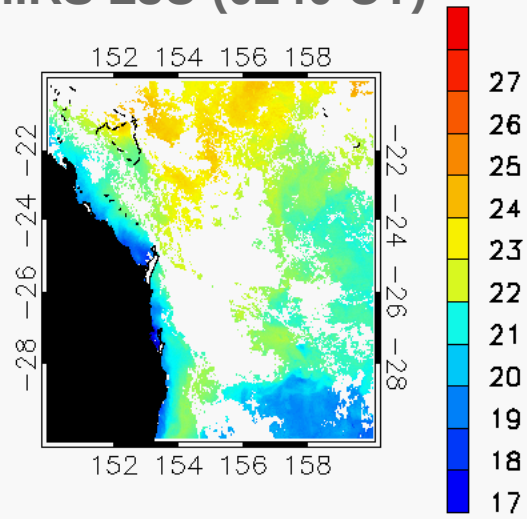
IMOS NOAA-19 fv01 L3C SSTskin vs bias-corrected VIIRS L3U SSTsubskin Queensland Coast: 17 Aug 2015 Day

IMOS L3C (0320 UT)



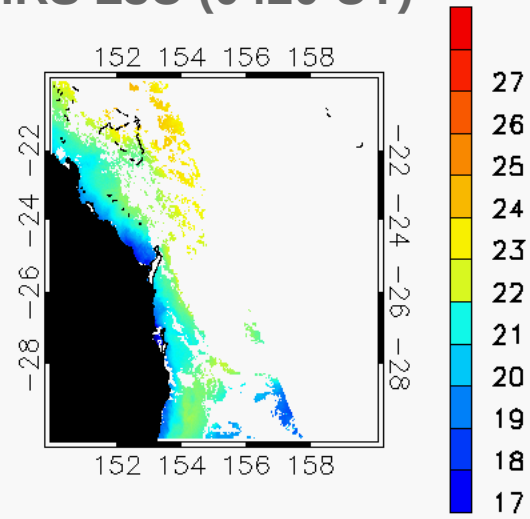
QL ≥ 3

VIIRS L3U (0240 UT)



QL = 5

VIIRS L3U (0420 UT)



QL = 5

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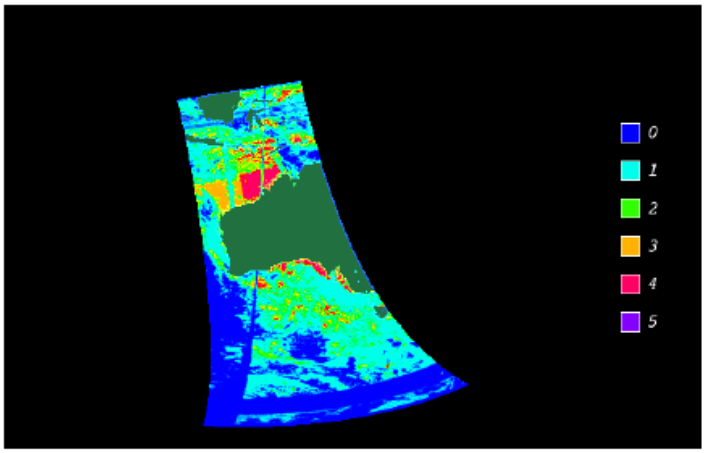
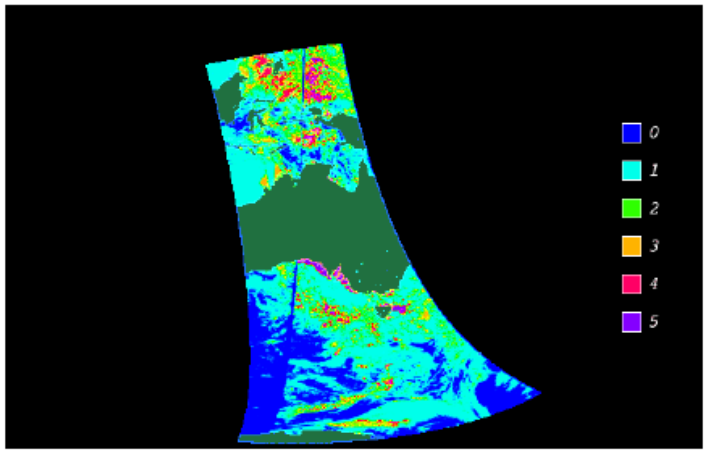
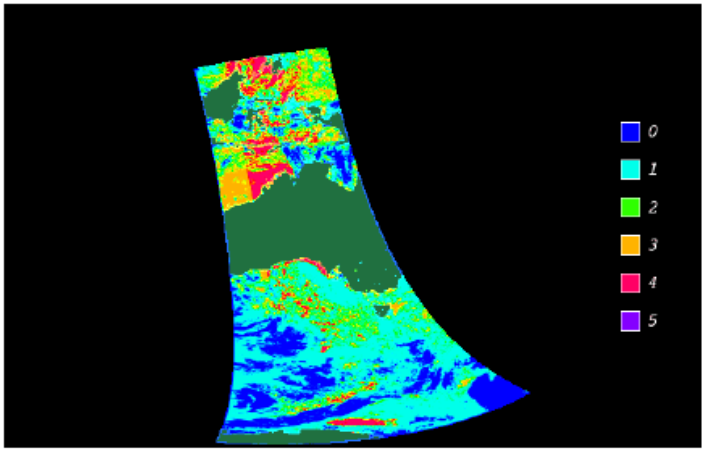
Does VIIRS L3U help coverage?
Compare "Harmonised Quality Level" (q_s)



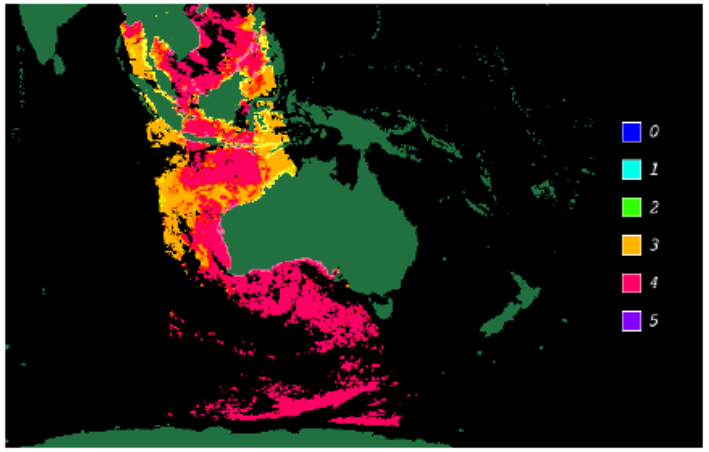
NOAA-15 fv01 L3U



NOAA-18 fv01 L3U



NOAA-19 fv01 L3U



L3U NPP VIIRS

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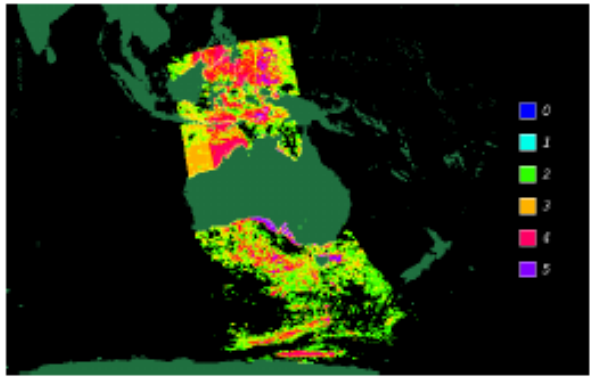
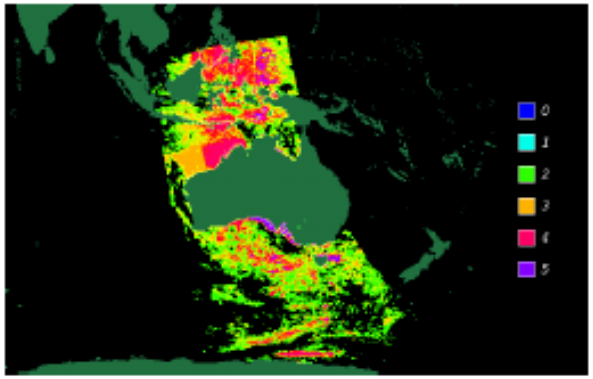
VIIRS increases spatial coverage of good quality SSTs on a single pass

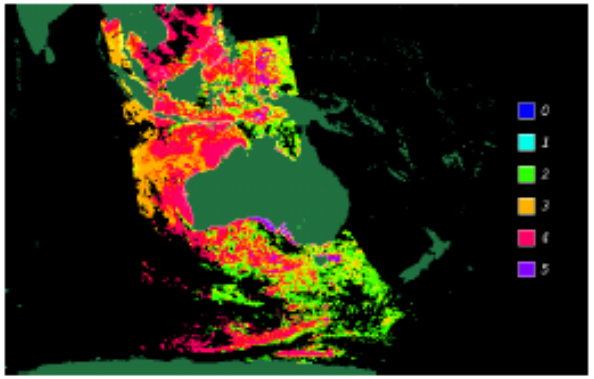
Compositing single swath SSTs from 4 satellites for $q_s \geq 2$



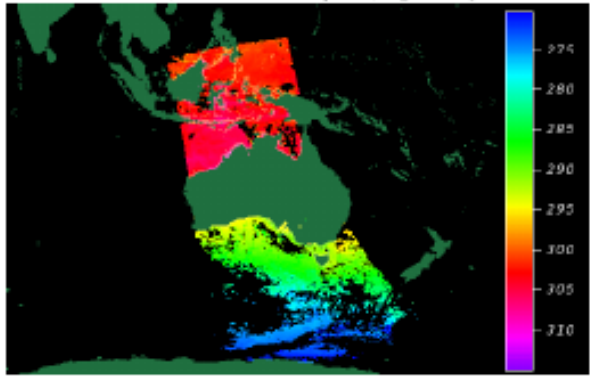
SST, NOAA-18/19, quality



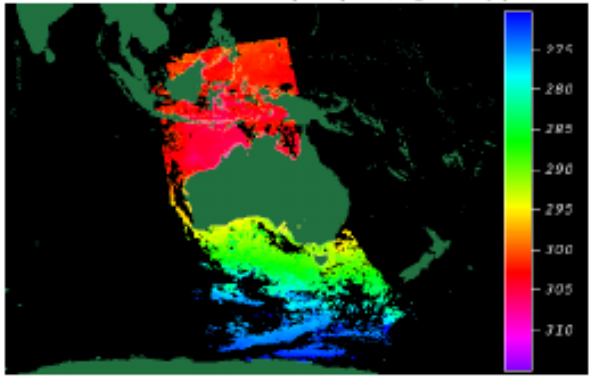
SST, NOAA-15/18/19, quality)



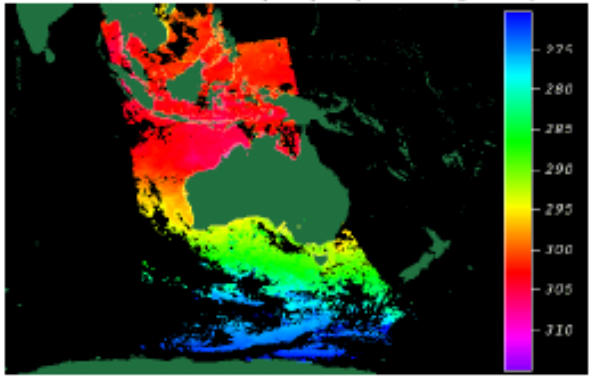
SST, NOAA-15/18/19/NPP quality



SST, NOAA-18/19, SST



SST, NOAA-15/18/19, SST



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

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Initial Findings

- VIIRS L3U SSTs (filtered for QL = 5) have slightly greater spatial coverage to IMOS fv01 NOAA-19 L3C SSTs (filtered for QL ≥ 3)
- Adding VIIRS L3U SST to IMOS L3C SSTs from NOAA-15/18/19 increases spatial coverage and overall quality from a single pass
- B. Petrenko, A. Ignatov and Y. Kihai compared QL = 5 SSTs from IMOS NOAA-19 L3U and ACSPO S-NPP VIIRS L3U for 1-31 Aug 2015 over Australian domain (70ºE – 180ºE, 70ºS – 20ºN).
  - VIIRS had ~ 1.5 to 2 times more QL=5 SSTs than IMOS NOAA-19 (within same area)
  - After bias correction using sses_bias, matchups with drifting + tropical moored buoys showed similar biases and ACSPO SDs significantly less (~0.2 K) than IMOS SDs (Note: IMOS L3U SSTskin converted to SSTsubskin by adding 0.17 K)

L3U Product	Day Matchups	Day Bias (K)	Day SD (K)	Night Matchups	Night Bias (K)	Night SD (K)
IMOS	847	0.00	0.55	956	-0.02	0.47
ACSPO	4908	0.09	0.34	5540	-0.03	0.30

IMOS VIIRS GHRSST Products
Current Status

- Using Chris Griffin's "harmonised quality level" (q_s) method (presented at GHRSST-XVII) one expects to be able to take the best quality measurements from IMOS AVHRR L3U and merge with ACSPO VIIRS L3U SSTs to form multi-sensor L3S products with greater spatial coverage but no worse accuracy
- Currently modifying ACSPO VIIRS L3U files to have some same ancillary fields to IMOS L3U files (e.g. l2p_flags, sea ice, winds, dt_analysis) but retain ACSPO SSES and quality_level fields, prior to merging with IMOS L3U files to produce IMOS VIIRS L3C and IMOS VIIRS+AVHRR L3S products

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Future use of VIIRS L3U SSTs

Over coming 12 months VIIRS L3U SST is a high priority data stream to add to satellite data ingested into:

- IMOS 0.02º VIIRS L3C and 0.02º VIIRS+AVHRR L3S products
  - input into ABoM operational ReefTemp NextGen coral bleaching nowcasting system over Great Barrier Reef
- RAMSSA/GAMSSA L4 analyses*
- OceanMAPS3 Global 0.1º Ocean Model*
- eReefs Great Barrier Reef ~ 4 km Ocean Model*

* Delayed until late 2016/early 2017 due to system porting to new supercomputer

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Thankyou!

Contact: h.beggs@bom.gov.au

EXTRA SLIDES FOR DISCUSSION

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Regional Australian Multi-Sensor SST Analysis

Depth: Foundation (pre-dawn SST)

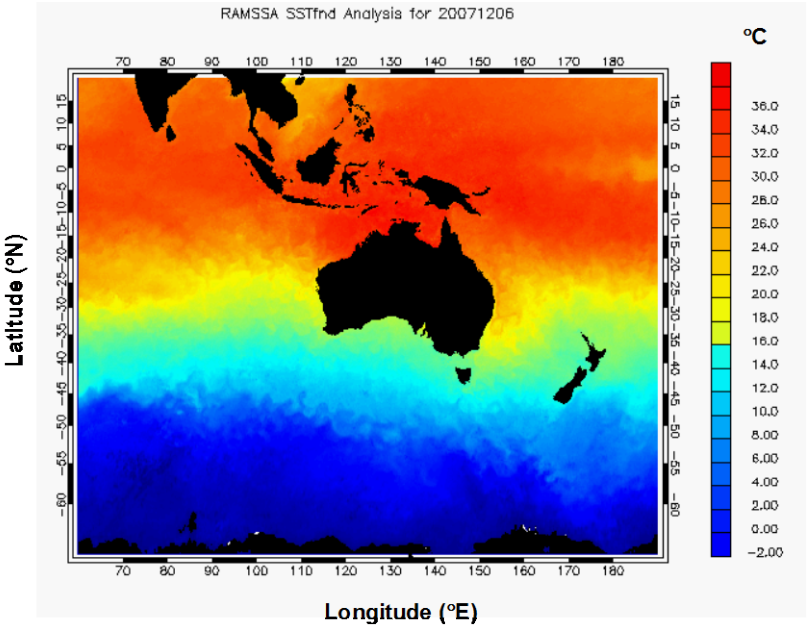
Resolution: Daily, 1/12˚

Domain: 60ºE - 170ºW , 20ºN - 70ºS

Data Inputs:

- 1 km IMOS HRPT AVHRR (NOAA-18,-19) **L2P**
- 9 km NAVOCEANO GAC AVHRR (NOAA-18, NOAA-19, METOP-A, METOP-B) **L2P**
- 25 km JAXA AMSR-2 (GCOM-W) **L2P**
- Buoy, ship, Argo, CTD, XBT obs (GTS)
- 1/12˚ NCEP ice concentration analyses
- BGF: Combination of previous day's RAMSSA SST and Reynolds climatology

Uses: Boundary condition for ABoM operational regional NWP models



Global Australian Multi-Sensor SST Analysis

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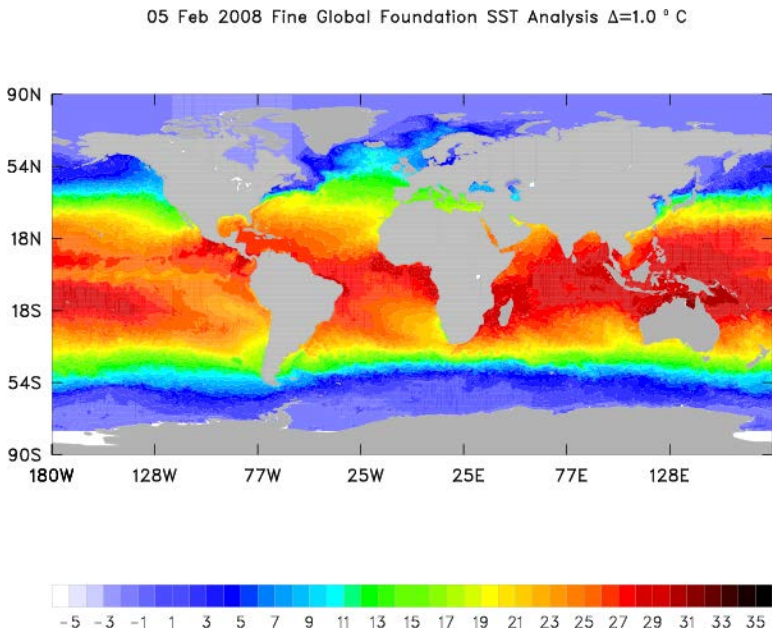
Depth: Foundation (pre-dawn SST)

Resolution: Daily, 1/4°

Domain: Global

Data Inputs:

- 1 km IMOS HRPT AVHRR (NOAA-18,-19) **L2P**
- 9 km NAVOCEANO GAC AVHRR (NOAA-18, NOAA-19, METOP-A, METOP-B) **L2P**
- 25 km JAXA AMSR-2 (GCOM-W) **L2P**
- Buoy, ship, CTD, XBT obs (GTS)
- 1/12° NCEP ice concentration analyses
- BGF: Combination of previous day's GAMSSA SST and Reynolds climatology



Uses: Boundary condition for ABoM operational global NWP models; Initialises ABoM seasonal prediction model; Contributes to GMPE.