
# Sea Surface Temperature

# Workshop IPEE/CLS - 3-FEB-2010

# Sea surface temperature products



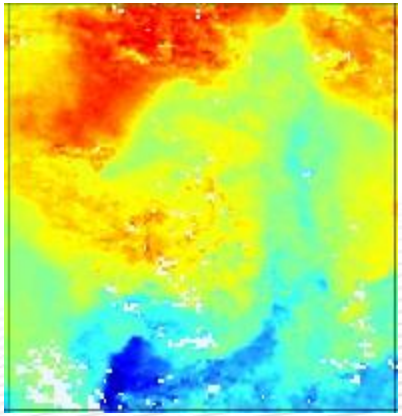
High resolution SST:

Passive technology:

infrared sensor

~4 km

(gaps due to clouds)



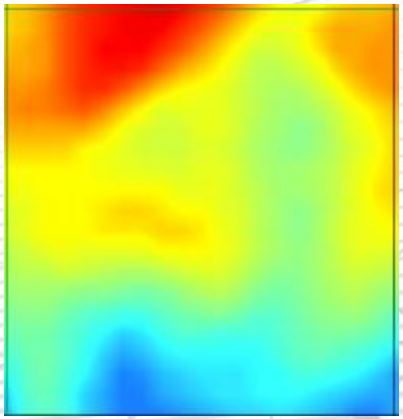
Low resolution SST:

Active technology:

microwave sensor

~25 km

(no clouds)



# High resolution SST

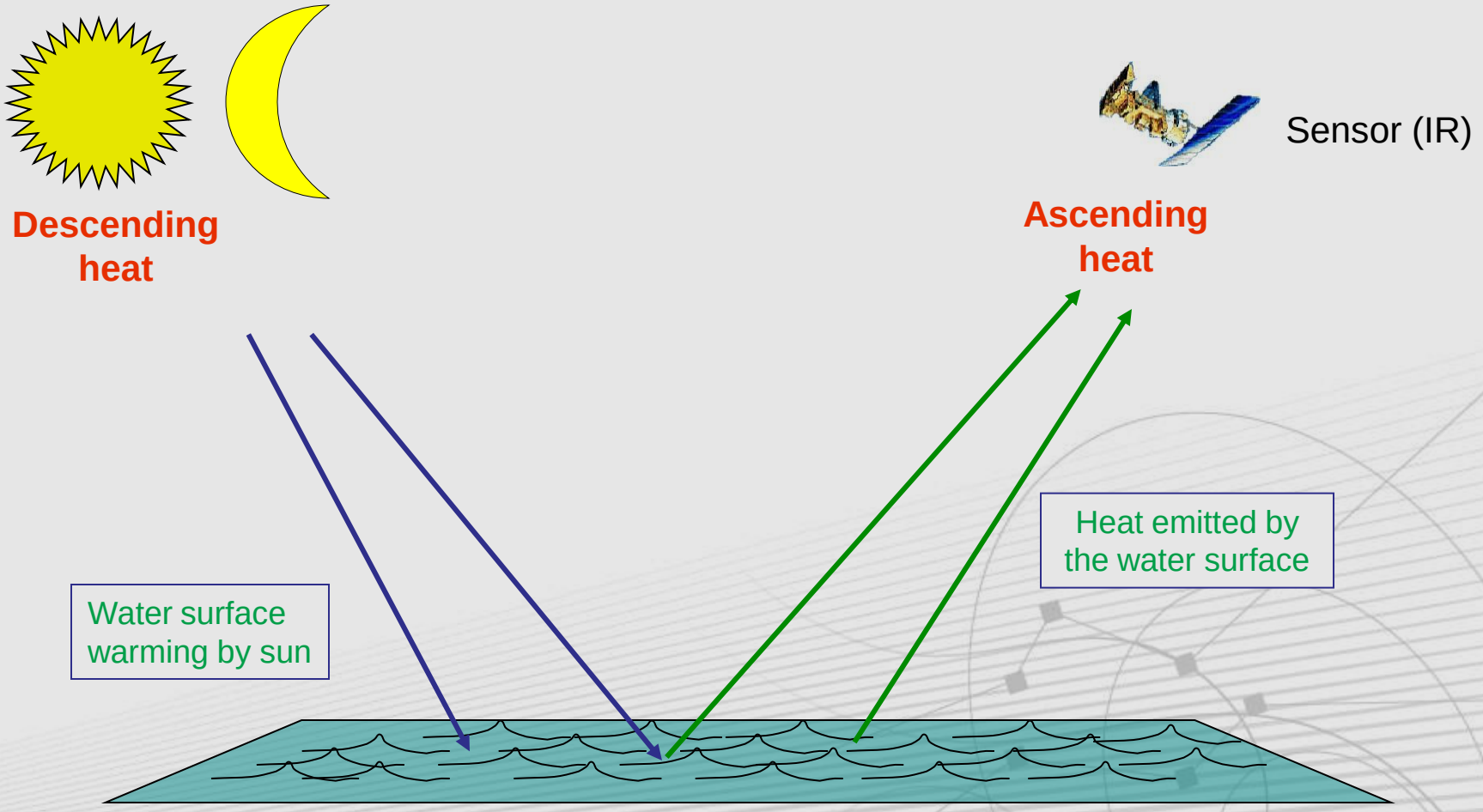


## ➔ Combination of 5 satellites to reduce cloud coverage

| Satellite | | Instrument | |
|---|---|---|---|
| NOAA-17<br>NOAA-18 | - American satellites (NOAA)<br>- Operational missions<br>- Orbit = 833 km<br>- 14/15 rotation/day<br>- almost polar<br>- heliosynchroneous | AVHRR | - radiometer<br>- passive measurement<br>-spatial resolution: 4.5 x 4.5 km.<br>- gaps due to clouds |
| AQUA<br>TERRA | - American satellites (NASA)<br>- Operational missions<br>- Orbit = 705 km<br>- 14/15 rotation/day<br>- almost polar<br>- heliosynchroneous | Modis | - radiometer<br>- passive measurement<br>-spatial resolution: 1 x 1 km.<br>- gaps due to clouds |
| METOP | - European satellite (ESA)<br>- Operational mission<br>- Orbit = 820 km<br>- 14/15 rotation/day<br>- almost polar<br>- heliosynchroneous | AVHRR | - radiometer<br>- passive measurement<br>-spatial resolution: 1 x 1 km.<br>- gaps due to clouds |

# Radiometer measurements





# Radiometer measurements

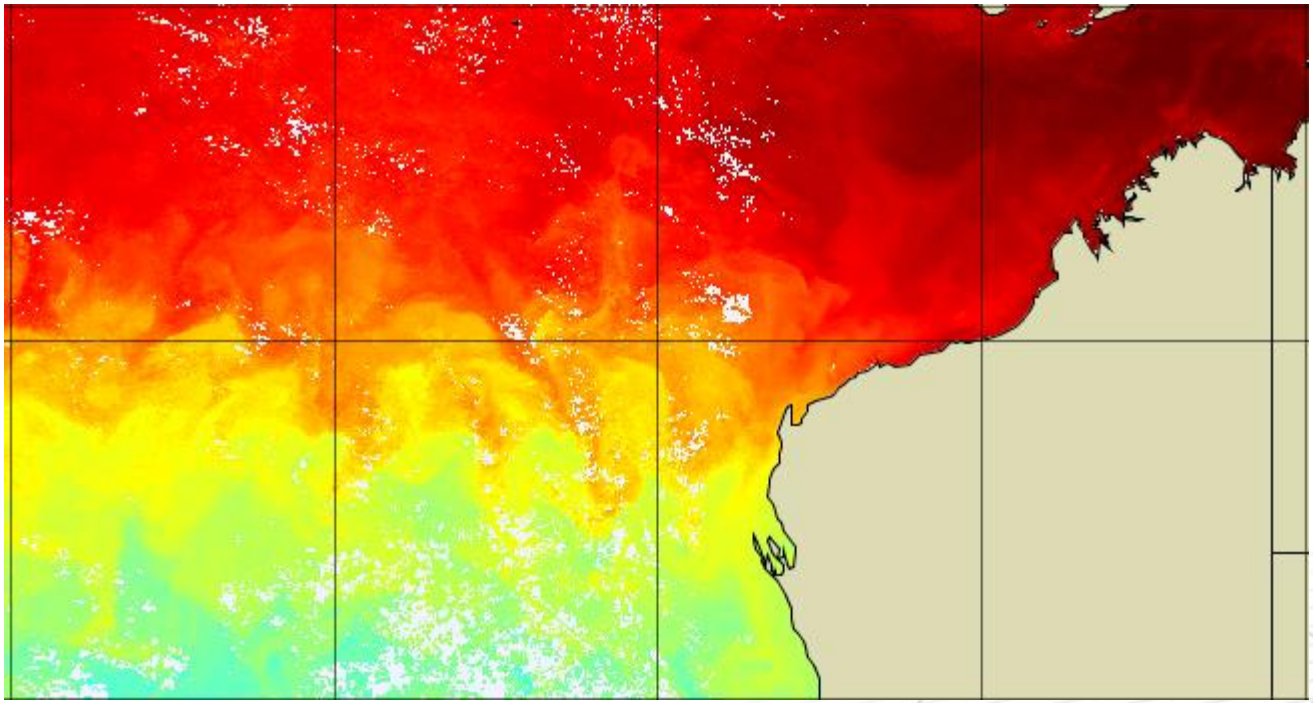


- Sensor = instrument that measure radiation emitted by the sea surface (few first millimeters)
- Satellite transmits data when it flies over a reception antenna (NOAA, NASA, ESA…)
- Data are sent to CLS to be processed
- Maps are generated by in built algorithm in CLS

- ➔ Final map: resolution (pixel) = 0.04 X 0.04° (4 km)
- Maximum time delivery between acquisition and CLS end processing = 6 hours

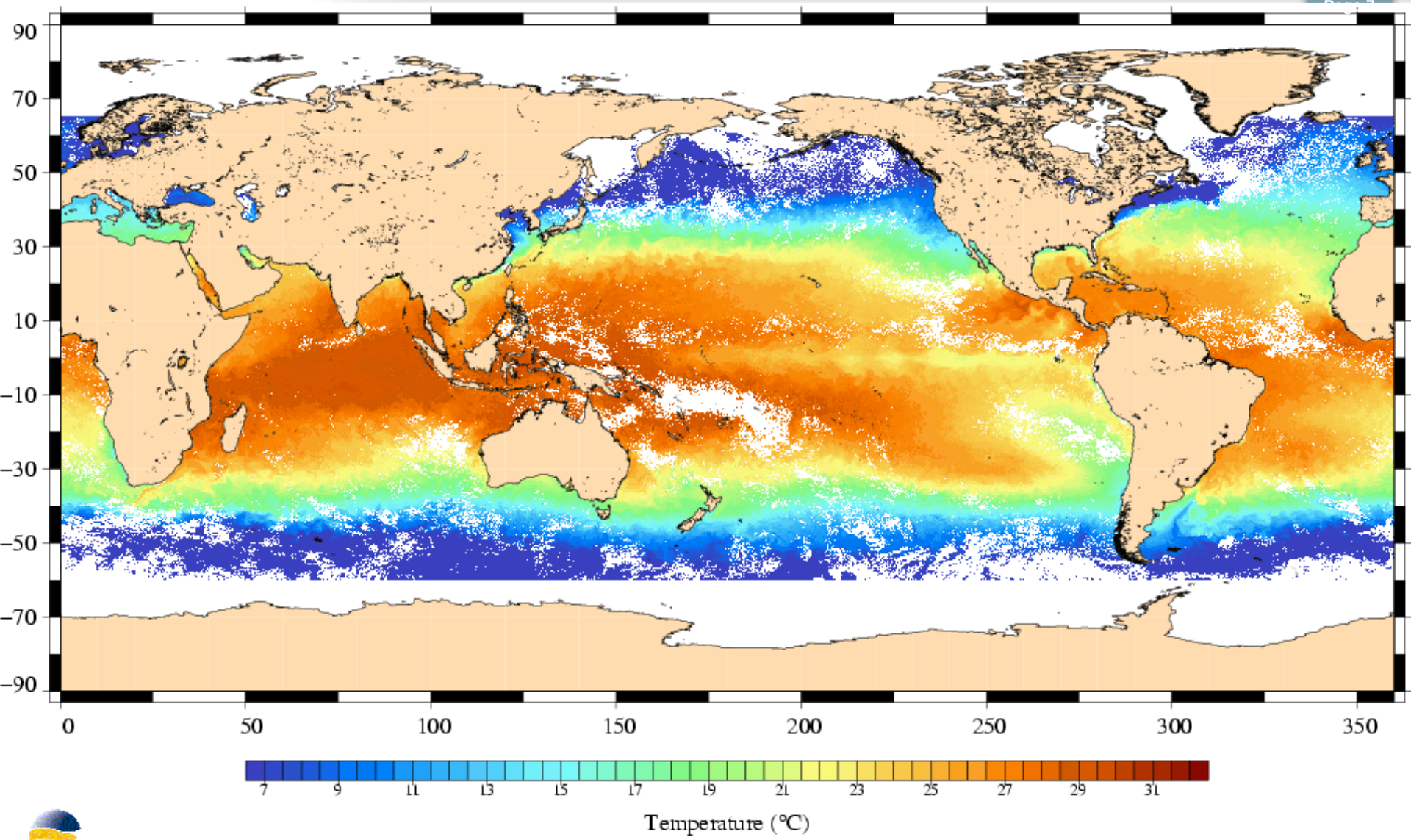
# Infrared SST maps





- Infrared technology: gaps due to clouds
- Resolution ~0.04°

# Global coverage



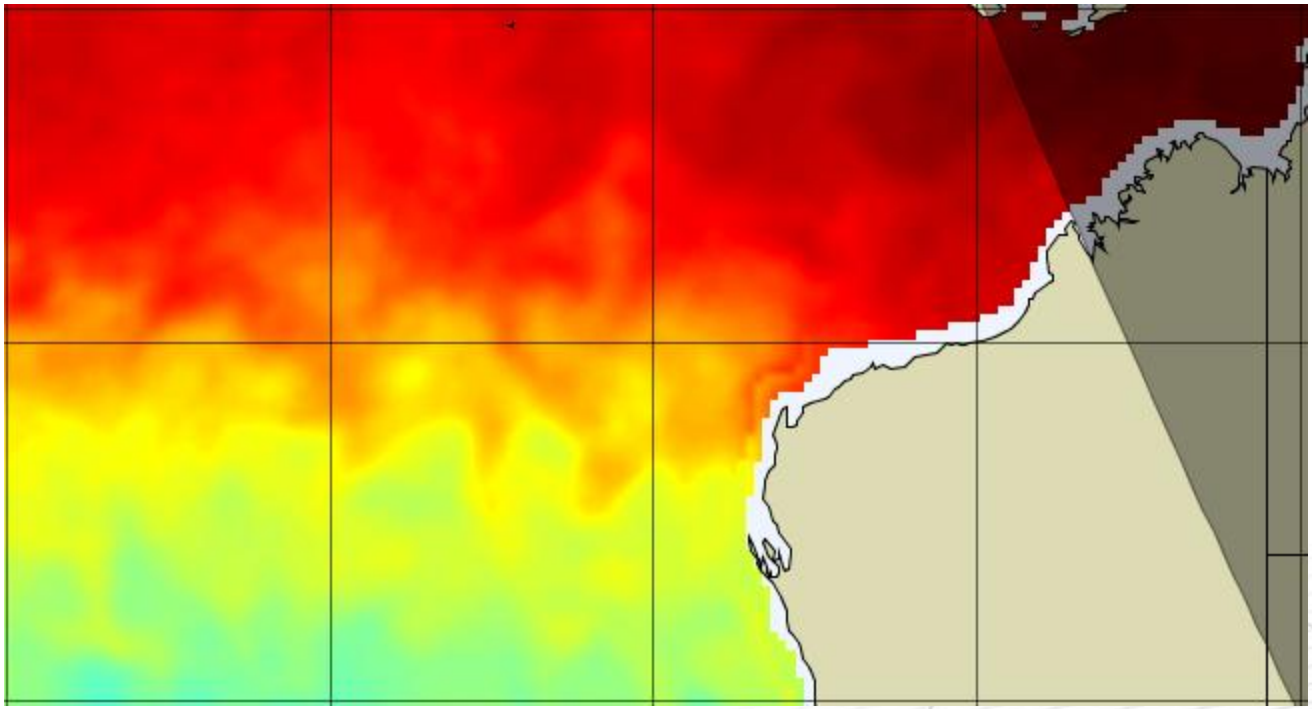
# Microvawe SST



| Satellite | | Instrument | |
|---|---|---|---|
| TRMM | - American/japanese satellite (NASA/NASDA)<br>- Operational mission<br>- Orbit = 350 km<br>- 16 rotations/day<br>- Inclination 35°<br>- ➔ measurements between 40°S and 40°N | TMI | - radar measurements<br>- no gap due to cloud<br>- spatial resolution (pixel) = 25 x 25 km |
| AQUA | - Orbit = 705 km<br>- 14/15 rotation/day<br>- Inclination 98°<br>- ➔ Global coverage | AMSR-E | - radar measurements<br>- no gap due to cloud<br>- spatial resolution (pixel) = 25 x 25 km |

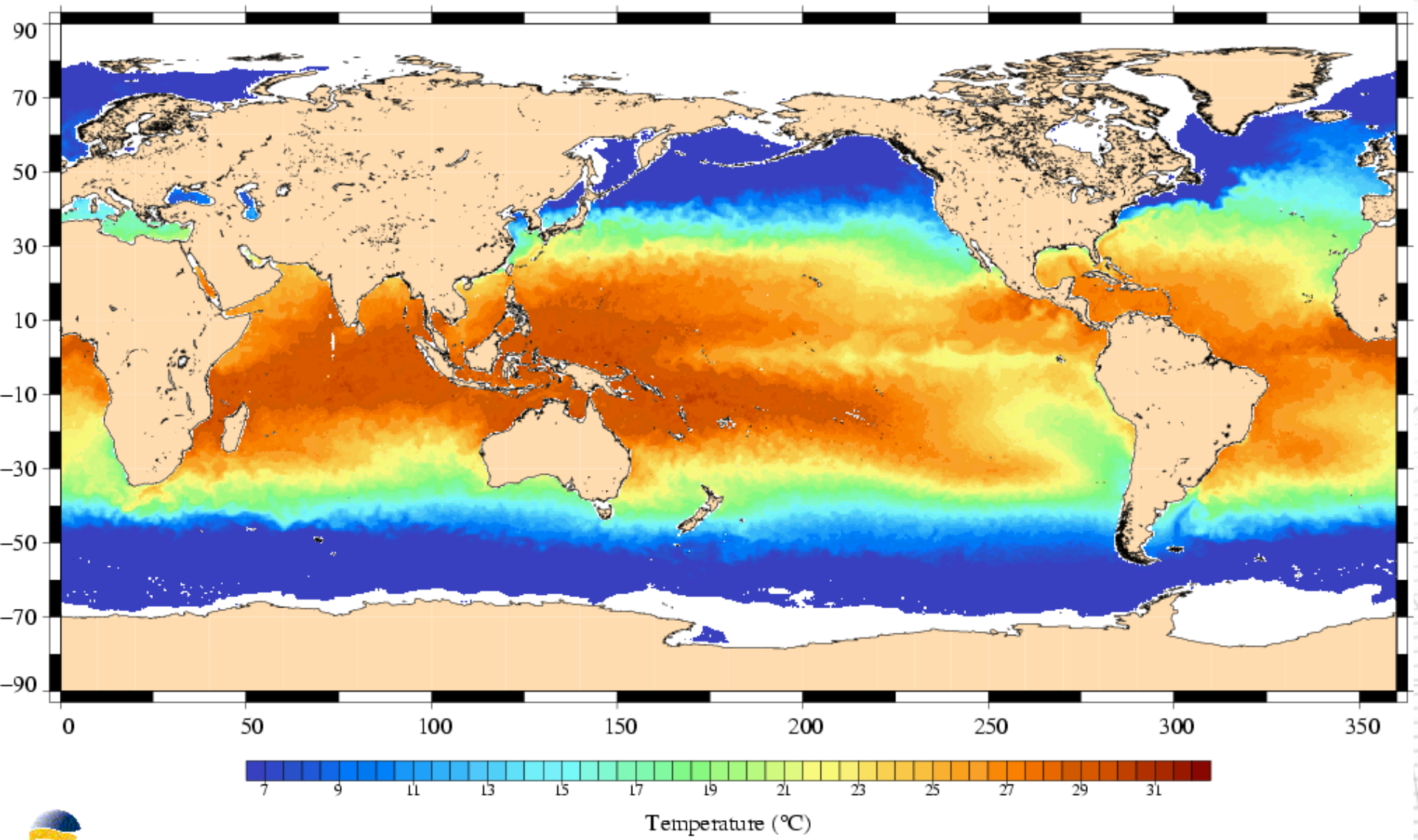
# Microwave SST maps





- Microwave technology: no gaps due to clouds
- Resolution ~1/4°

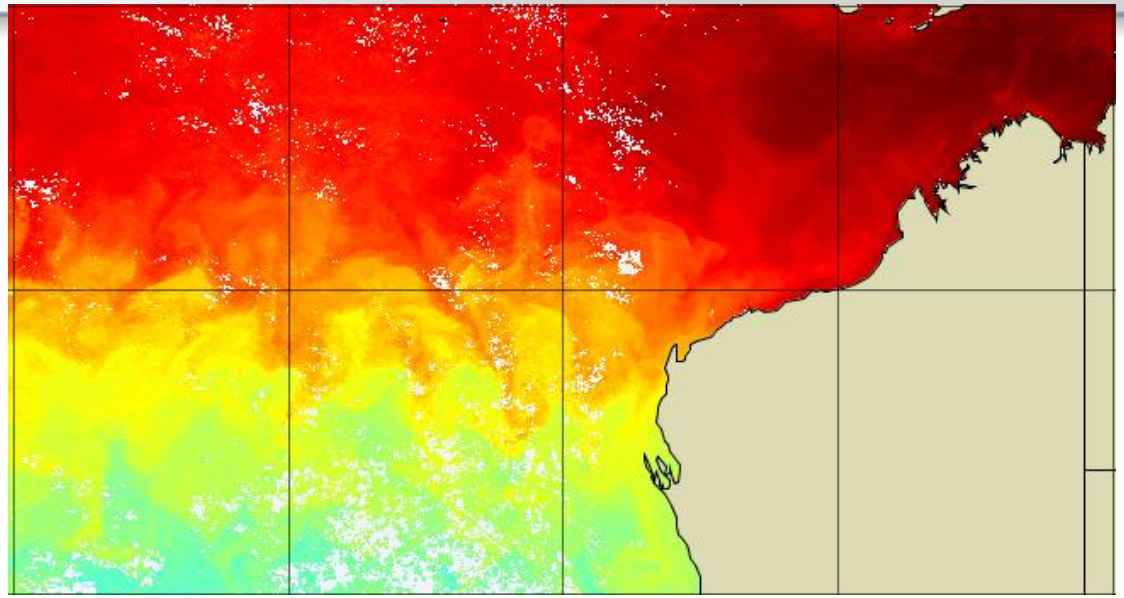
# Global coverage



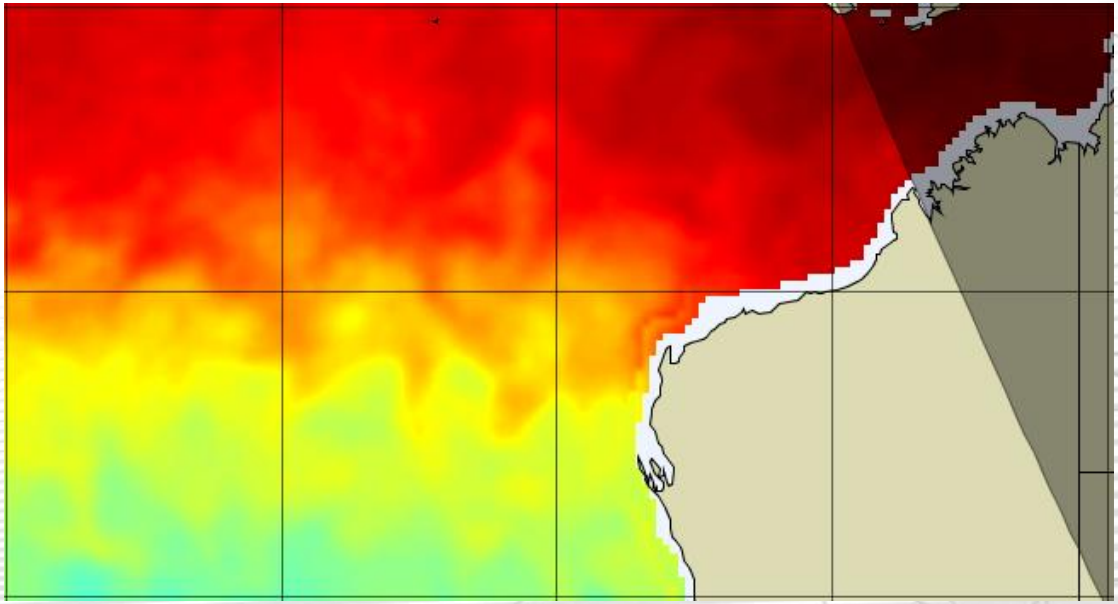
# Comparisons



Infrared



Microwave

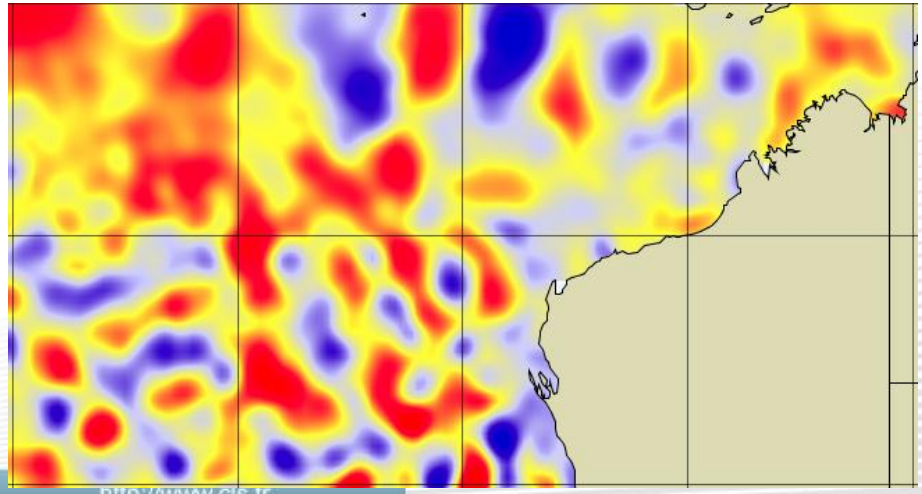


# Marine resource management

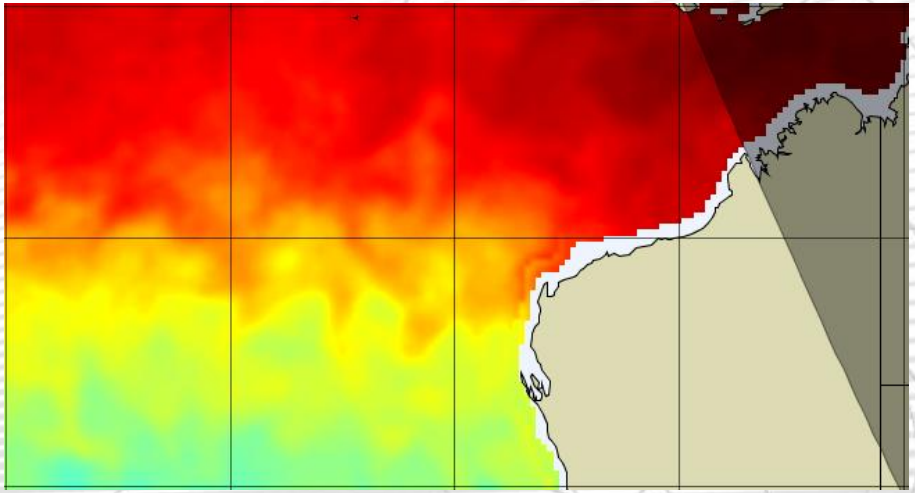


- SST maps are synoptic views of the ocean surface
- Combination of SST maps with altimetry maps highlight oceanic fronts, currents, eddies and upwelling
- Some marine pelagic species move along fronts and feed in cold waters

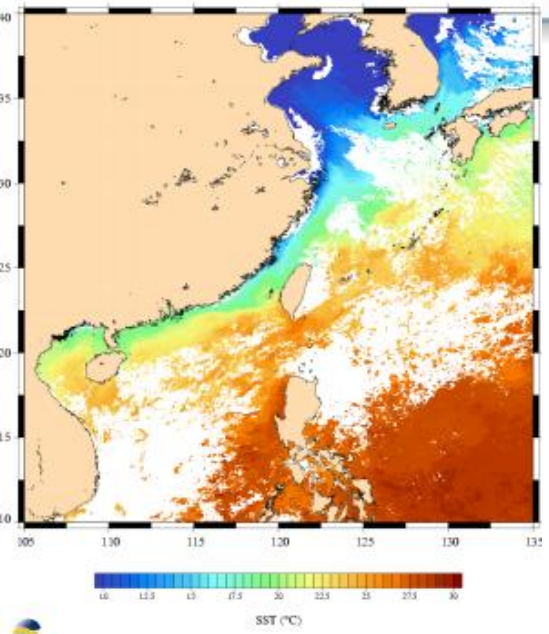
Altimetry



SST



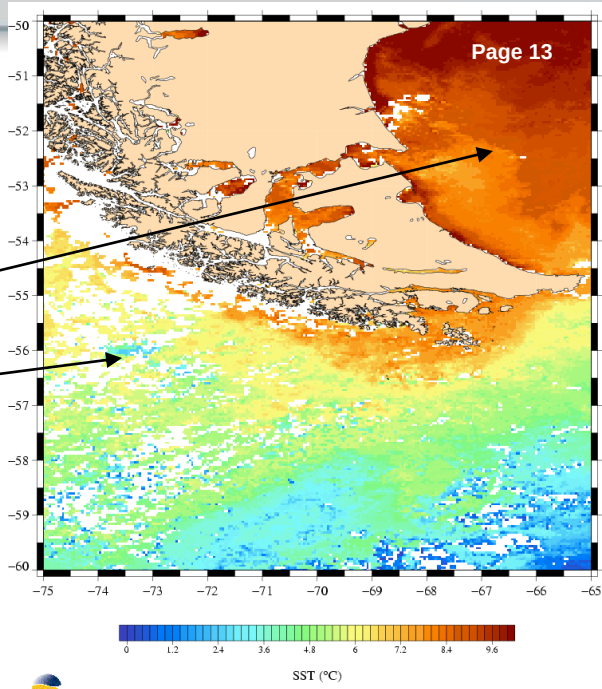
# Detecting fronts




With satellite observations of Sea Surface Temperature

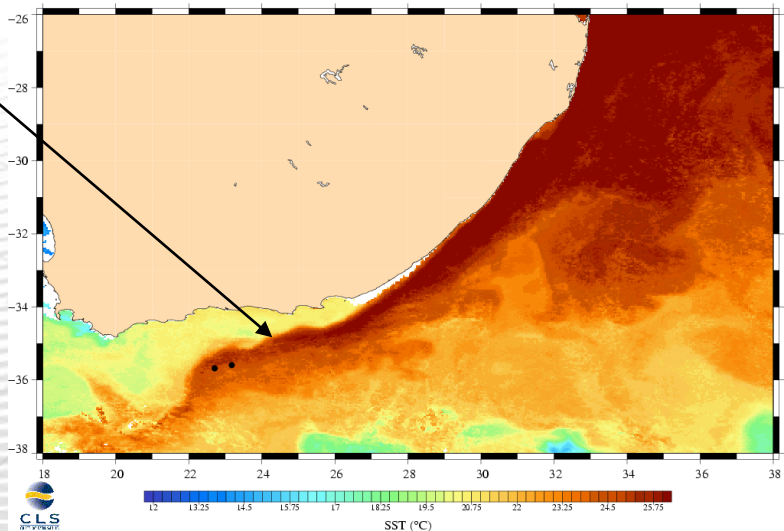
Patagonia:

- To delineate fronts
- To localize upwelling




South Africa

- To delineate fronts
- To separate water masses




Sea surface temperature data make it possible to delineate water masses from space.