# Large biases between *in situ* and remotely-sensed data sets around the coast of South Africa


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LETTERS

# Global patterns and predictors of marine biodiversity across taxa

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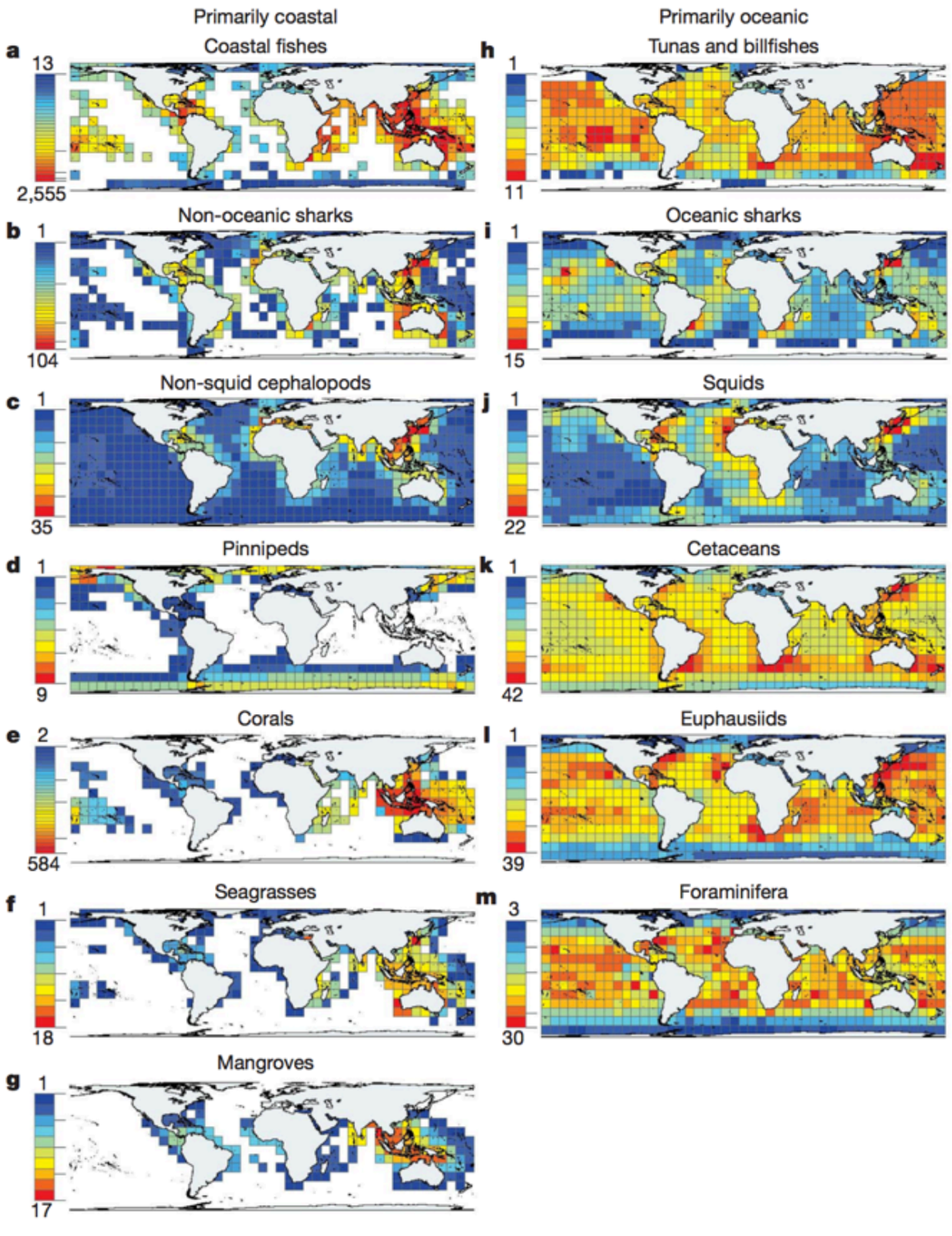


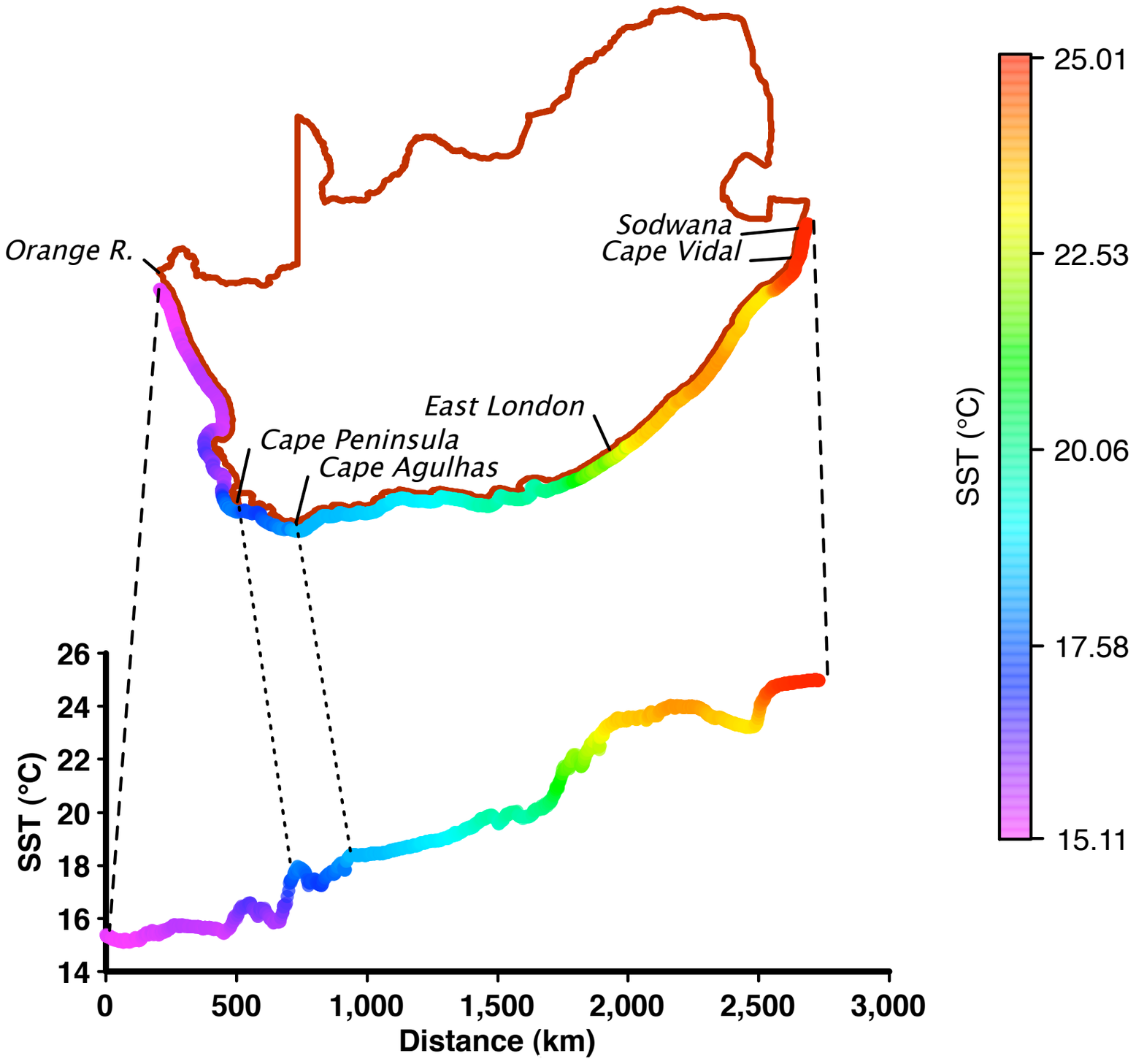

## SST at the coast (!)

Coast:

* <400 m from the shore
* ~1 m deep

# Coastal* AVHRR SST

* pixel closest to shore



# Aims

1. Assimilate multiple sources of coastal *in situ* seawater temperature data into a coherent, high resolution alongshore climatology for the South African coast

2. Compare with SSTs
   * warning to coastal users
   * stress severity of biases to developers of SST products

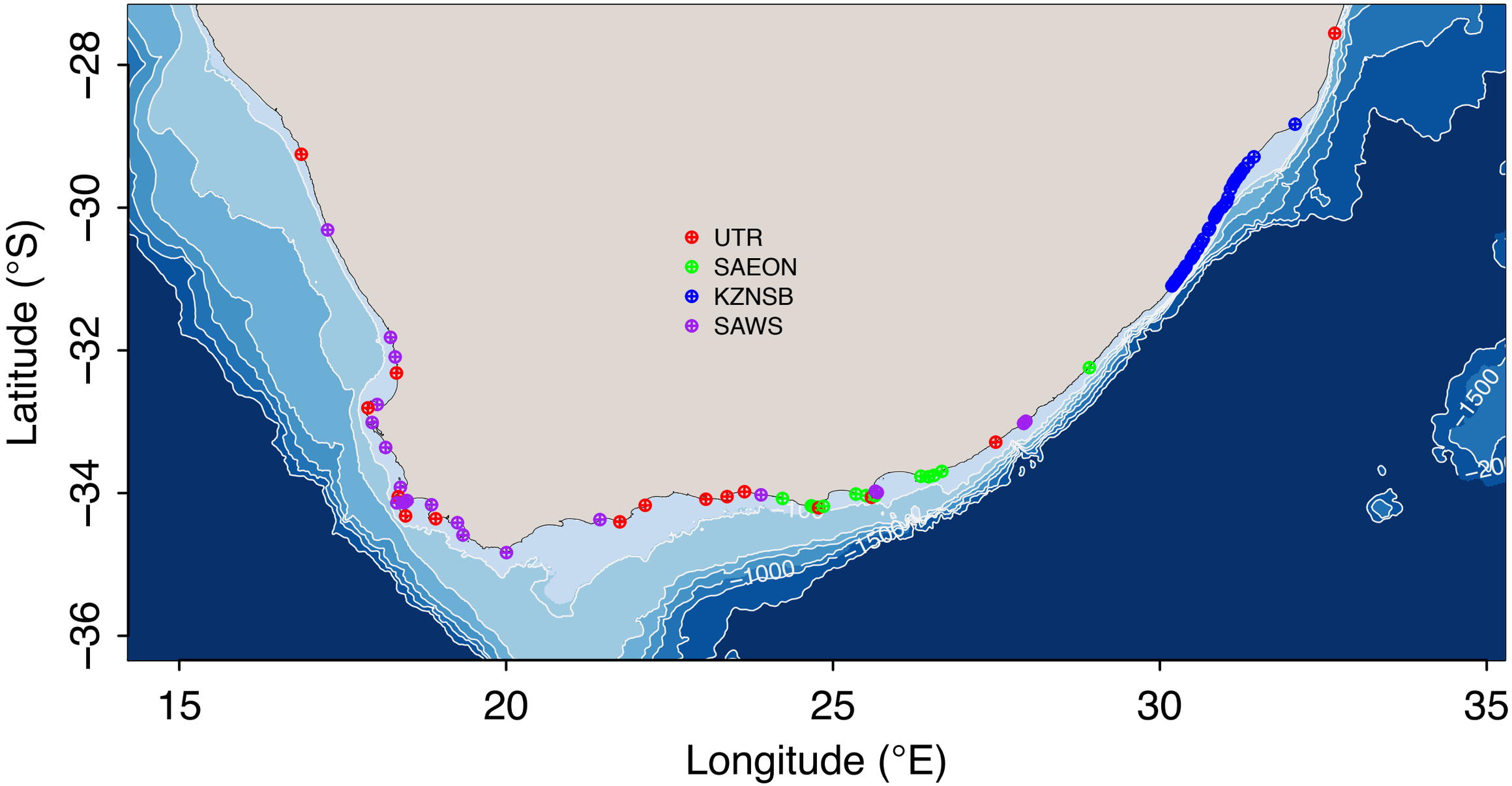
# Satellite sources

Daytime Pathfinder v. 5.2 AVHRR (4 km)

* quality flag of 4

MODIS Terra (1 km, 4 km)

* daytime passes with cloud flag (CLDICE); SSTWARN and SSTFAIL flags turned off; SeaDAS flags (ATMFAIL, LAND, HILT, HISOLZEN, LOWLW, MAXAERITER, ATMWARN, NAV- FAIL, FILTER) applied


UTR
SAEON
KZNSB
SAWS
−1000
−1500
−1500
−20
−28
−30
−32
−34
−36
Latitude (°S)
15
20
25
30
35
Longitude (°E)

# Monthly Box Plots

Cape Agulhas | Doringbaai | Eastern Beach | Fish Hoek | Gansbaai | Gordons Bay | Hermanus | Hondeklipbaai | Hout Bay | Humewood

Kalk Bay | Knysna | Kommetjie | Lamberts Bay | Mossel Bay | Muizenberg | Nahoon Beach | Orient Beach | Plettenberg Bay | Pollock Beach

Port Nolloth | Saldanha Bay | Sea Point | St Helena Bay | Stilbaai | Storms River Mouth | Tsitsikamma | Yzerfontein | Amanzimtoti | Antsey's Beach

Ballito Bay | Banana Beach | Blythedale | Brighton Beach | Caribbean Bay | Durban | Glenmore | Hibberdene | Ifafa | Isipingo

Karridene | Kent Bay | La Mercy | Leisure Bay | Margate | Marina Beach | Mtwalumi | Mzamba | Park Rynie | Port Edward

Ramsgate | Richards Bay | Salt Rock | San Lameer | Scottburgh | South Port | Southbroom | St Michaels | Sunwich Port | T.O. Strand

Thompson's Bay | Tinley Manor | Trafalgar | Umdloti | Umgababa | Umhlanga Rocks | Umtentweni | Umzumbe | Uvongo | Warner Beach

Westbrook | Winkelspruit | Zinkwazi | Elands Bay | Paternoster | Ystervarkpunt | Mosterts Hoek | Mangold's Pool | Port Alfred | Sodwana Bay

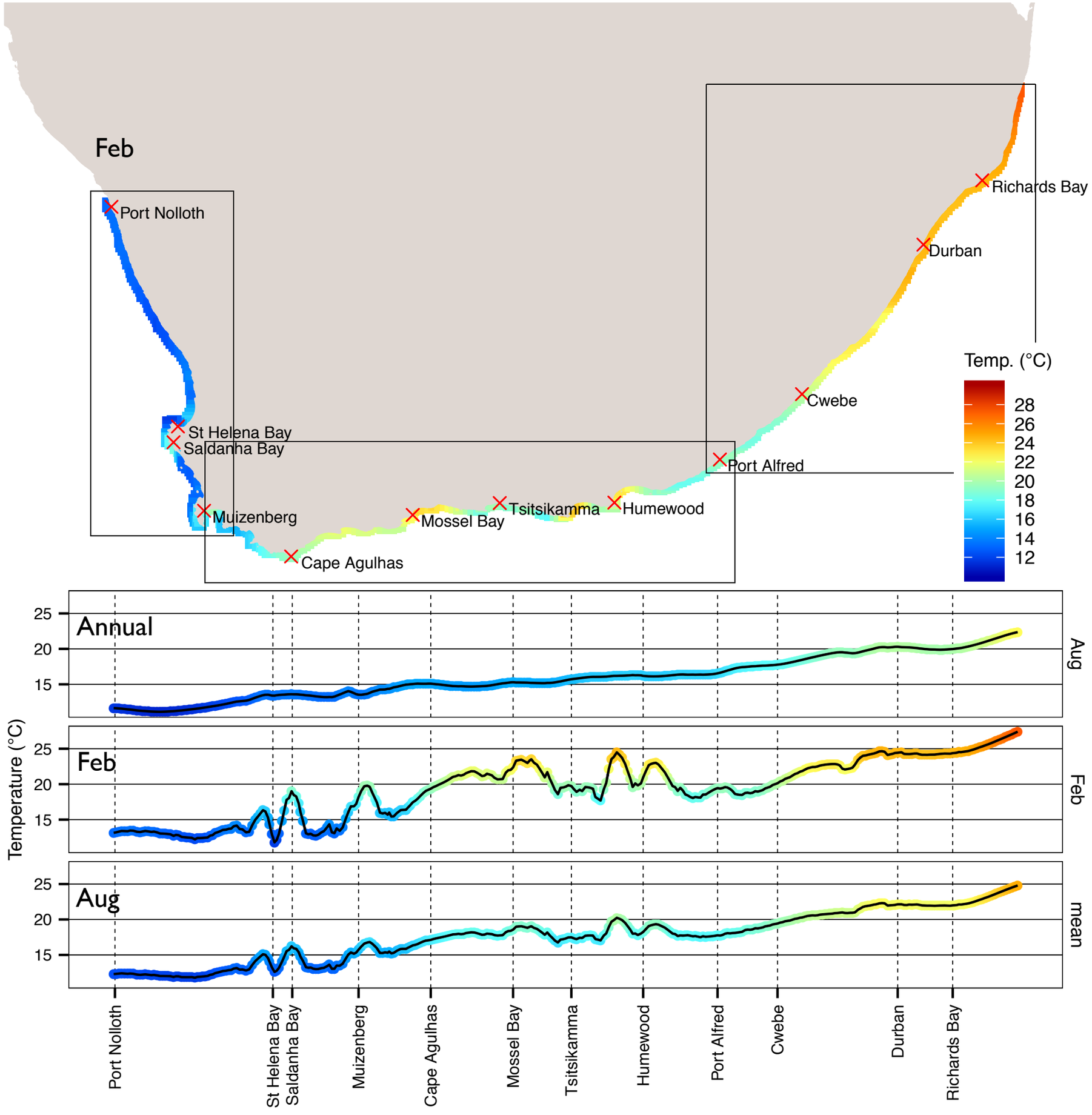
Betty's Bay | Bordjies | Cwebe | Cannon Rocks | Cape Padrone | Eerste Rivier | Kenton on Sea | Noordhoek | Oyster Bay | Port St Francis

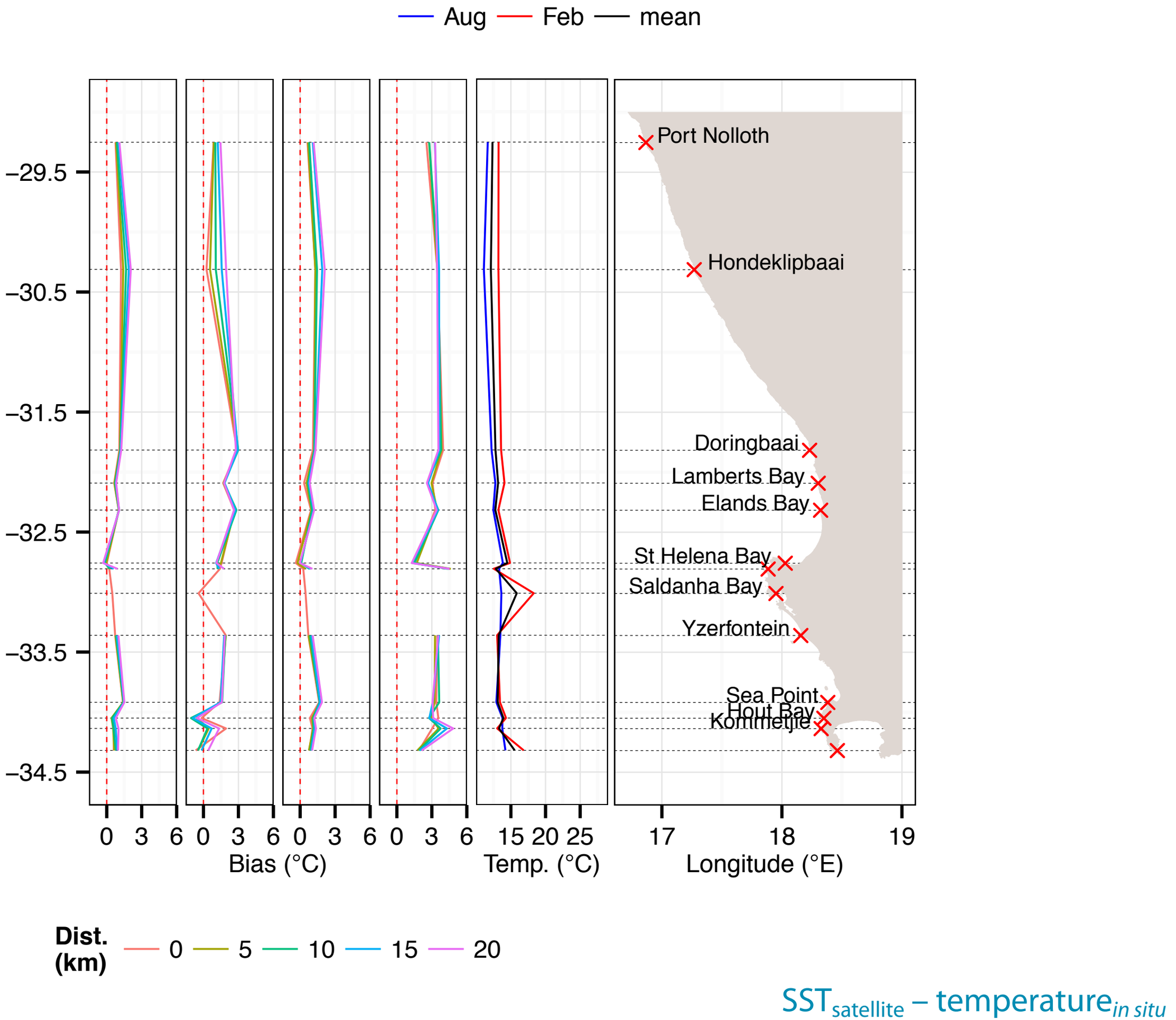
Rebelsrus | Schoenmakerskop | Seaview | Thyspunt | Woody Cape

Temperature (°C)

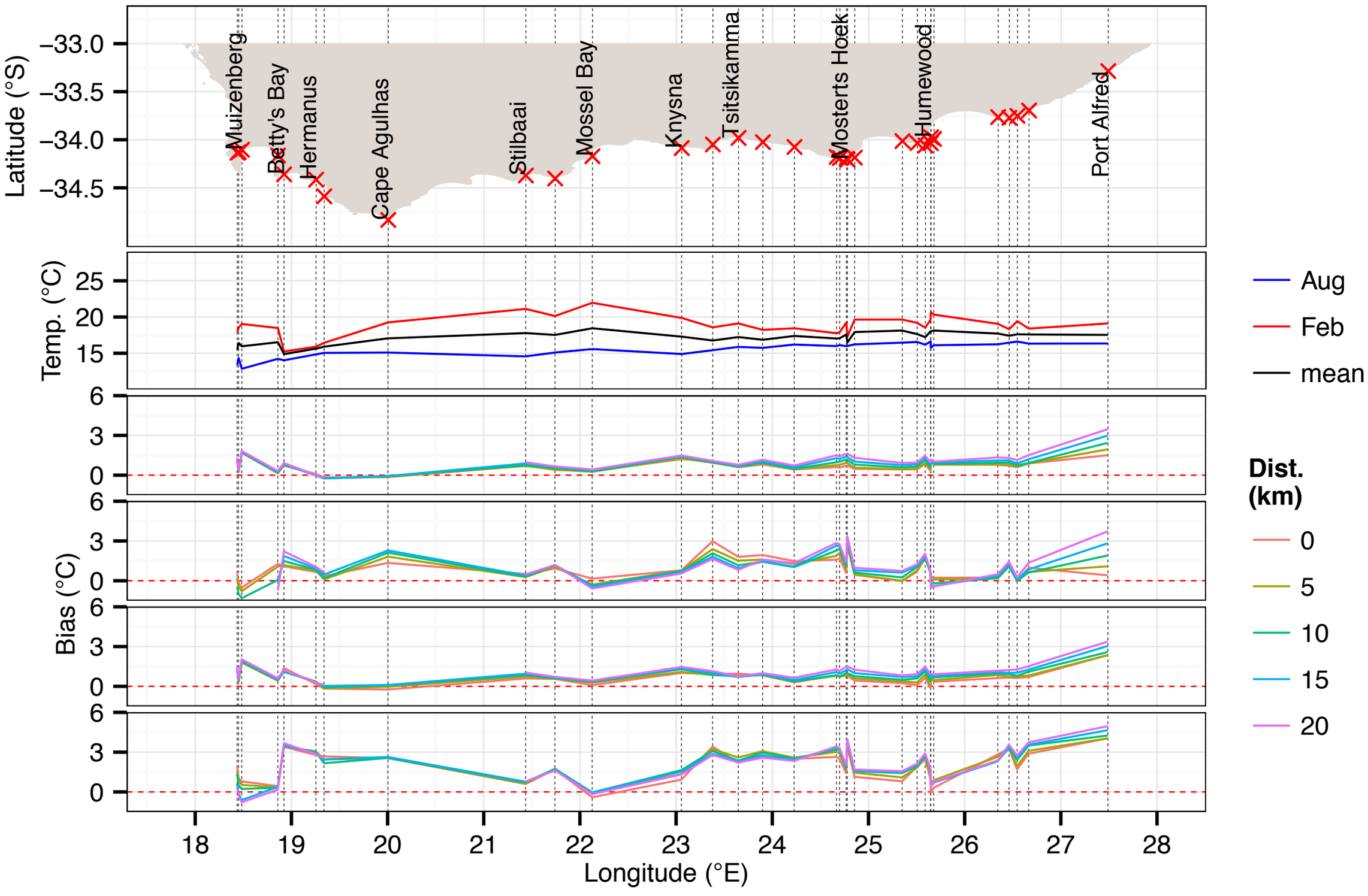
10 15 20 25

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Feb
Port Nolloth
St Helena Bay
Saldanha Bay
Muizenberg
Cape Agulhas
Mossel Bay
Tsitsikamma
Humewood
Port Alfred
Cwebe
Durban
Richards Bay
Temp. (°C)
28
26
24
22
20
18
16
14
12
Annual
Feb
Aug
Temperature (°C)
25
20
15
mean
Port Nolloth
St Helena Bay
Saldanha Bay
Muizenberg
Cape Agulhas
Mossel Bay
Tsitsikamma
Humewood
Port Alfred
Cwebe
Durban
Richards Bay




SST$_{satellite}$ – temperature$_{in\ situ}$




$SST_{satellite}$ – $temperature_{in\ situ}$

Aug Feb mean

Sodwana Bay
Richards Bay
Durban
Scottburgh
Port Edward
Cwebe
Orient Beach
Port Alfred

Latitude (°S)
−27.5
−28.5
−29.5
−30.5
−31.5
−32.5
−33.5

28 30 32
Longitude (°E)

15 20 25
Temp. (°C)

0 3 6 0 3 6 0 3 6 0 3 6
Bias (°C)

**Dist. (km)** 0 5 10 15 20

$SST_{satellite}$ – $temperature_{in\ situ}$

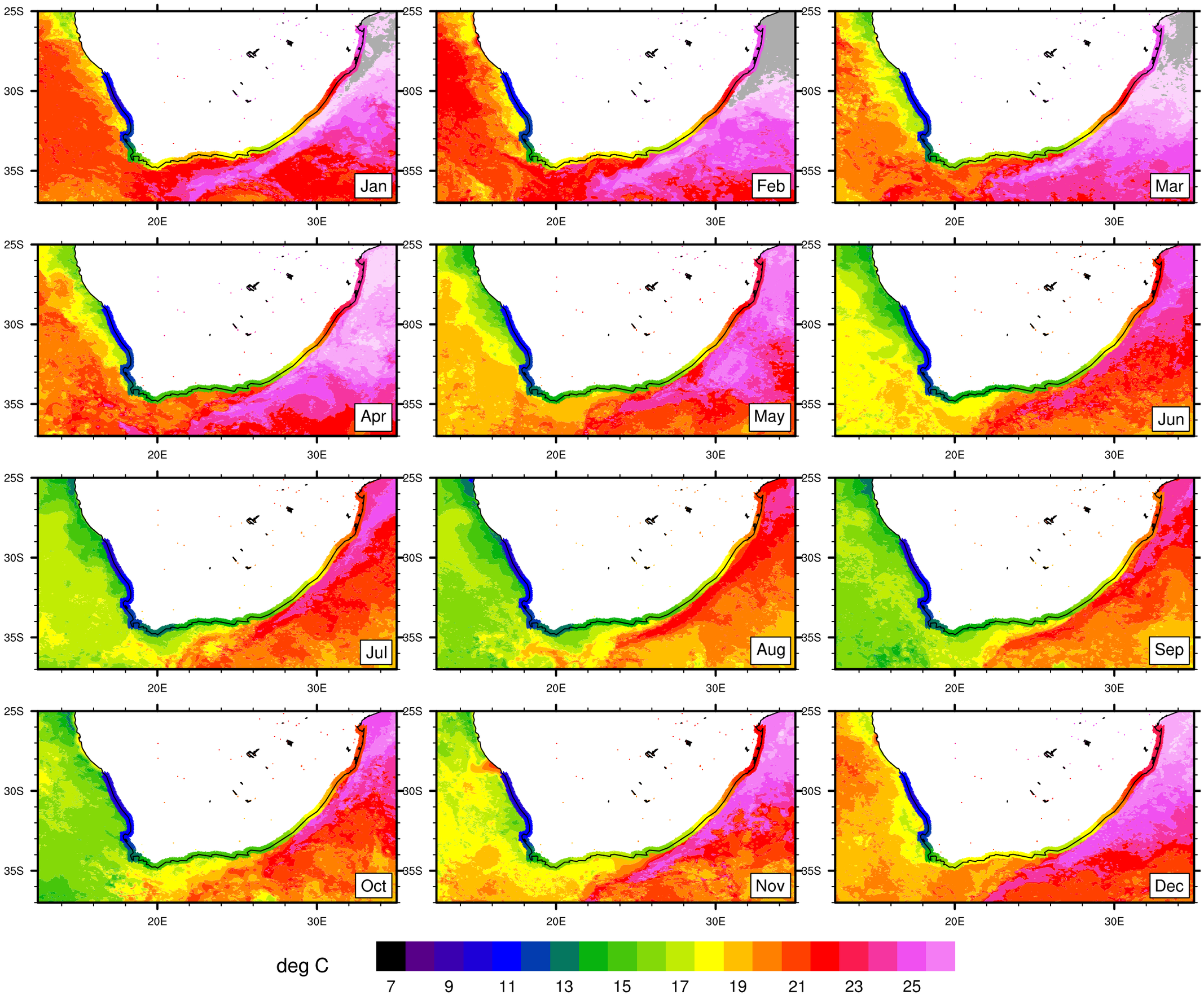
# Causes of biases

Biases well known (Western Aus., China, USA, SA)

Quantify components of variation...

- atmospheric influences
- reflect underlying oceanographic processes
  -- e.g. upwelling (seasonal WC; intermittent SC; absent EC)
- intrinsic differences between data sets
  -- instrumental differences
  -- bulk *vs*. skin effects
  -- surface winds
- inshore hydrodynamics
  -- turbulence, convective mixing, velocity shear, tidal mixing
    -- break down mixed layer
- across-shore thermal gradients

# Temperature: AVHRR vs. coastal



# Expand spatial resolution

# Coastal Temperature Network

Scientific steering and technical coordination
New installations

Assimilation and processing
Quality control
Annually updated product
* Climatologies: monthly, annual
* Time series: daily, monthly, annual
* Measures of variance
* Long-term change

Reporting of meta-data
Documentation
Dissemination of netCDF via web portal