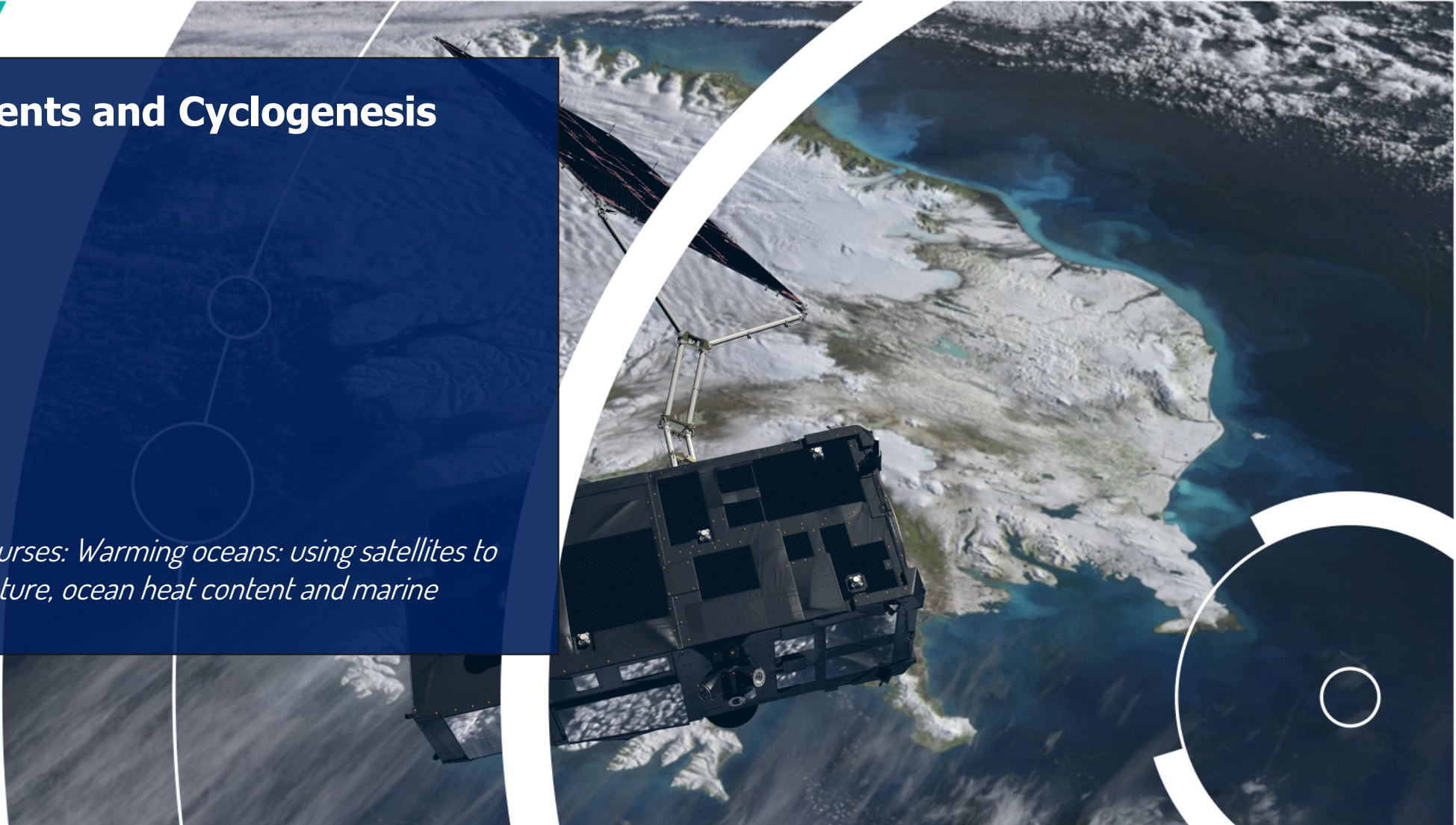# Ocean Heat Contents and Cyclogenesis
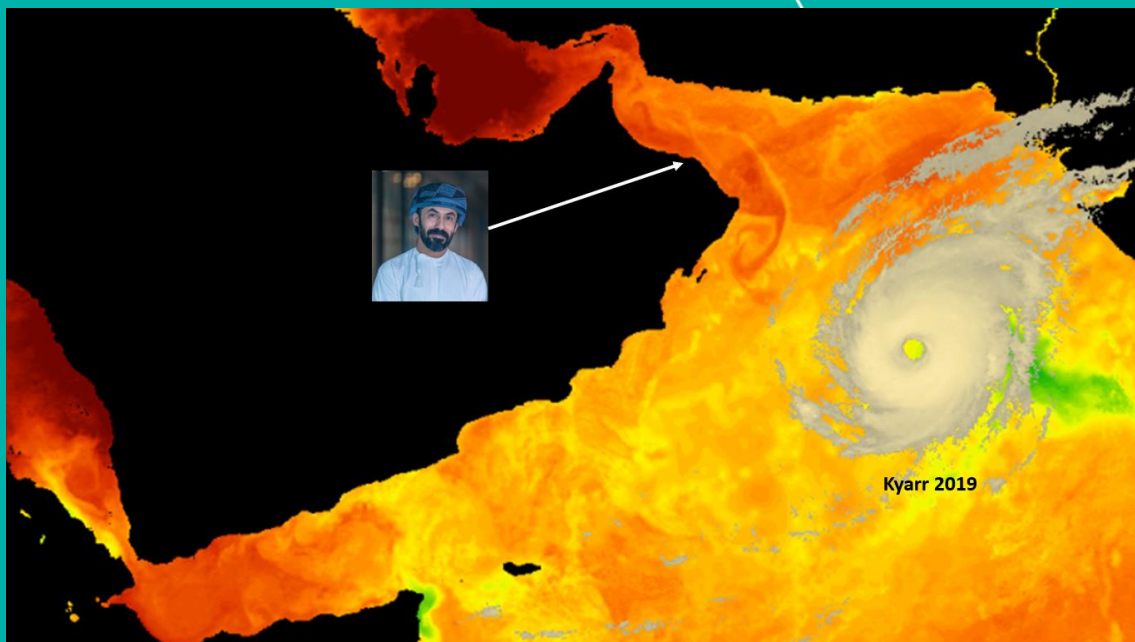
Ibrahim Al Abdulsalam

Meteorologist
Civil Aviation Authority / Oman

i.alabdulsalam@met.gov.om

EUMETSAT series of short courses: Warming oceans: using satellites to monitor sea surface temperature, ocean heat content and marine heatwaves; 07.2023
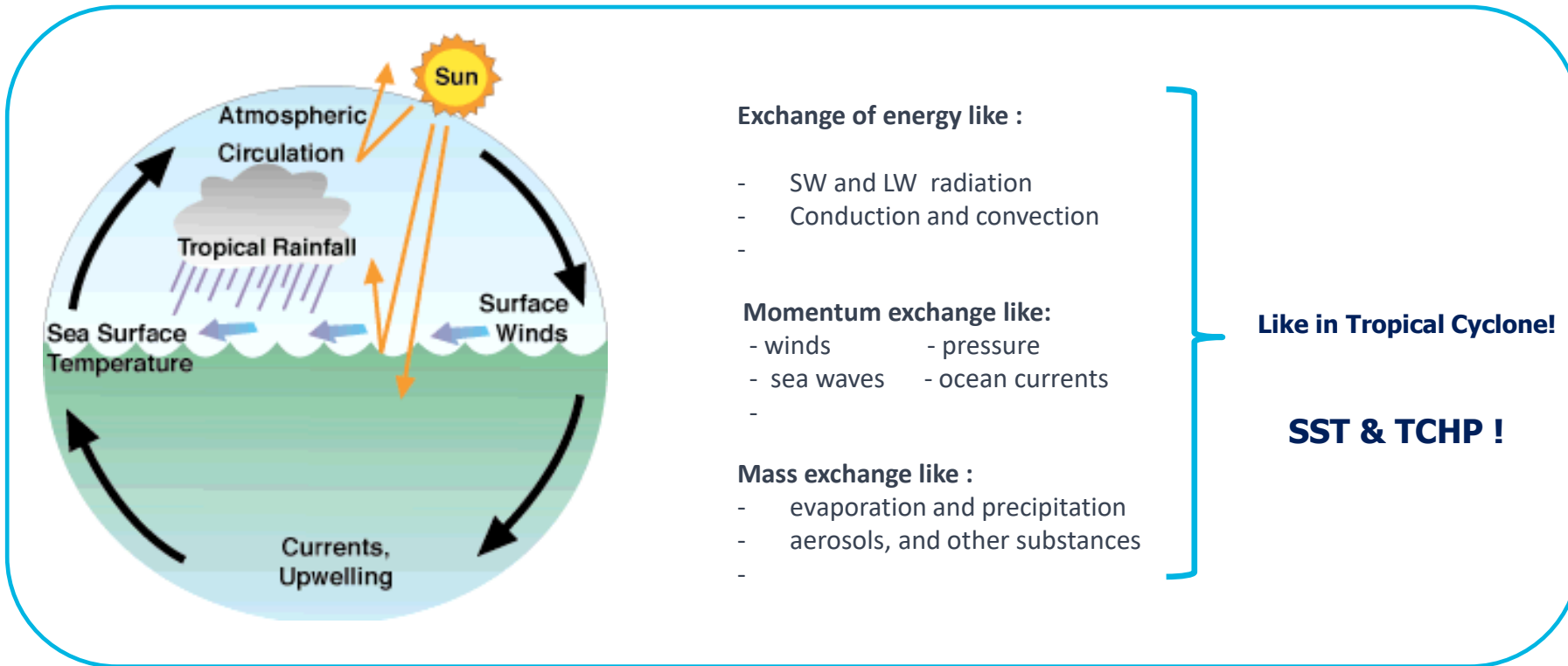
Ocean Heat Contents and Cyclogenesis

Kyarr 2019

Contents :

- **Tropical Cyclone Heat Potential**
- **Cyclogenesis**
- **Climate Review for Arabian Sea**

Atmosphere-Ocean Coupling

Atmosphere-ocean coupling

Refers to the interaction and exchange of **energy**, **momentum**, and **mass** between the atmosphere and oceans.

Exchange of energy like :

- SW and LW radiation
- Conduction and convection
-

Momentum exchange like:
- winds   - pressure
- sea waves   - ocean currents
-

Mass exchange like :
- evaporation and precipitation
- aerosols, and other substances
-

Like in Tropical Cyclone!

SST & TCHP !

That is fully nonlinear

>> Very complex !

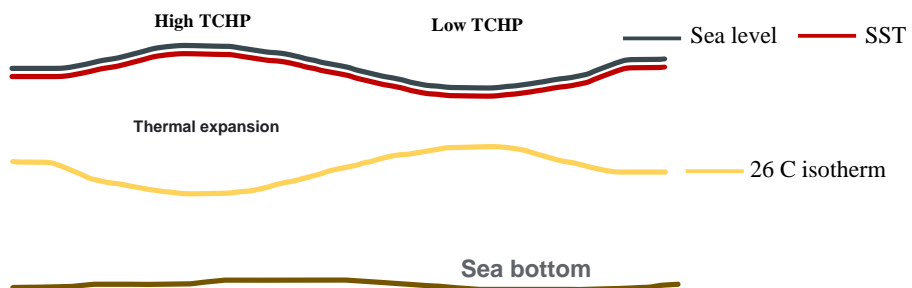**Needs accurate observation and numerical modeling**

Credit:

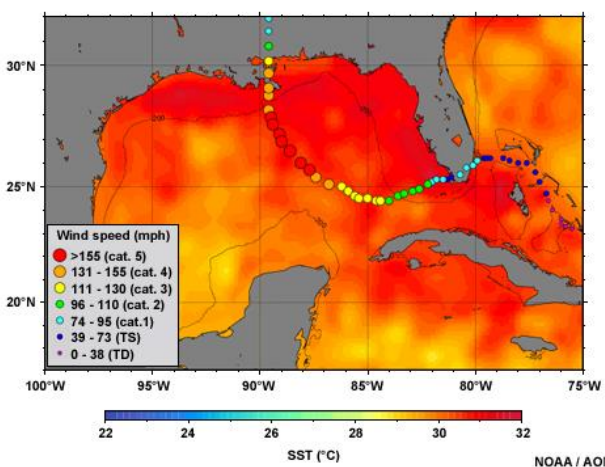# Tropical Cyclone Heat Potential (TCHP)

Tropical cyclone heat potential (TCHP)

Measure of the integrated vertical temperature from the sea surface to the depth of the 26 C isotherm.
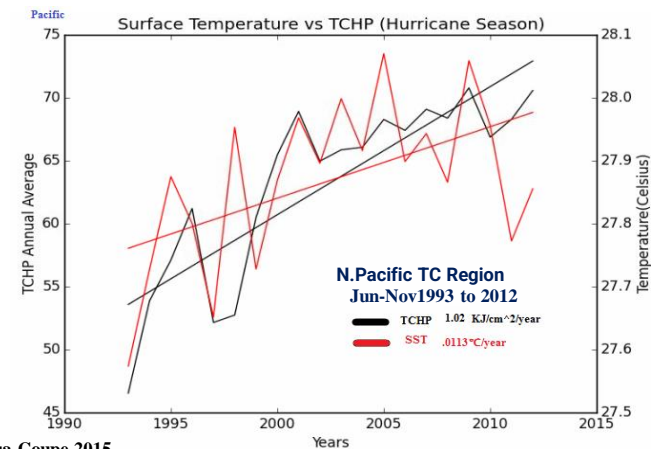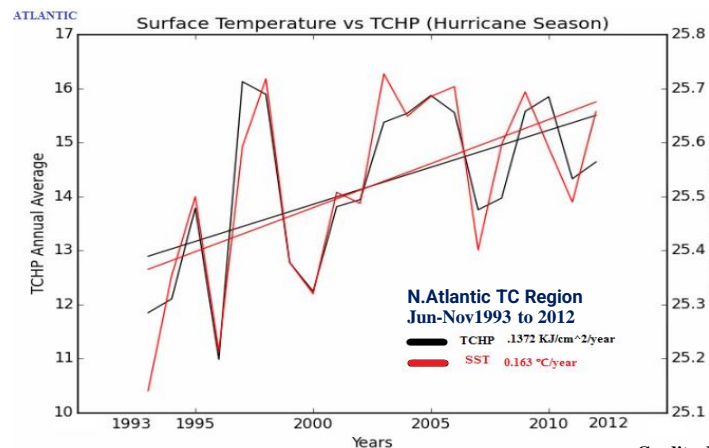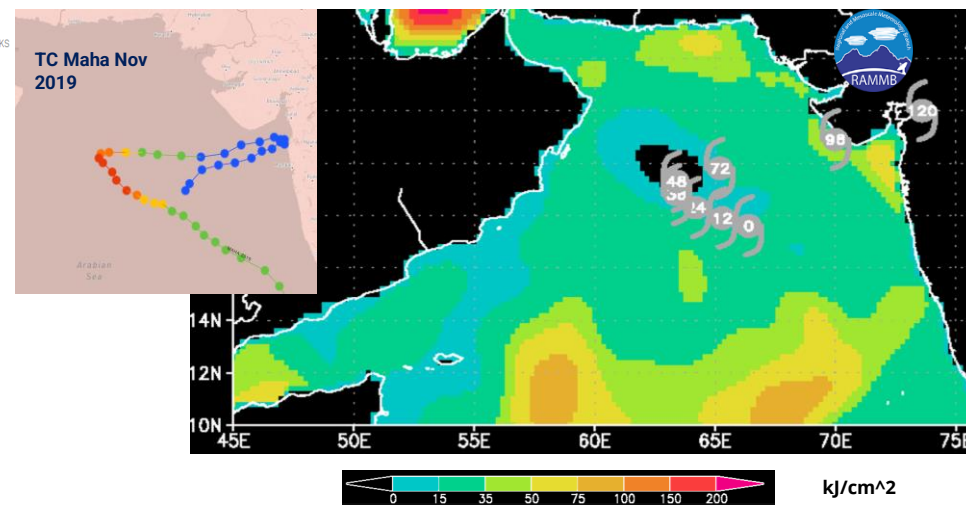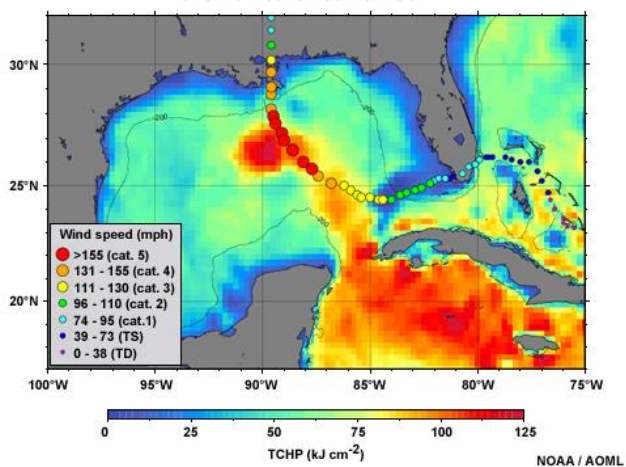

Credit : Joshua Coupe 2015

Tropical Cyclogenesis Ingredients :

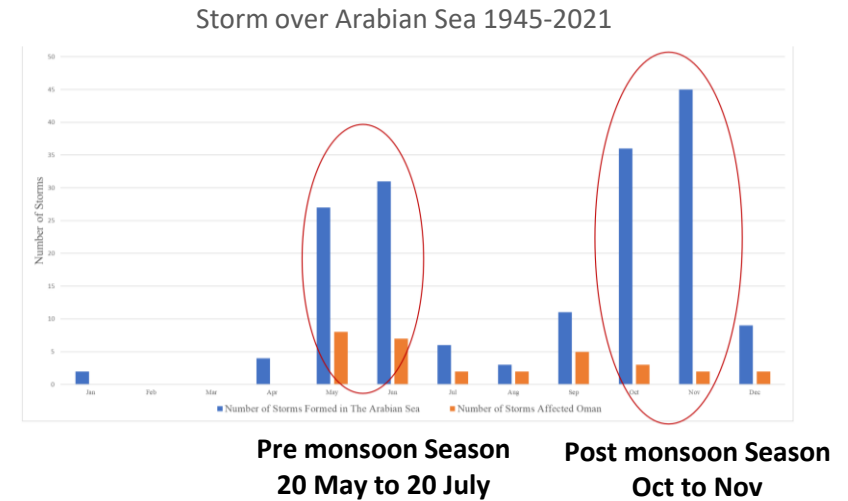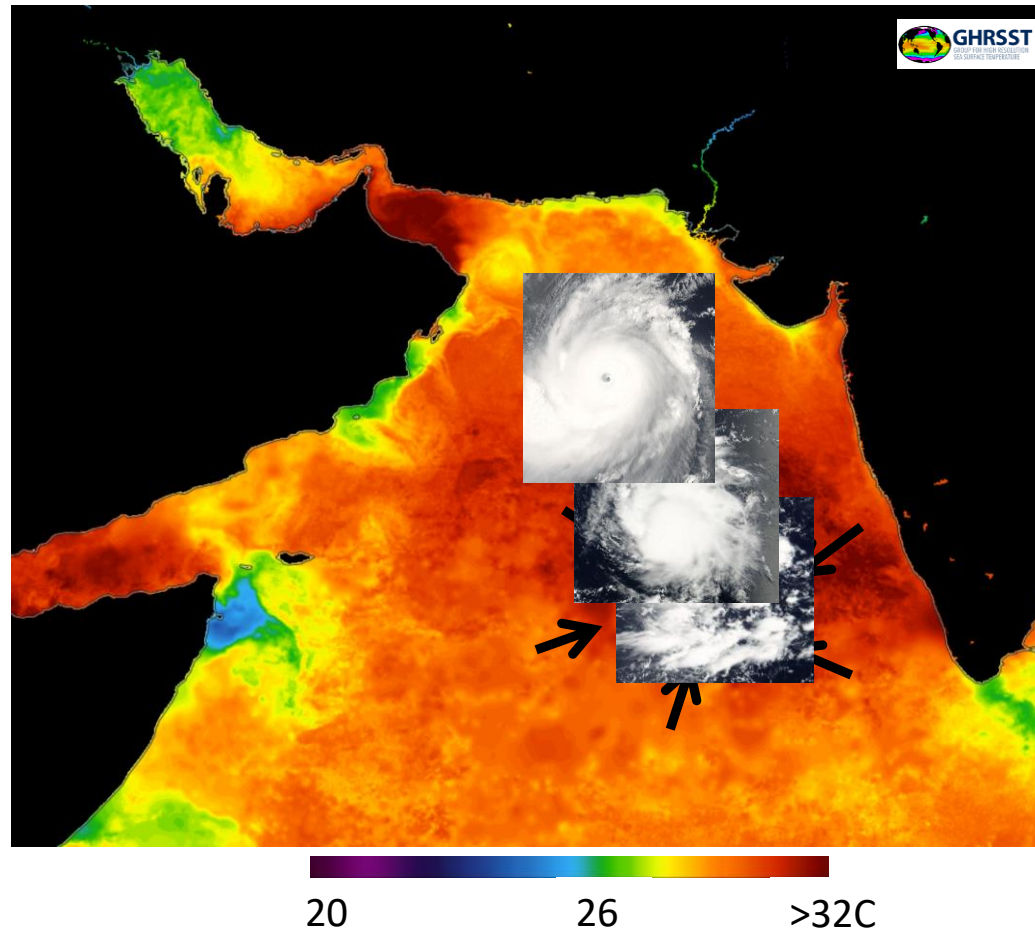- Warm Sea , SST > 26.5 Deep down to 50 m

- Pre-existing low-pressure system , tropical easterly waves

- Instability

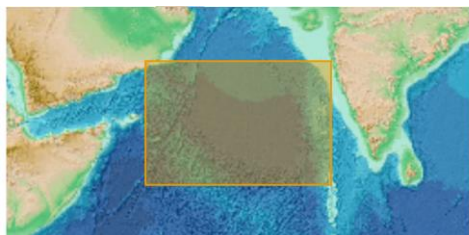- High moisture in low and mid troposphere
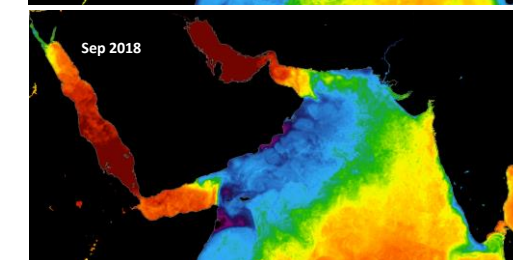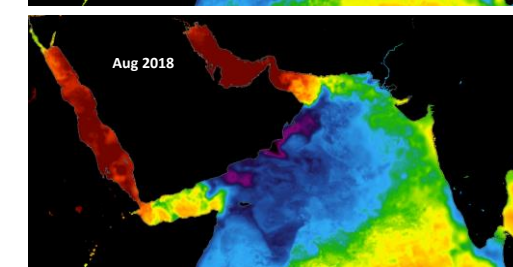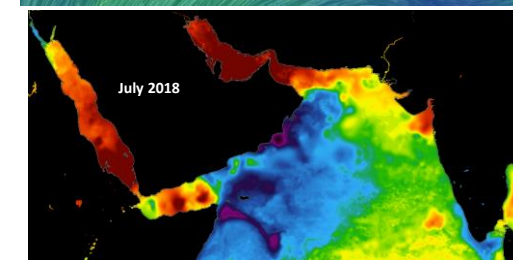
- Low vertical wind shear

- Coriolis Force

20   26   >32C

Storm over Arabian Sea 1945-2021

Pre monsoon Season
20 May to 20 July

Post monsoon Season
Oct to Nov
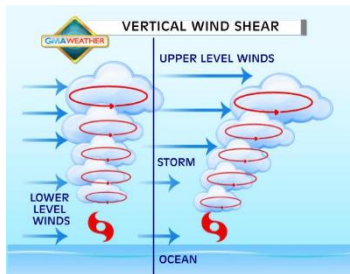
Arabian Sea SST Seasonal Variation

18 N

55 E   73 E

6 N

SOURCE: NOAA OI SST

https://mynasadata.larc.nasa.gov/

SST [°C]

?

1   2   3   4   5   6   7   8   9   10   11   12

Monthly Average Arabian Sea SST 1982-2021

Storm over Arabian Sea 1945-2021

Number of Storms Formed in The Arabian Sea   Number of Storms Affected Oman

July 2018

Aug 2018

Sep 2018

20   26   >32C

TCs Kyaar and Maha 2019

copernicus.eumetsat.int

STORM NAME	DATE RANGE	MAX WIND SPEED	MIN PRESSURE	MAX CATEGORY
MAHA 2019	Oct 28, 2019 to Nov 11, 2019	105	959	H3
KYAAR:KYARR 2019	Oct 22, 2019 to Nov 03, 2019	135	924	H4

17.10.2019
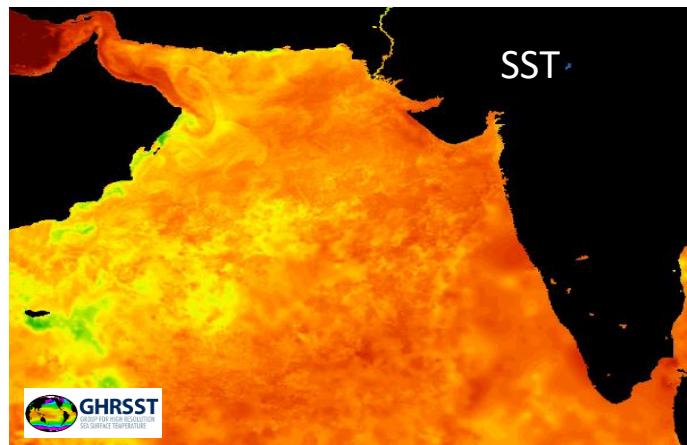
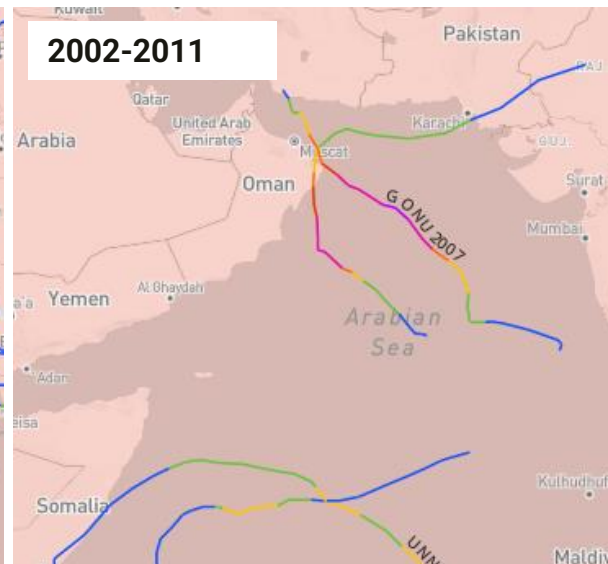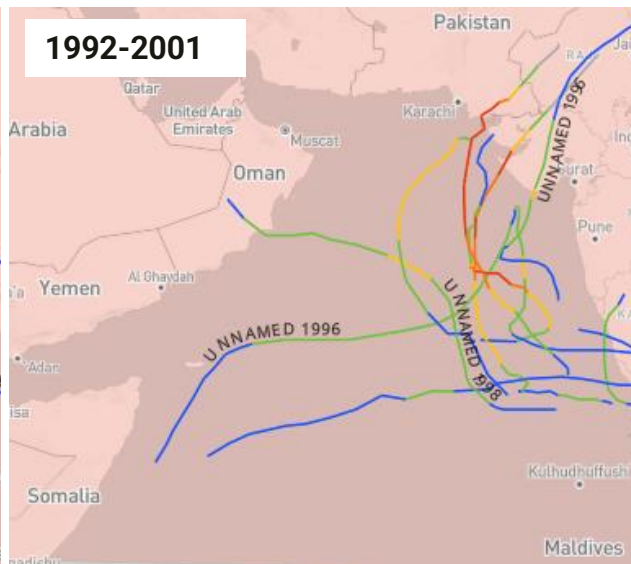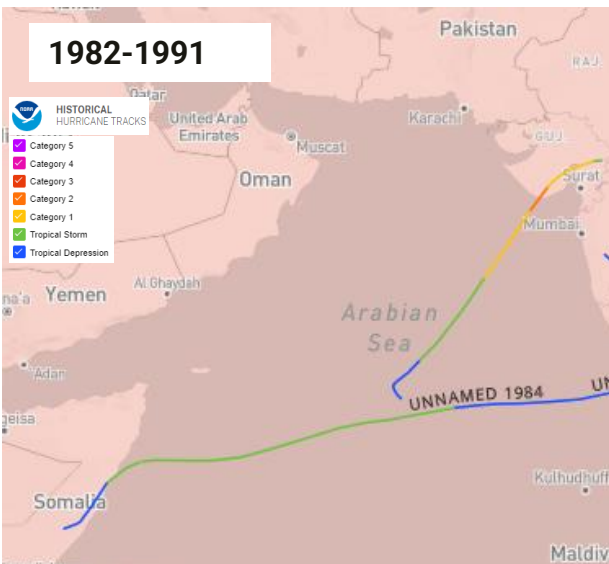08.11.2019
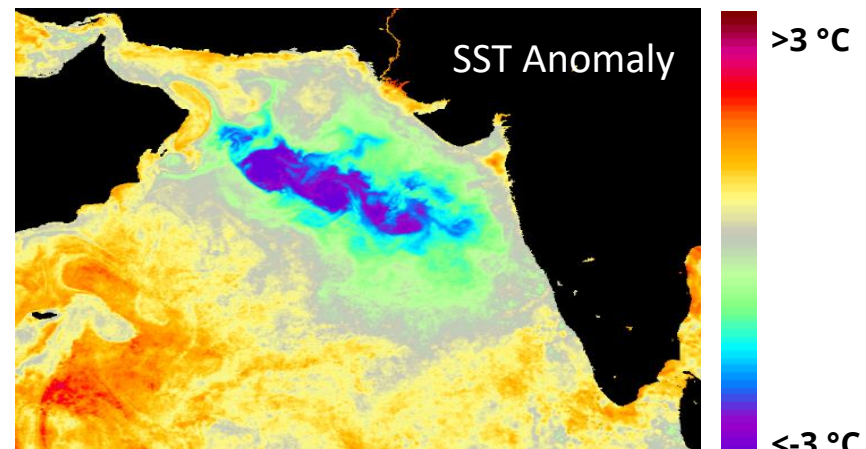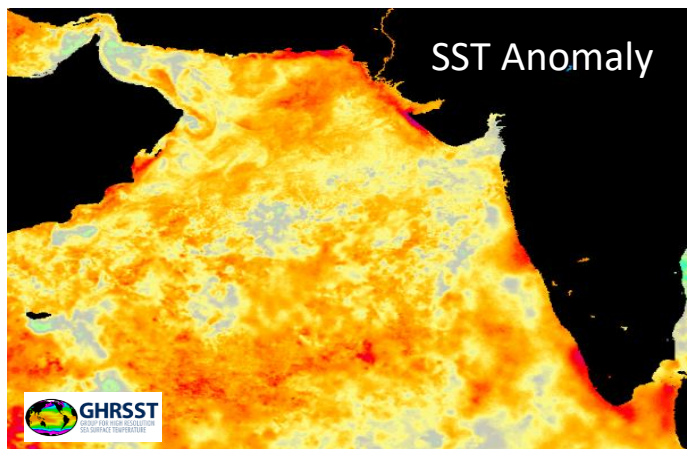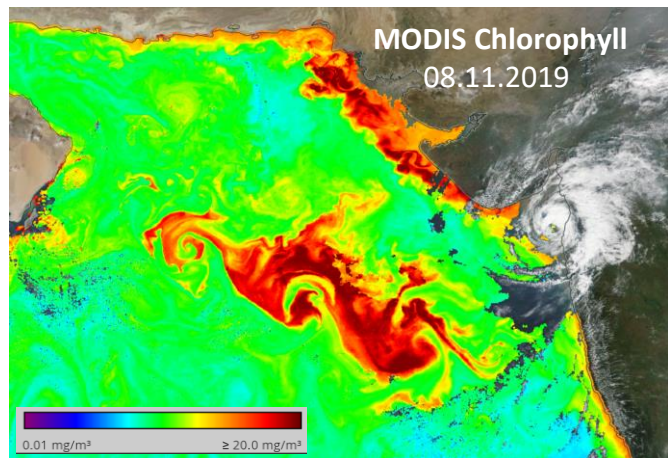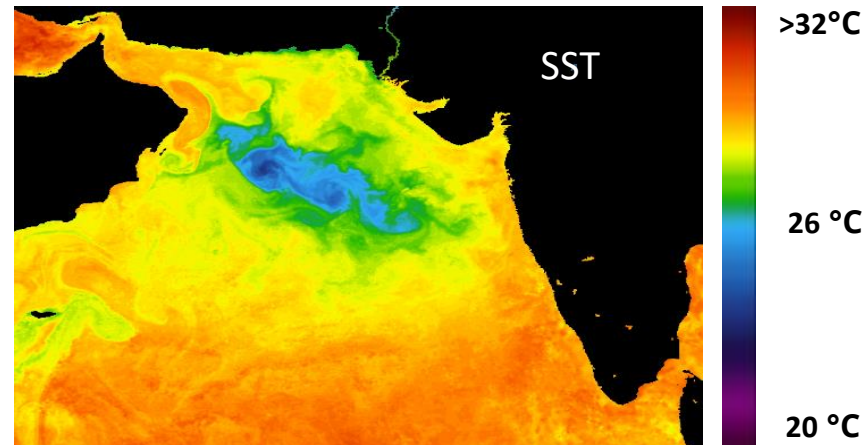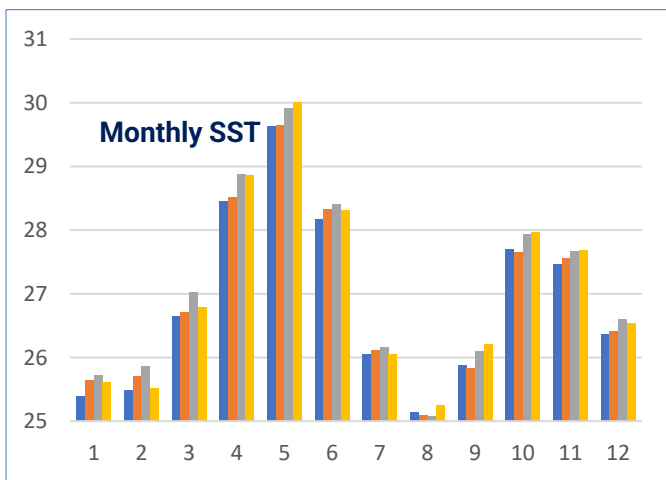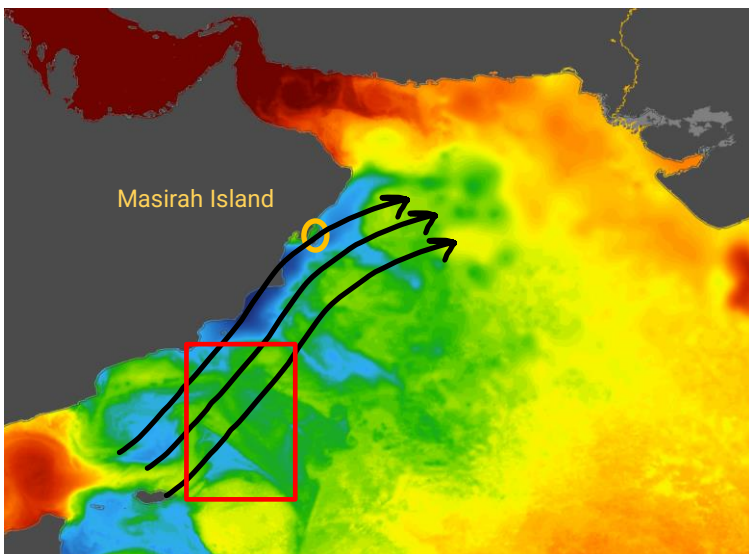
Arabian Sea , What is going on?

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Masirah Island

Monthly SST
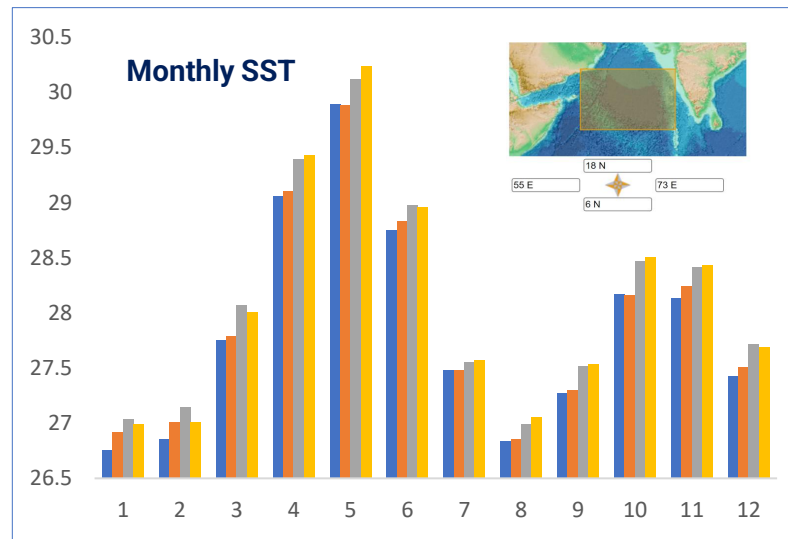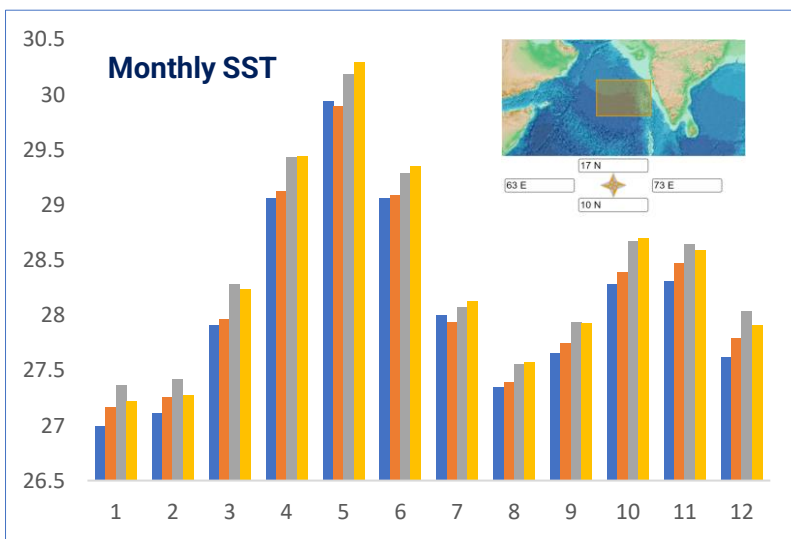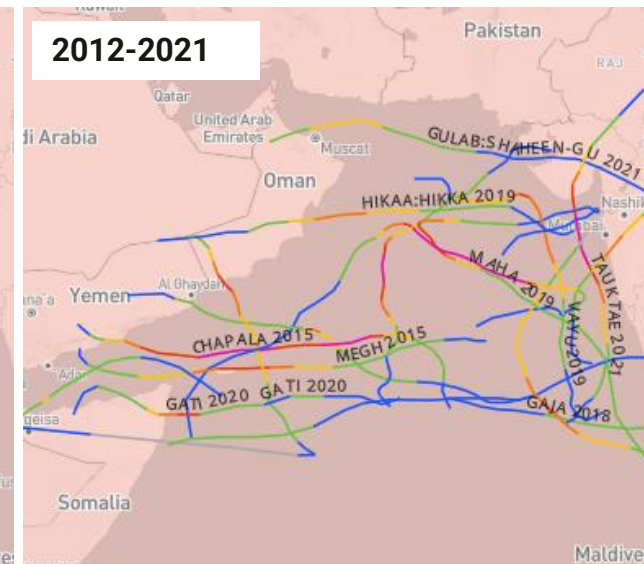
■ Average 1982-1991 ■ Average 1992-2001 ■ Average 2002-2011 ■ Average 2012-2021

Correlation (R) : **0.7724**

Masirah T

SST
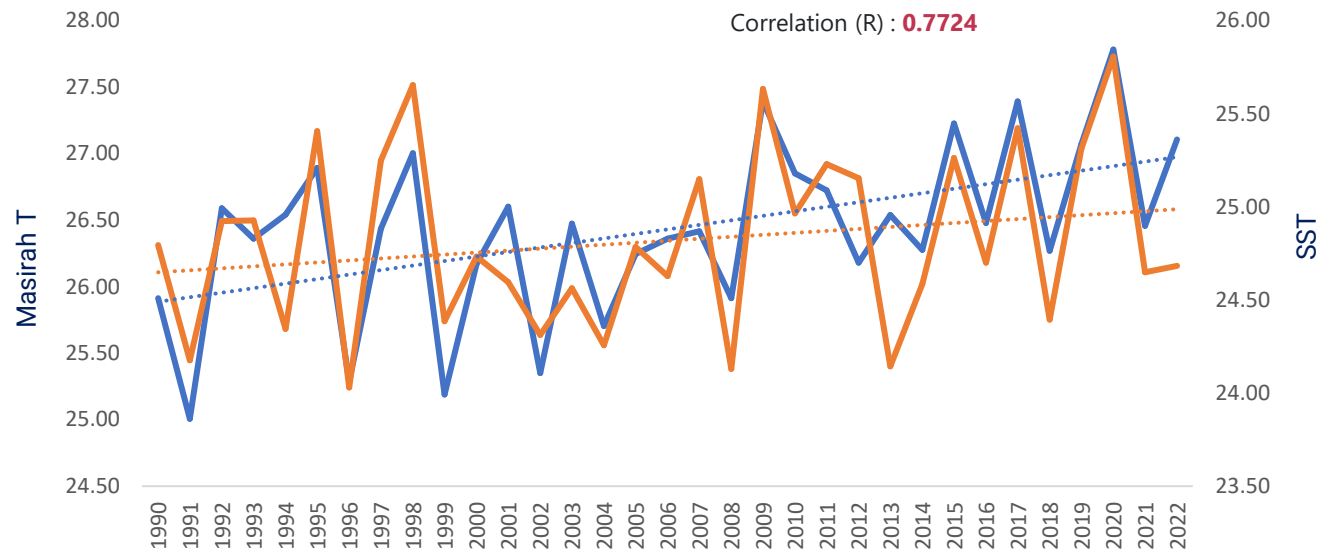
NOAA OI SST vs Masirah Island Air Temperature
August   1990 - 2022

EUMETSAT   Copernicus   9

Thank You