Conclusions

• HRSST drifters (TRUSTED and non-TRUSTED) evaluated using SLSTR for February 2019 to September 2019

• Preliminary results show
  • TRUSTED drifters compare very well with heritage platforms (analogue sensor)
  • No notable difference between analogue and digital sensor results (TRUSTED)

• In general, the quality of the drifting buoy network is much improved in 2019 compared to previous

• Future work
  • Include more TRUSTED matchups
  • Include depth (pressure) provided with TRUSTED measurements
  • Look in more detail at other drifter manufacturers
Copernicus Sentinel 3: SLSTR

- The first Sea and Land Surface Temperature Radiometer (SLSTR) was launched on Sentinel 3A on 16th February 2016.
- S3B launched on 26 April 2018
- Dual-view self-calibrating radiometer following the ATSR class of sensors

- SST Retrievals by radiative transfer modelling of the form:
  \[ a_0 + \sum_{i}^{n} a_n BT_n \]
  where \( n \) is the number of channels

- For SLSTR we use 2 channels during day and 3 during night
  - 3.7 µm not used during day owing to solar contamination
- We have two views, so we have four SST retrievals in total

<table>
<thead>
<tr>
<th>Nominal Channel Centre</th>
<th>Primary Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>S7: 3.7 µm</td>
<td>SST Retrieval</td>
</tr>
<tr>
<td>S8: 11 µm</td>
<td>SST/LST Retrieval</td>
</tr>
<tr>
<td>S9: 12 µm</td>
<td>SST/LST Retrieval</td>
</tr>
</tbody>
</table>
Methodology... the validation uncertainty budget

\[ \sigma_{Total} = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 + \sigma_4^2 + \sigma_5^2} \]

- **Satellite** (\(\sigma_1\))
  - Varies pixel by pixel
- **Reference** (\(\sigma_2\))
  - Generally unknown; Estimate of \(O(0.1\text{ K})\) for GTMBA moorings and radiometers; \(O(0.2\text{ K})\) for drifters; negligible for Argo
- **Geophysical: spatial – surface** (\(\sigma_3\))
  - Systematic for single match-up; pseudo-random for large dataset
  - Can be reduced through pixel averaging (e.g. sample 11 by 11 instead of 1 by 1)
  - Includes uncertainty in geolocation (may be systematic even for large numbers)
- **Geophysical: spatial – depth** (\(\sigma_4\))
  - Systematic for single match-up for different depths; pseudo-random for large dataset at different depths (with diurnal & skin model)
- **Geophysical: temporal** (\(\sigma_5\))
  - Systematic for single match-up; may be reduced for large dataset (if match-up window small enough)
  - Can be reduced with diurnal & skin model

Fairall et al.1996; Kantha and Clayson 1994
Results

• Match-up results are shown on the subsequent slides

• Results are shown for TRUSTED and non-TRUSTED drifters (in similar spatial and temporal location)

• Four types of results
  • Dependence of differences
    • Day time results in red, night time in blue (2-channel) and green (3-channel); single view in dashed line dual-view in solid line
  • Spatial variability of differences
    • N2 (daytime), N3 (nighttime), D2 (daytime), D3 (nighttime)
  • Histograms of differences
    • N2 (daytime), N3 (nighttime), D2 (daytime), D3 (nighttime)
  • Uncertainty validation
Sea Surface Temperature Validation Results

This page contains analysis results from the EUMETSAT Felix Matchup Databases.

- EUMETSAT SLSTR-A
- EUMETSAT SLSTR-B
- OSI-SAF METOP-B AVHRR
- OSI-SAF METOP-B IASI
- WCT
- WST
- dependence
- spatial
- histograms
- uncertainty
- drifiters
- Argo
- moorings
- radiometer
- salinmeter
- skin vs. depth
- skin vs. skin
- OSTA vs. depth
- QL = 1
- QL = 2
- QL = 3
- QL = 4
- QL = 5
- Apply Q5ES

SLSTR-A WCT SST_{true} versus drifter SST_{true}

SLSTR-A WCT SST_{true} versus drifter SST_{true}

SLSTR-A WCT SST_{true} versus drifter SST_{true}

SLSTR-A WCT SST_{true} versus drifter SST_{true}

.. 

24 h Day  
24 h Night  
36 h Night

24 h Day  
24 h Night  
36 h Night

24 h Day  
24 h Night  
36 h Night

24 h Day  
24 h Night  
36 h Night

.. 

SLSTR-A WCT SST_{true} versus drifter SST_{true}

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24 h Day  
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36 h Night

24 h Day  
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.. 

SLSTR-A WCT SST_{true} versus drifter SST_{true}

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..
Sea Surface Temperature Validation Results

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- EUMETSAT SLSTR-A
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- OSI-SAF METOP-B AVHRR
- OSI-SAF METOP-B IASI
- WCT
- WST
- drifter: Argo
- moorings
- radiometer
- satellite
- SST vs. depth
- SST vs. skin
- SST vs. OSTM/A vs. depth
- SST vs. altitude
- QT vs. quality level
- QL = all
- QL = 2
- QL = 3
- QL = 4
- QL = 5
- Apply SSES

SLSTR-A WCT SST_{sat} vs. drifter SST_{sat}

SLSTR-A WCT SST_{sat} vs. drifter SST_{sat}

SLSTR-A WCT SST_{sat} vs. drifter SST_{sat}

SLSTR-A WCT SST_{sat} vs. drifter SST_{sat}

SLSTR-A WCT SST_{sat} vs. drifter SST_{sat}

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- OSI SAF METOP-B IASI
- WCT
- WST
- dependence
- spatial
- histograms
- uncertainty
- drifter
- Argo
- moorings
- radiometer
- salinity
- skin vs. depth
- skin vs. skin
- OSTM1 vs. depth
- QL = 1
- QL = 2
- QL = 3
- QL = 4
- QL = 5
- Apply SSSS

SLSTR-A WCT SST vs. drifter SST

SLSTR-A WCT SST vs. drifter SST

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Sea Surface Temperature Validation Results

This page contains analysis results from the EUMETSAT Felixx Matchup Databases.
- EUMETSAT SLSTR-A
- EUMETSAT SLSTR-B
- OSI-SAF METOP-B AVHRR
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- WCT
- WST
- Dependence spatial / histogram / uncertainty
- drifters / Argo / moorings / radiometer / satellite
- skin vs. depth / skin vs. skin / SSTLIA vs. depth
- QL = all / QL = 2 / QL = 3 / QL = 4 / QL = 5
- Apply SSS

SLSTR-A WCT SST vs. drifter SST

SLSTR-A WCT SST vs. drifter SST

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SLSTR-A WCT SST vs. drifter SST

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Sea Surface Temperature Validation Results

This page contains analysis results from the EUMETSAT Felix Matchup Databases.

Data vs. WST:
- Precipitation
- Temperature
- Salinity
- Chlorinity
- Turbidity
- Chl
- Nutrients

SLSTR-A WCT N2 daytime SST w dry SST vs. drifter SST

SLSTR-A WCT N3 nighttime SST w dry SST vs. drifter SST

SLSTR-A WCT D2 daytime SST w dry SST vs. drifter SST

SLSTR-A WCT D3 nighttime SST w dry SST vs. drifter SST
Sea Surface Temperature Validation Results

This page contains analysis results from the EUMETSAT Felyx Matchup Databases.

- EUMETSAT SLSTR-A
- EUMETSAT SLSTR-N
- OSI-SAF METOP-B AVHRR
- OSI-SAF METOP-B IASI
- WCT
- WST
- TCW
- spatial
- histogram uncertainty
- drifter
- Argo
- moorings
- radiometer
- salinometer
- skin vs. depth
- skin vs. skin
- SST vs. SST
- QL = 0
- QL = 2
- QL = 3
- QL = 4
- QL = 5
- Apply SSRS

SLSTR-A WCT N2 daytime SST$_{sea}$ versus drifter SST$_{depth}$

SLSTR-A WCT N3 nighttime SST$_{sea}$ versus drifter SST$_{depth}$

SLSTR-A WCT D2 daytime SST$_{sea}$ versus drifter SST$_{depth}$

SLSTR-A WCT D3 nighttime SST$_{sea}$ versus drifter SST$_{depth}$
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