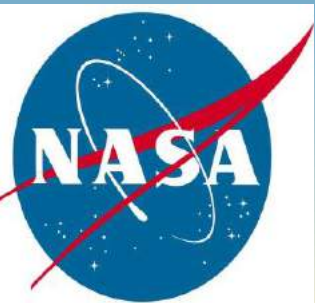


Decision and Information System for the Coastal waters of Oman (DISCO)

An integrative tool for managing coastal resources under changing climate

Joaquim I. Goes

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Huijie Xue
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Khalid Al-Hashmi
Sultan Qaboos University, Muscat, Oman

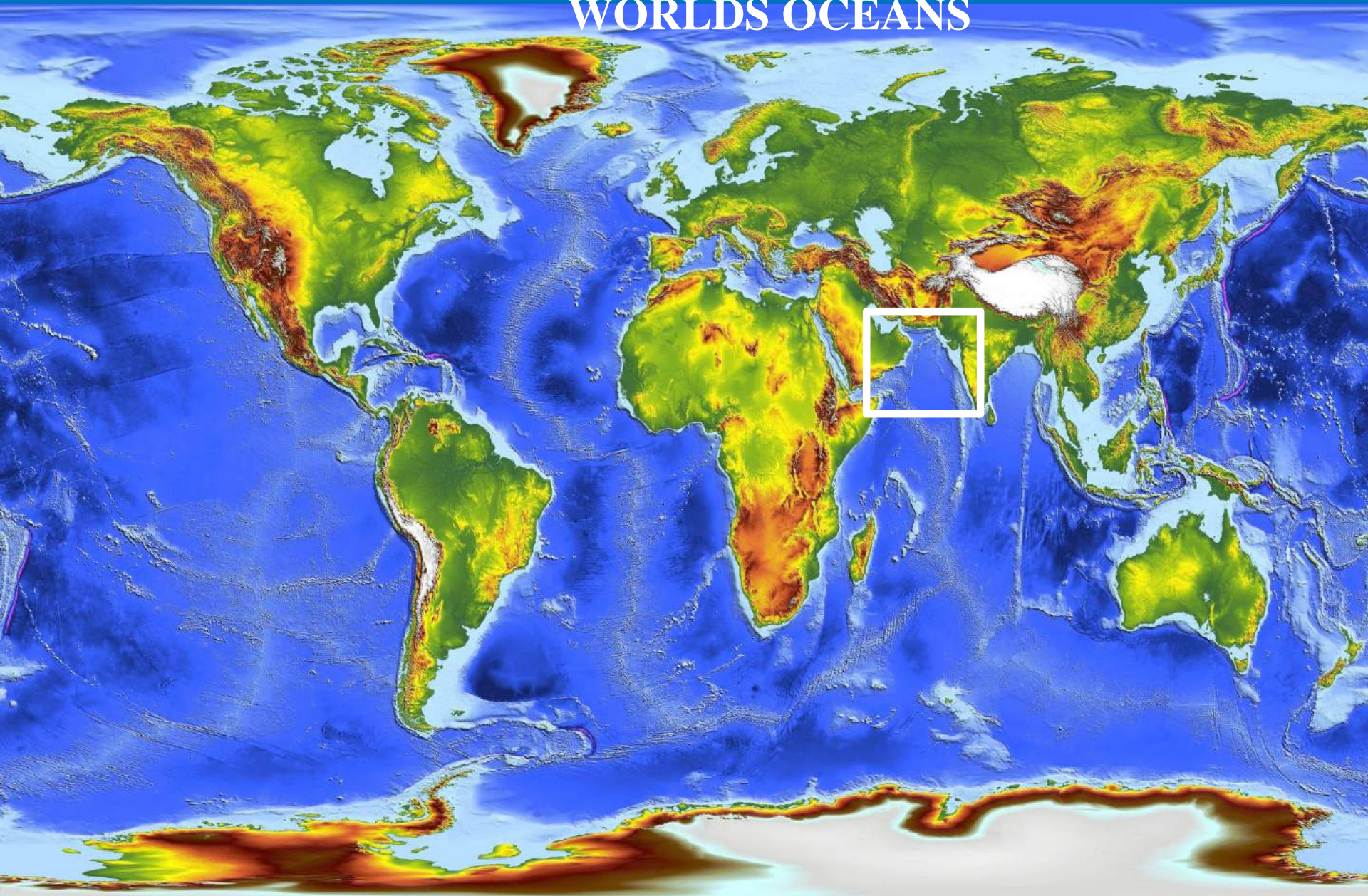


Adnan Al-Azri
Ministry of Foreign Affairs. Sultanate of Oman, Oman



Lubna Al-Kharusi
*Ministry of Agriculture and Fisheries Wealth
Sultanate of Oman Muscat, Oman*

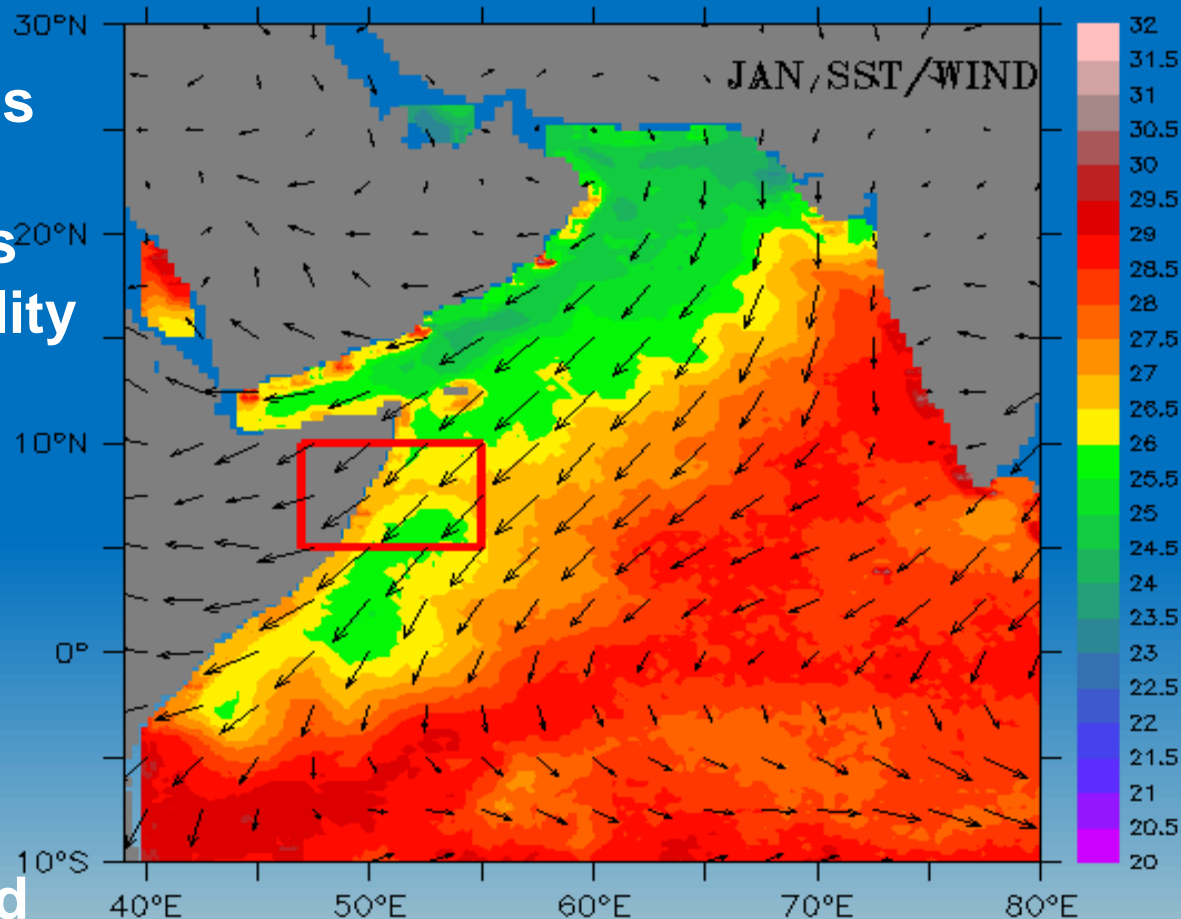
THE ARABIAN SEA IN THE CONTEXT OF THE WORLD'S OCEANS



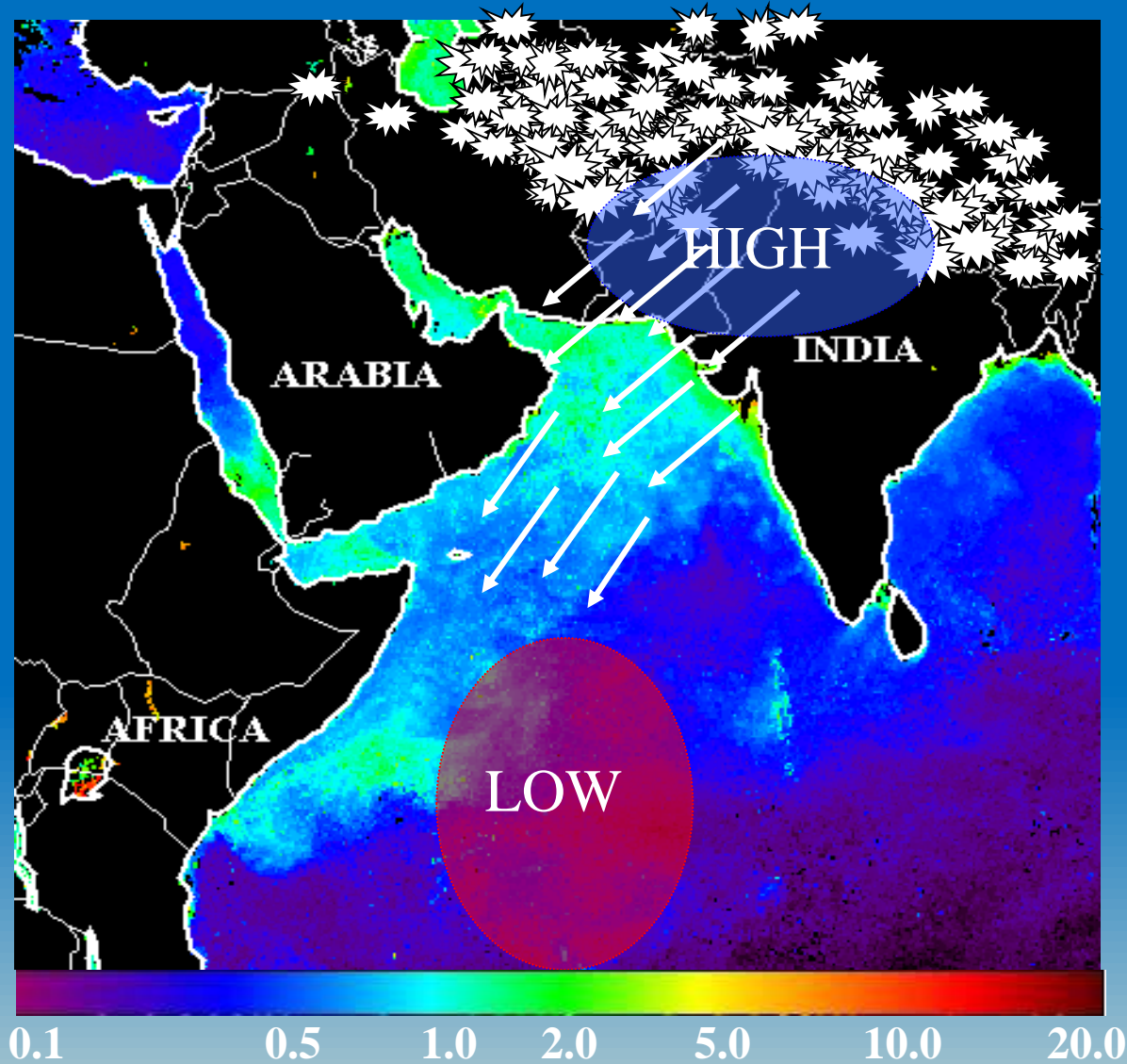
THE ARABIAN SEA AND THE MONSOONS

Reversing monsoon winds drive one the most energetic current systems and the greatest seasonality in phytoplankton productivity and carbon fluxes observable in all oceans

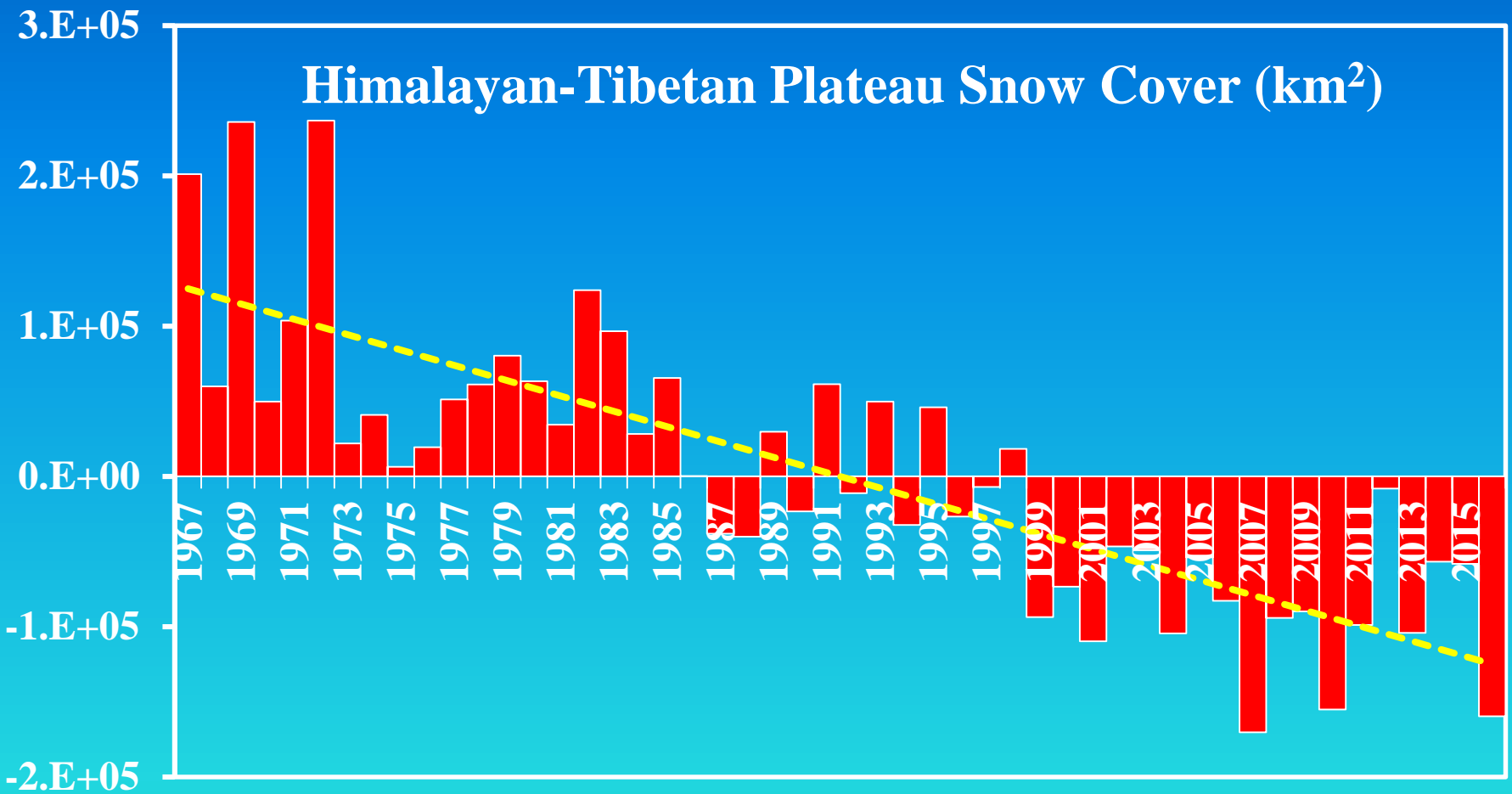
Intensity of winds is regulated by thermal gradient between land and the sea



WINTER MONSOON

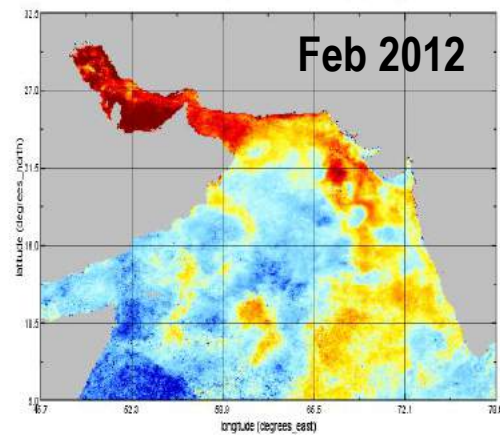


Schematic showing snow cover extent and wind direction superimposed on an ocean color chlorophyll image for the northeast monsoon season (Nov-Feb).



Annual trends of snow cover extent over the Himalayan-Tibetan Plateau Region (data source NSIDC)

Sea Surface Temperature at 4 microns (Night Only)



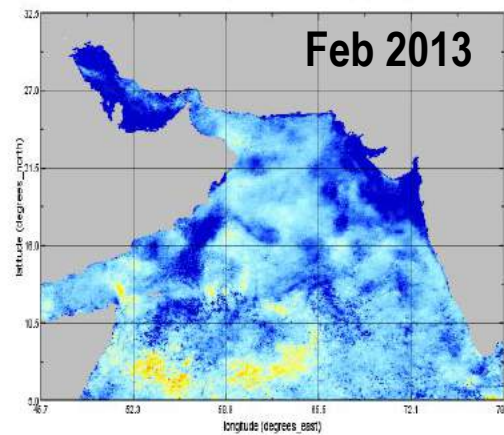
Feb 2012

Sea Surface Temperature at 4 microns (Night Only) - Sea Surface Temperature at 4 microns (Night Only) (C)



Data Min = -3.2, Max = 3.5

Sea Surface Temperature at 4 microns (Night Only)



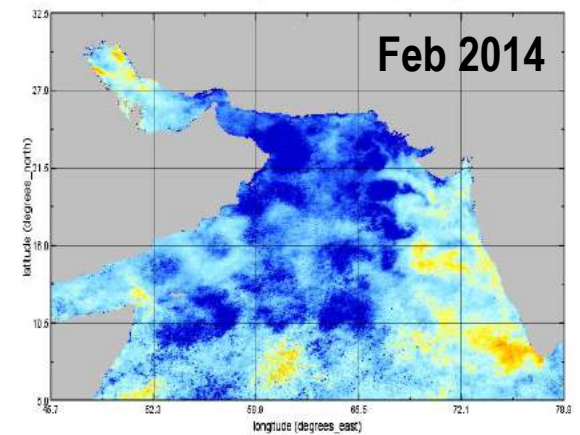
Feb 2013

Sea Surface Temperature at 4 microns (Night Only) - Sea Surface Temperature at 4 microns (Night Only) (C)



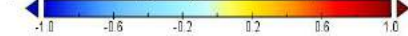
Data Min = -4.5, Max = 3.0

Sea Surface Temperature at 4 microns (Night Only)



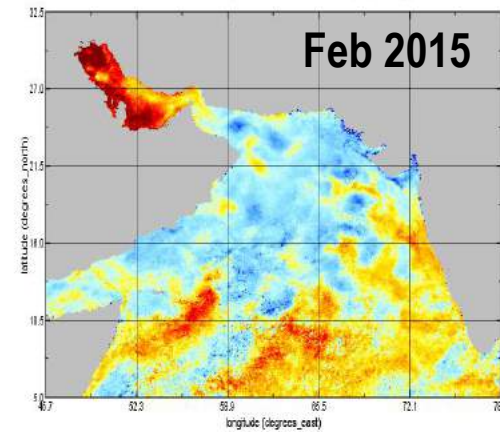
Feb 2014

Sea Surface Temperature at 4 microns (Night Only) - Sea Surface Temperature at 4 microns (Night Only) (C)



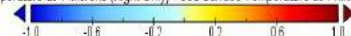
Data Min = -6.8, Max = 2.2

Sea Surface Temperature at 4 microns (Night Only)



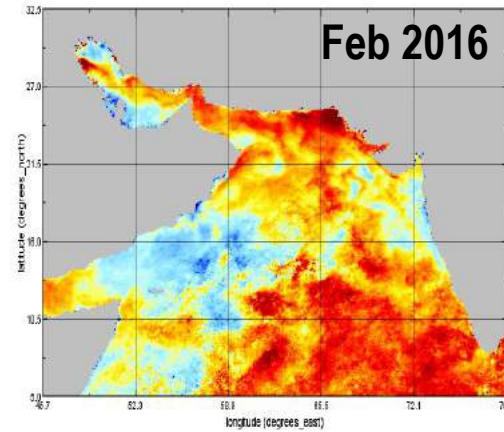
Feb 2015

Sea Surface Temperature at 4 microns (Night Only) - Sea Surface Temperature at 4 microns (Night Only) (C)



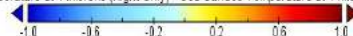
Data Min = -4.5, Max = 3.1

Sea Surface Temperature at 4 microns (Night Only)



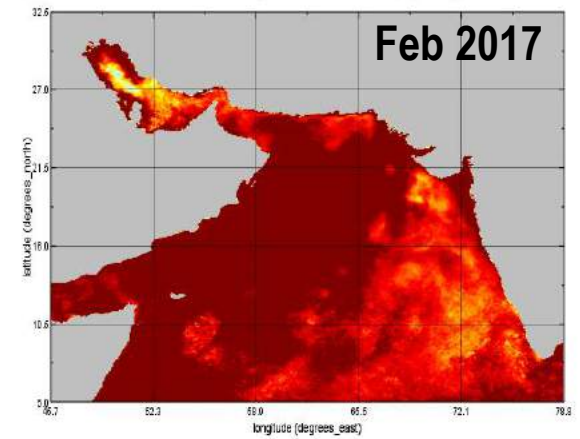
Feb 2016

Sea Surface Temperature at 4 microns (Night Only) - Sea Surface Temperature at 4 microns (Night Only) (C)



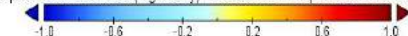
Data Min = -3.5, Max = 3.0

Sea Surface Temperature at 4 microns (Night Only)



Feb 2017

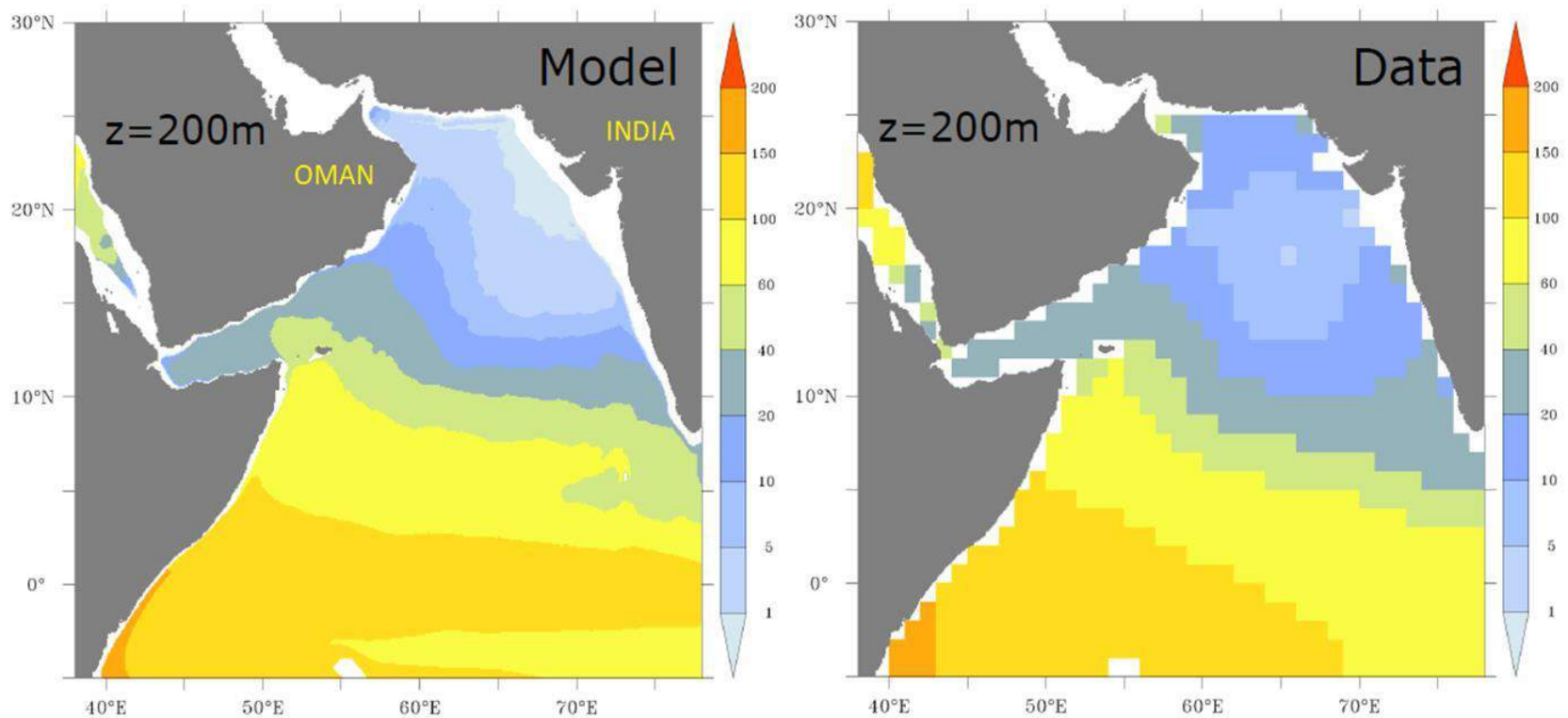
Sea Surface Temperature at 4 microns (Night Only) - Sea Surface Temperature at 4 microns (Night Only) (C)



Data Min = -1.3, Max = 5.2

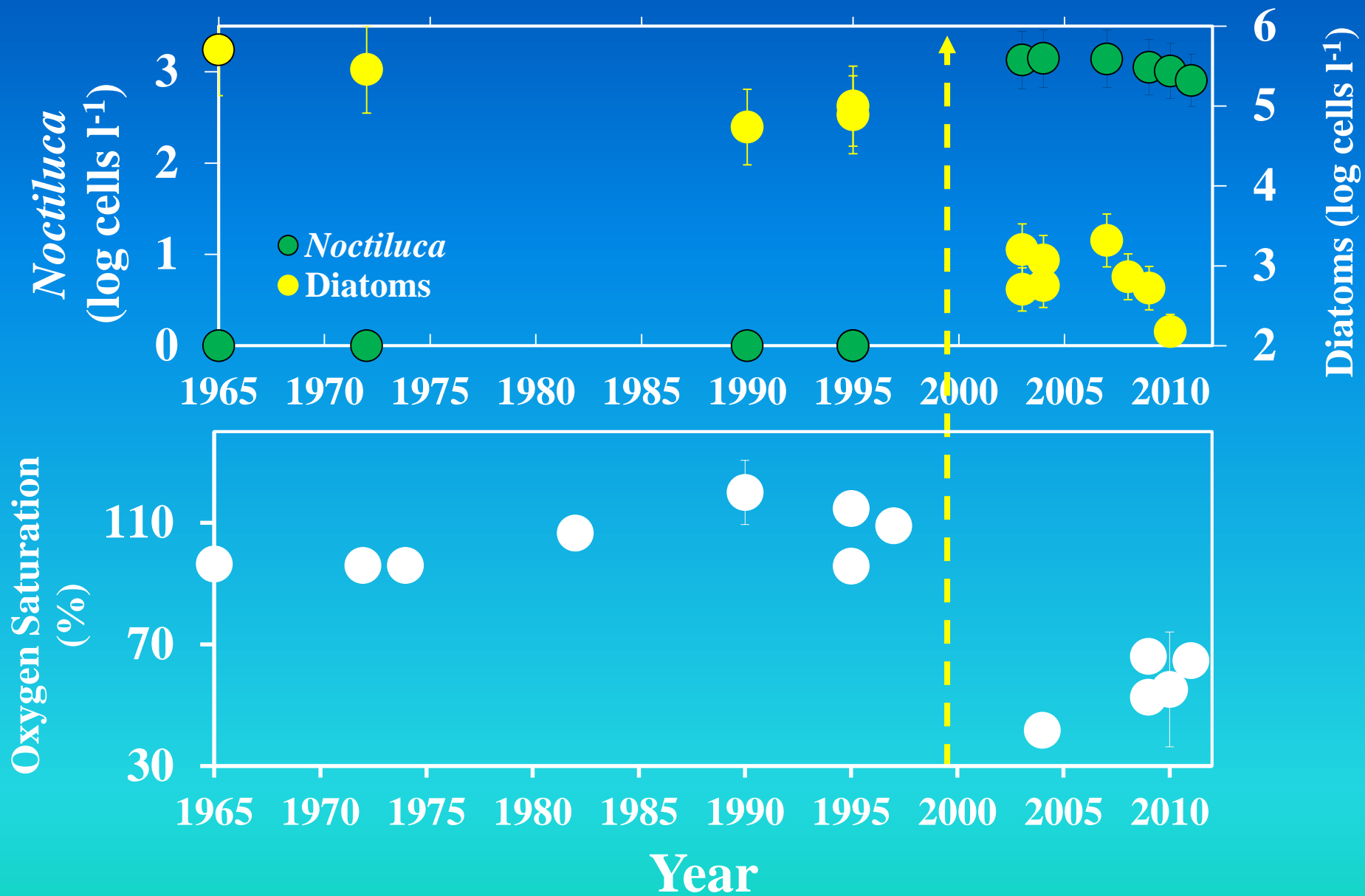
Sea surface temperature anomaly fields for the month of February

THE OXYGEN MINIMUM ZONE OF THE ARABIAN SEA



Horizontal distribution of annual mean oxygen (in mmol m⁻³) at 200 m in the Arabian Sea simulated in ROMS (left) and from World Ocean Atlas (2009) dataset.

Figure from Lachkar, et al. (2017). Intensification and deepening of the Arabian Sea Oxygen Minimum Zone in response to increase in Indian monsoon wind intensity. Biogeosciences 2017, 1-34.



Advent of *Noctiluca* in the Arabian Sea tied to the spread of hypoxia (Gomes et al., Nature Comm. 2014)

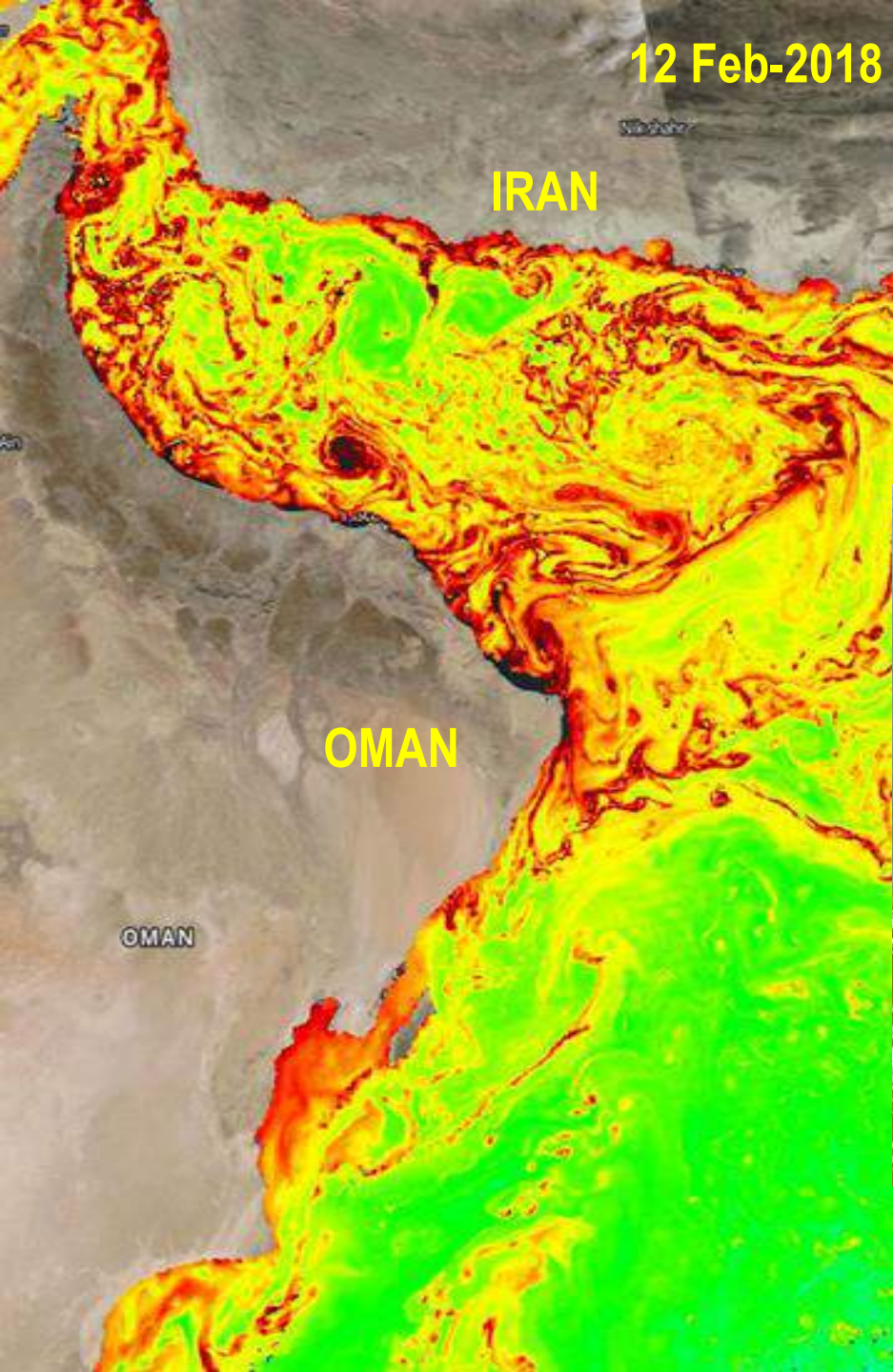
12 Feb-2018

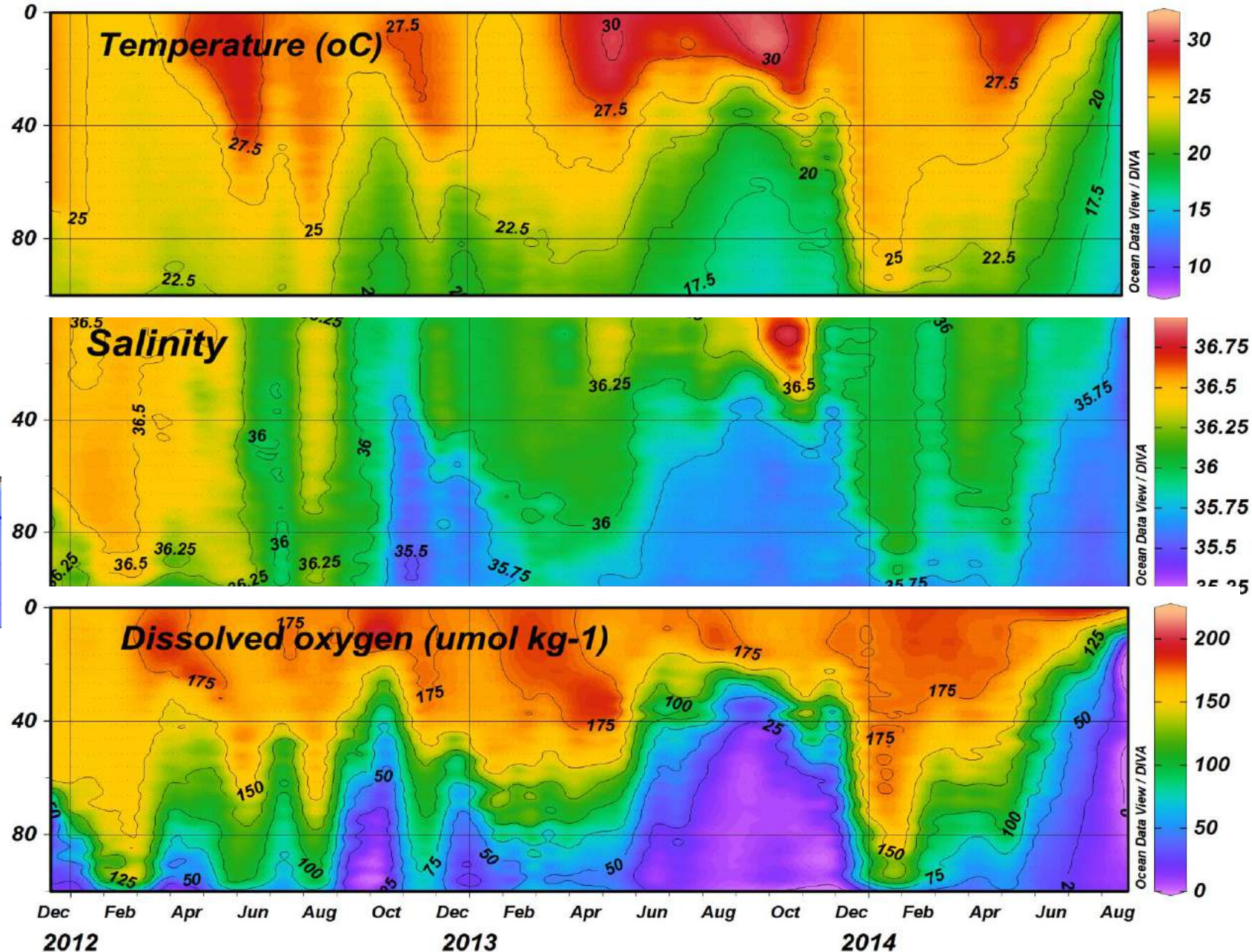
IRAN

OMAN

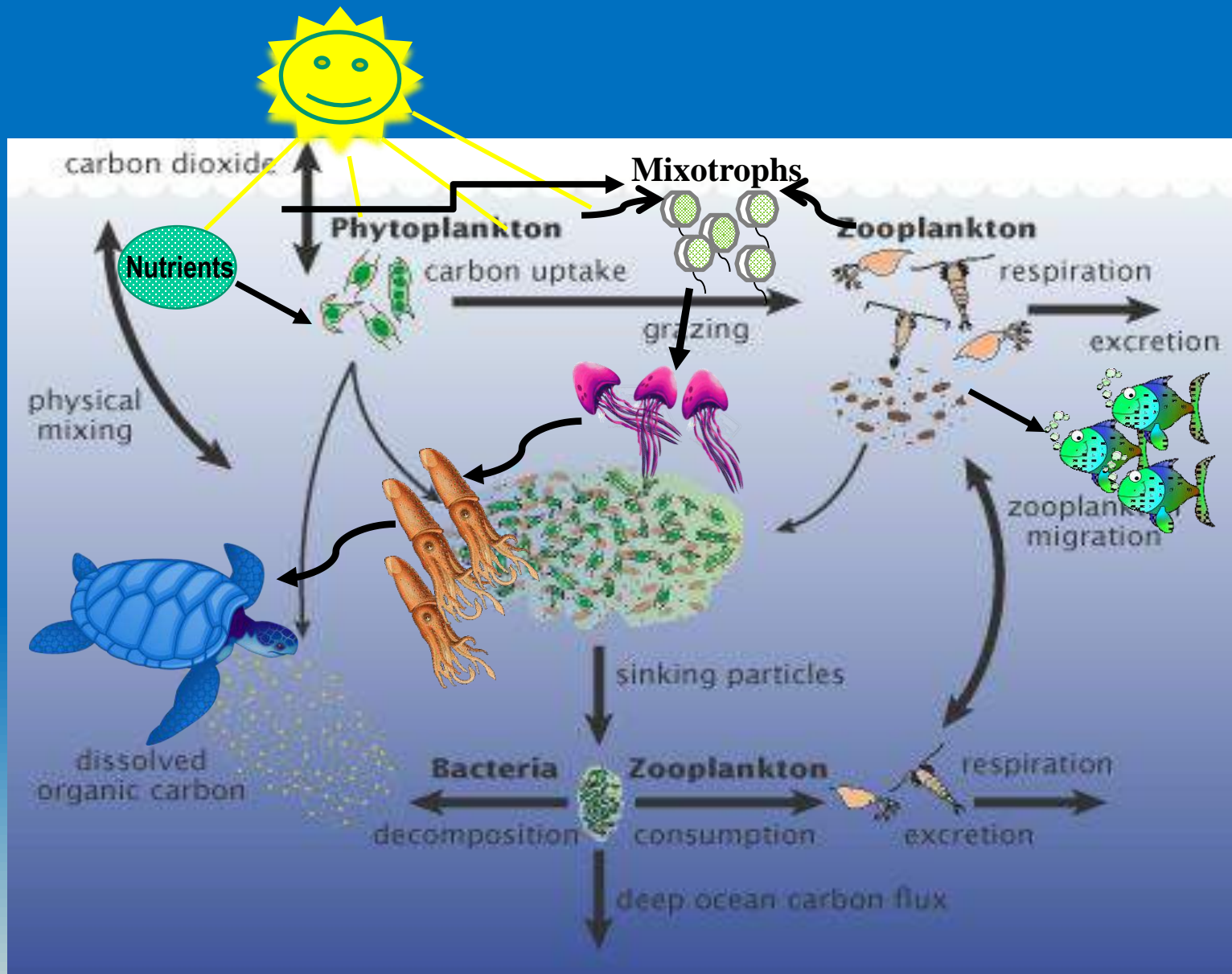
OMAN

NOCTILUCA BLOOMS OFF THE COAST OF MUSCAT,
OMAN

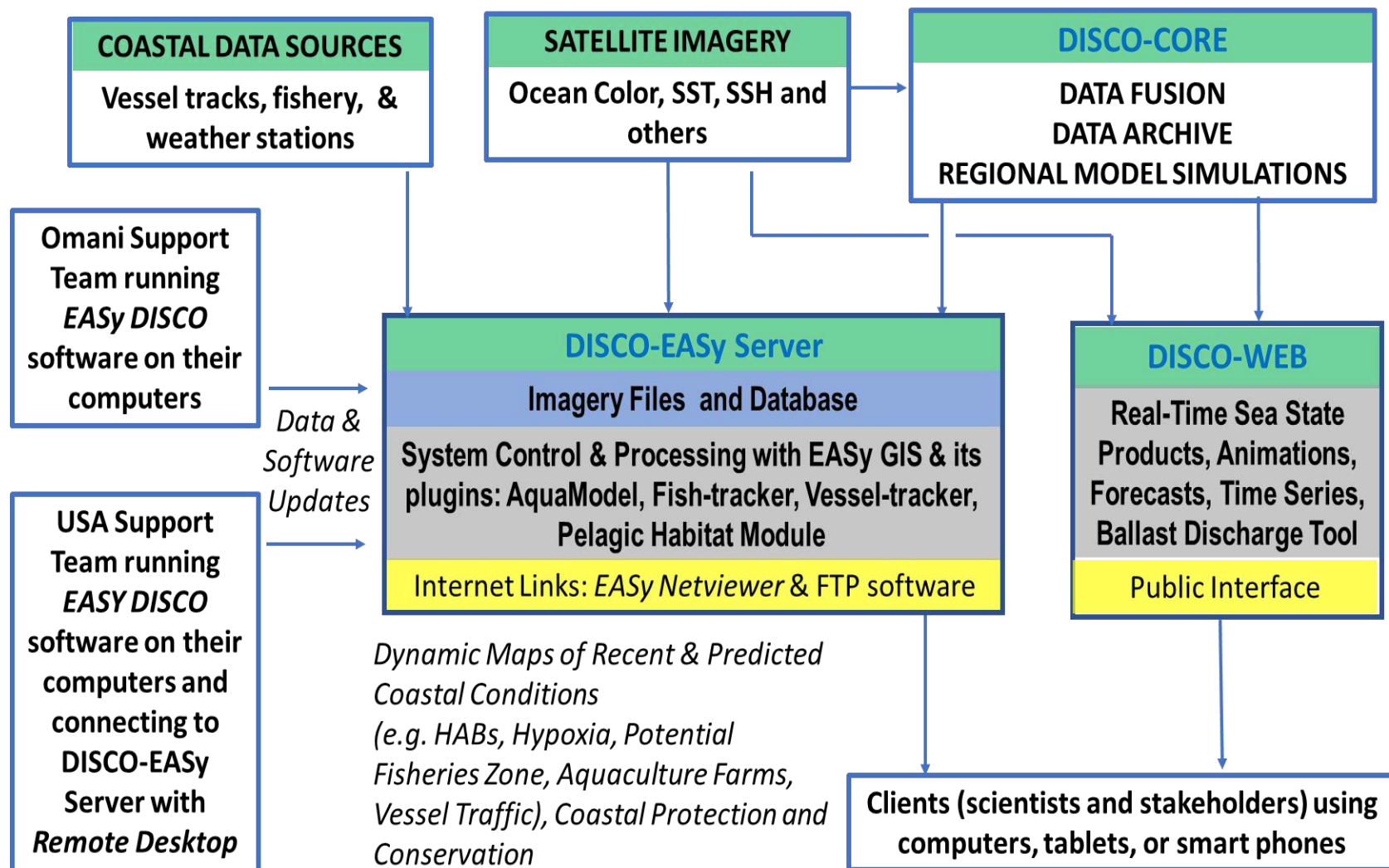




Upwelling and the activity of eddies are causing the shoaling of hypoxic waters (Data from ARGO float data)



Changing food web of the Arabian Sea

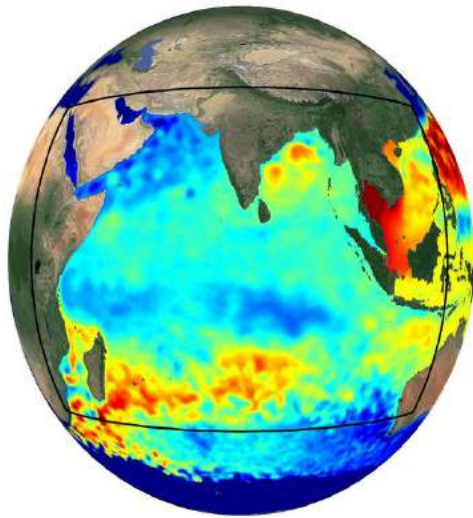


Schematic of DISCO Architecture, depicting various components, interactions and flow of information

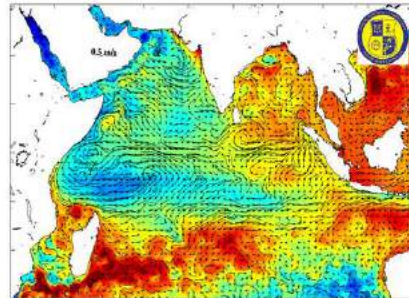
DISCO-WEB



Oman REAL TIME FORECASTING SYSTEM

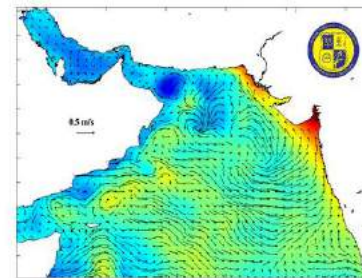


Indian Ocean



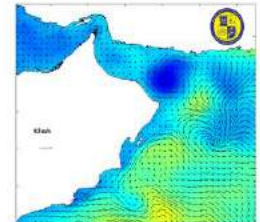
~8 Km resolution

Arabian Sea



~4 Km resolution

Sea of Oman



~2 Km resolution

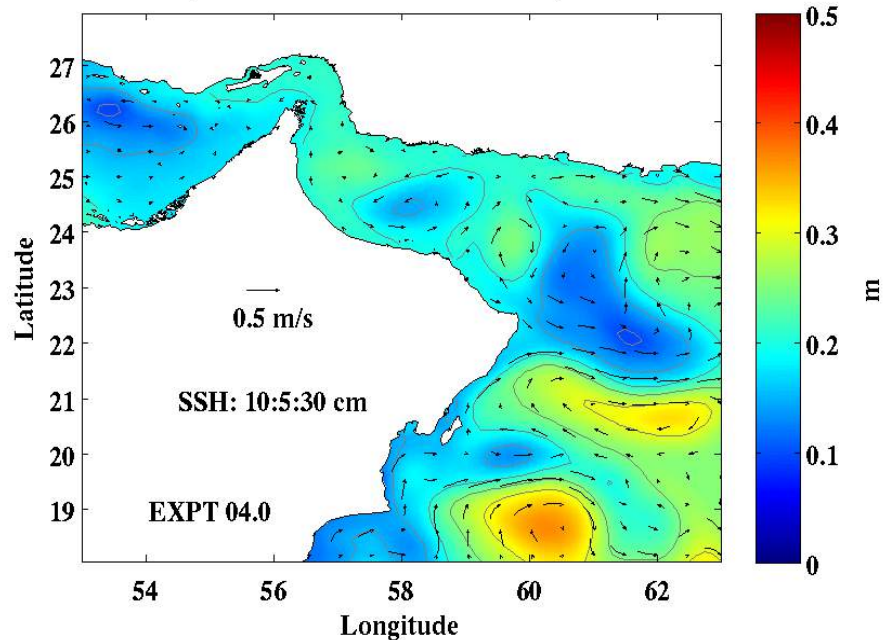
[Forecasts](#)

[Analyses](#)

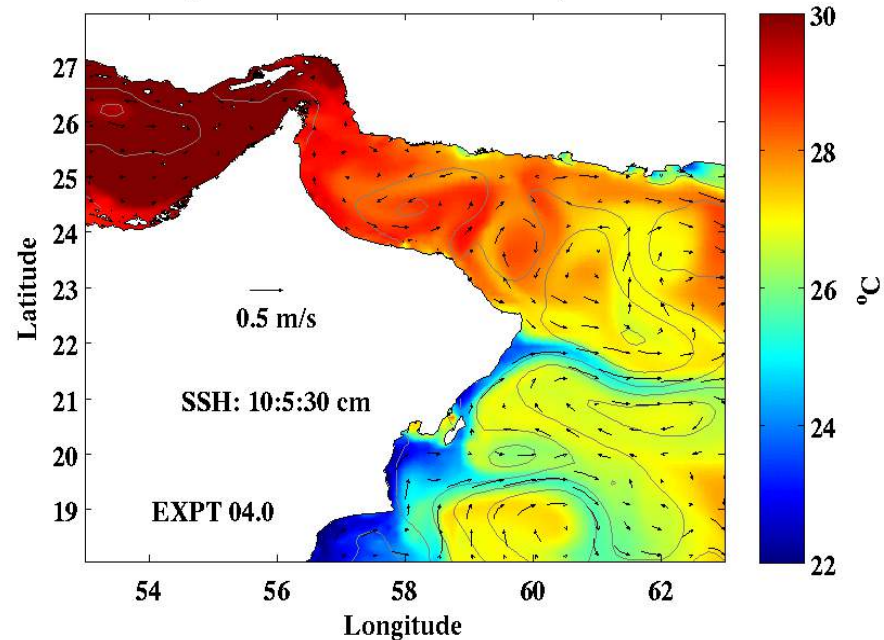
05/20/2019 IMPORTANT: This Demonstration web portal is a place-holder for DISCO. Upon stakeholder commitment and output requirements, this web-portal is customized and turned on to dynamically produce customer products, including near-real time monitoring and prediction of oceanographic and atmospheric conditions.

DISCO-Web – for dissemination of Near Real time Ocean Sea State and Biogeochemical Fields

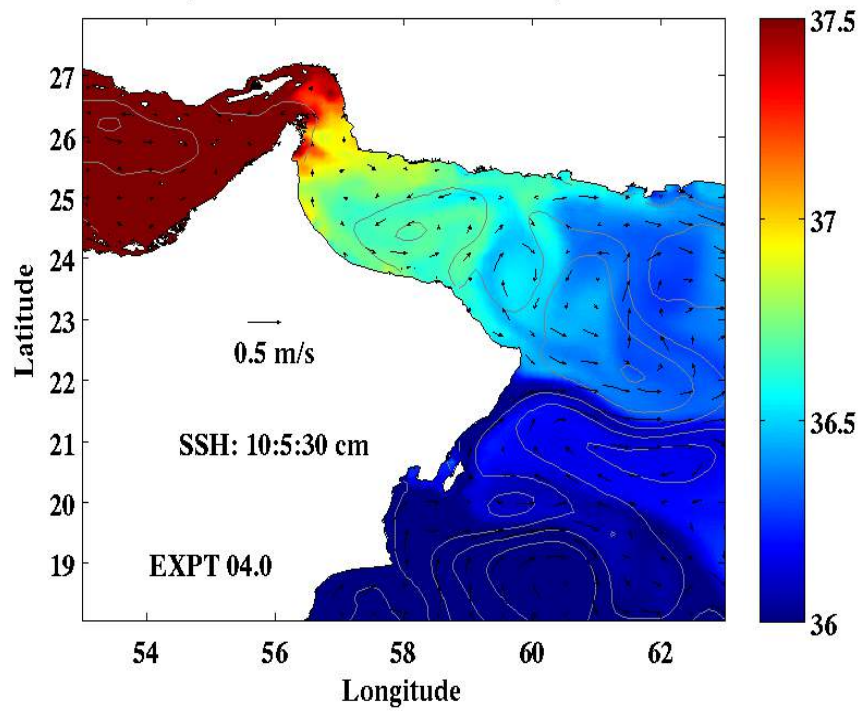
SSH (+ SSH & SURFACE CURRENTS) 20081001



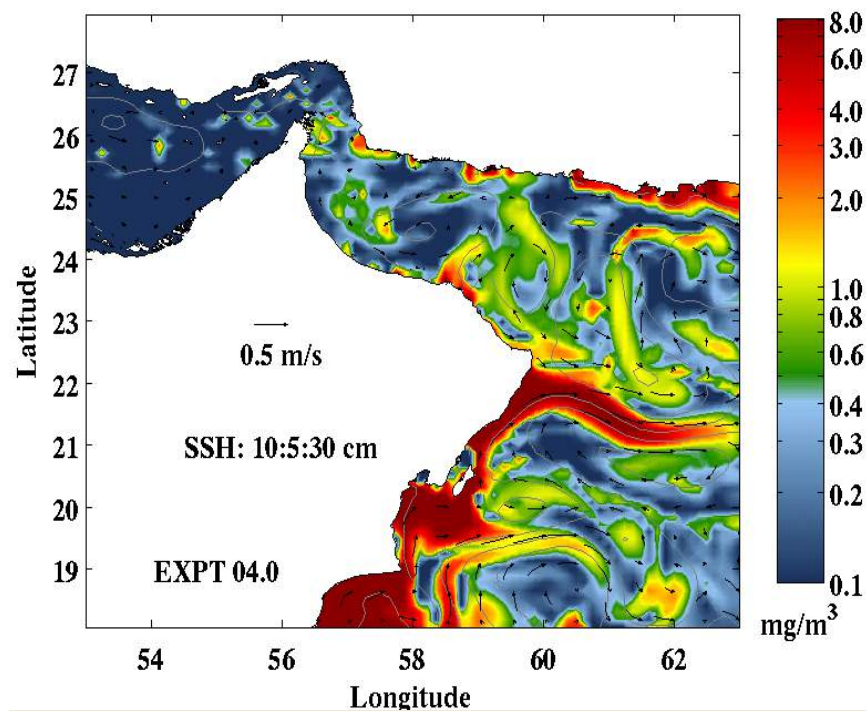
SST (+ SSH & SURFACE CURRENTS) 20081001



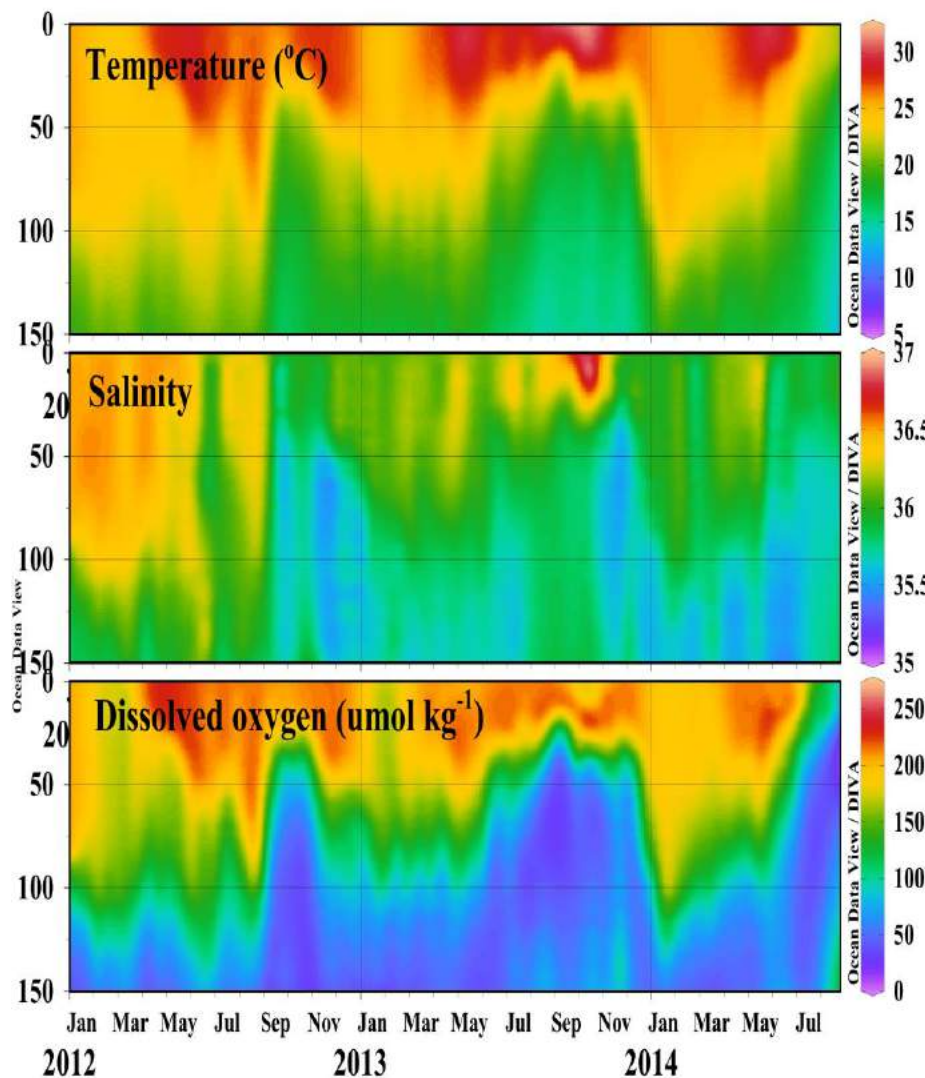
SSS (+ SSH & SURFACE CURRENTS) 20081001



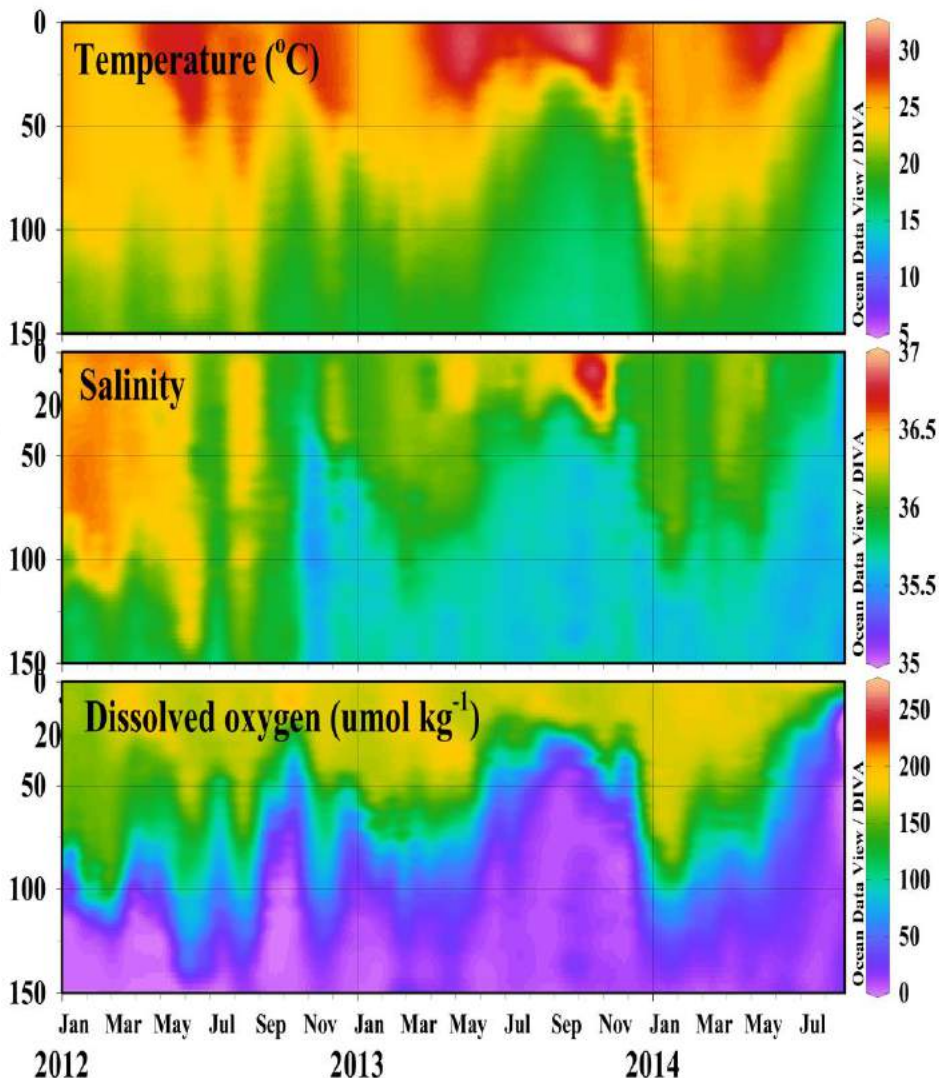
SSCHLOR (d=1.2, s=0.3) (SSH & SURFACE CURRENTS) 20081001



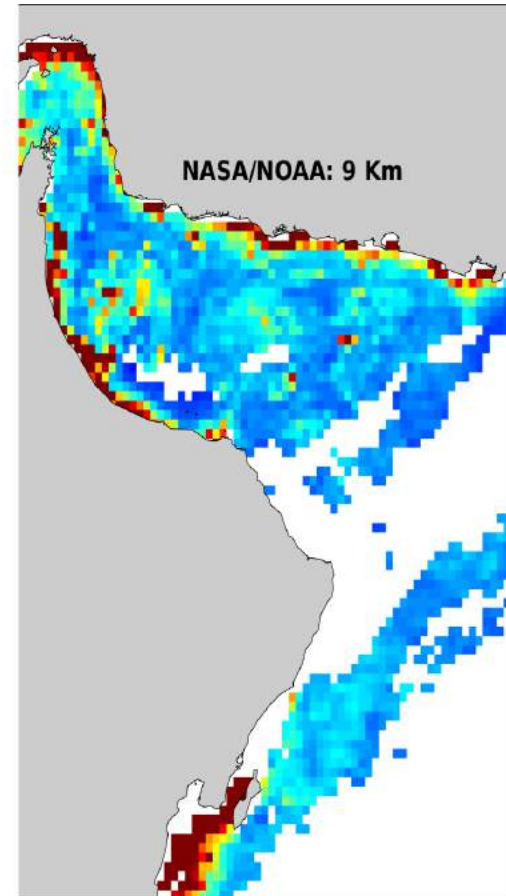
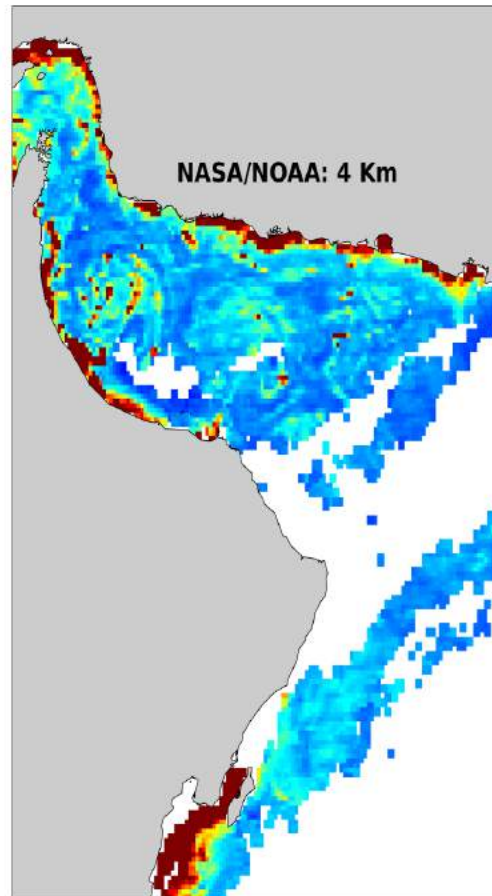
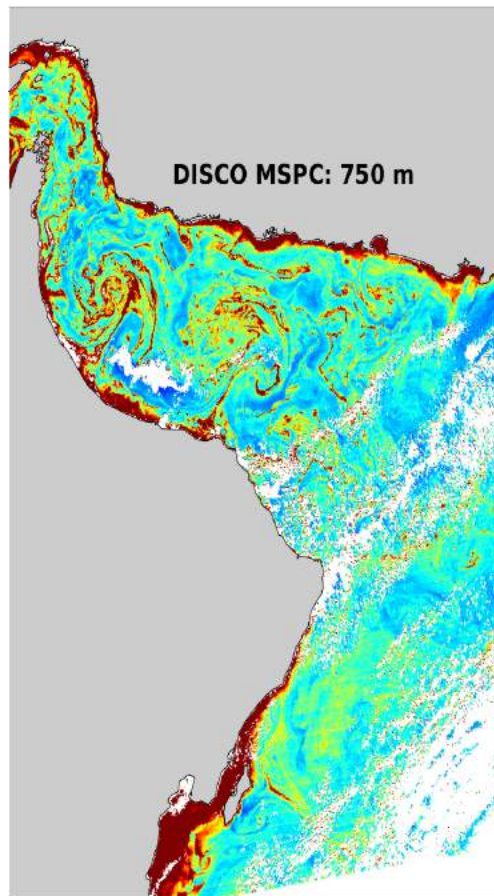
NCOM-COSiNE MODEL



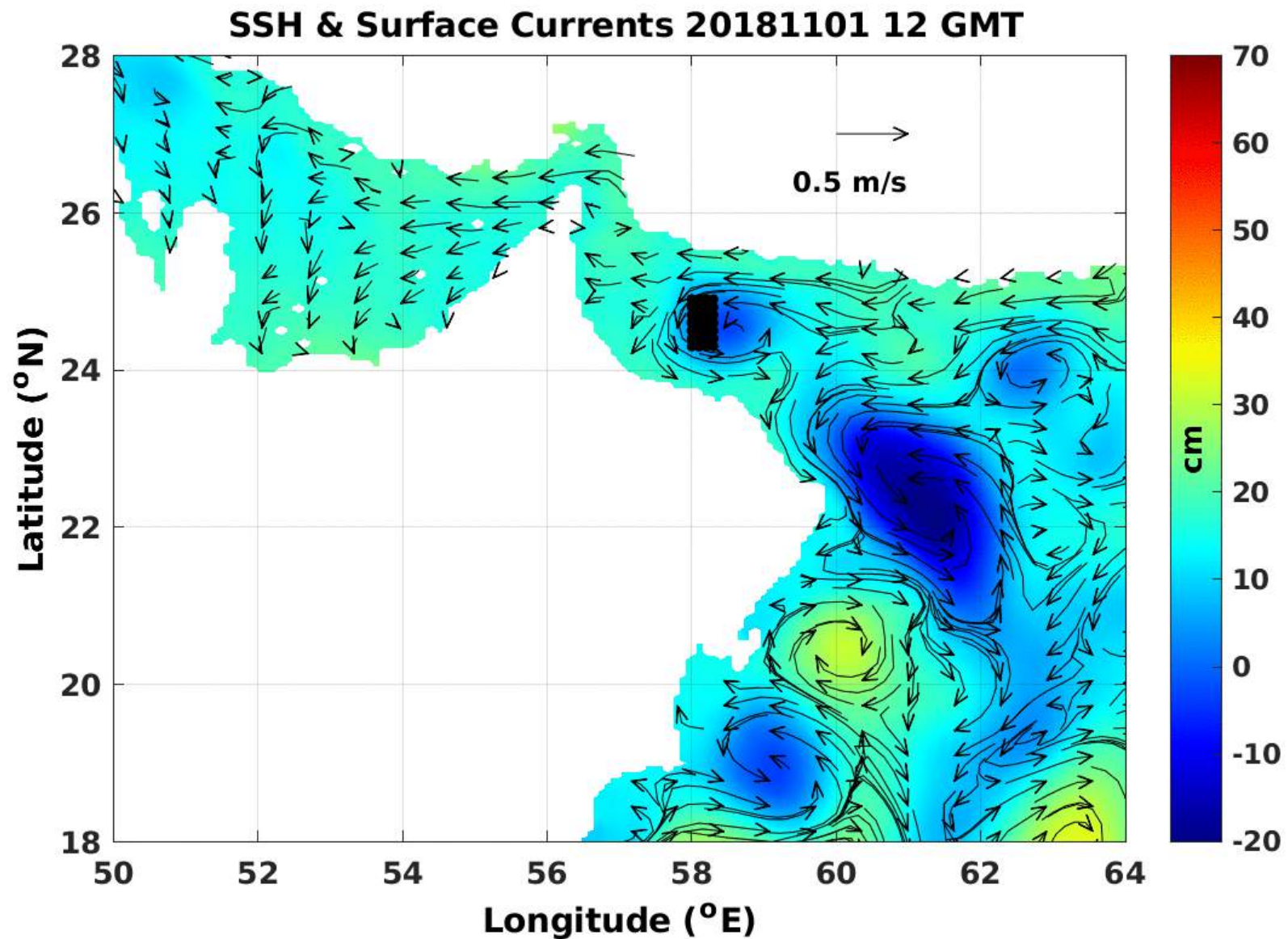
ARGO-FLOAT



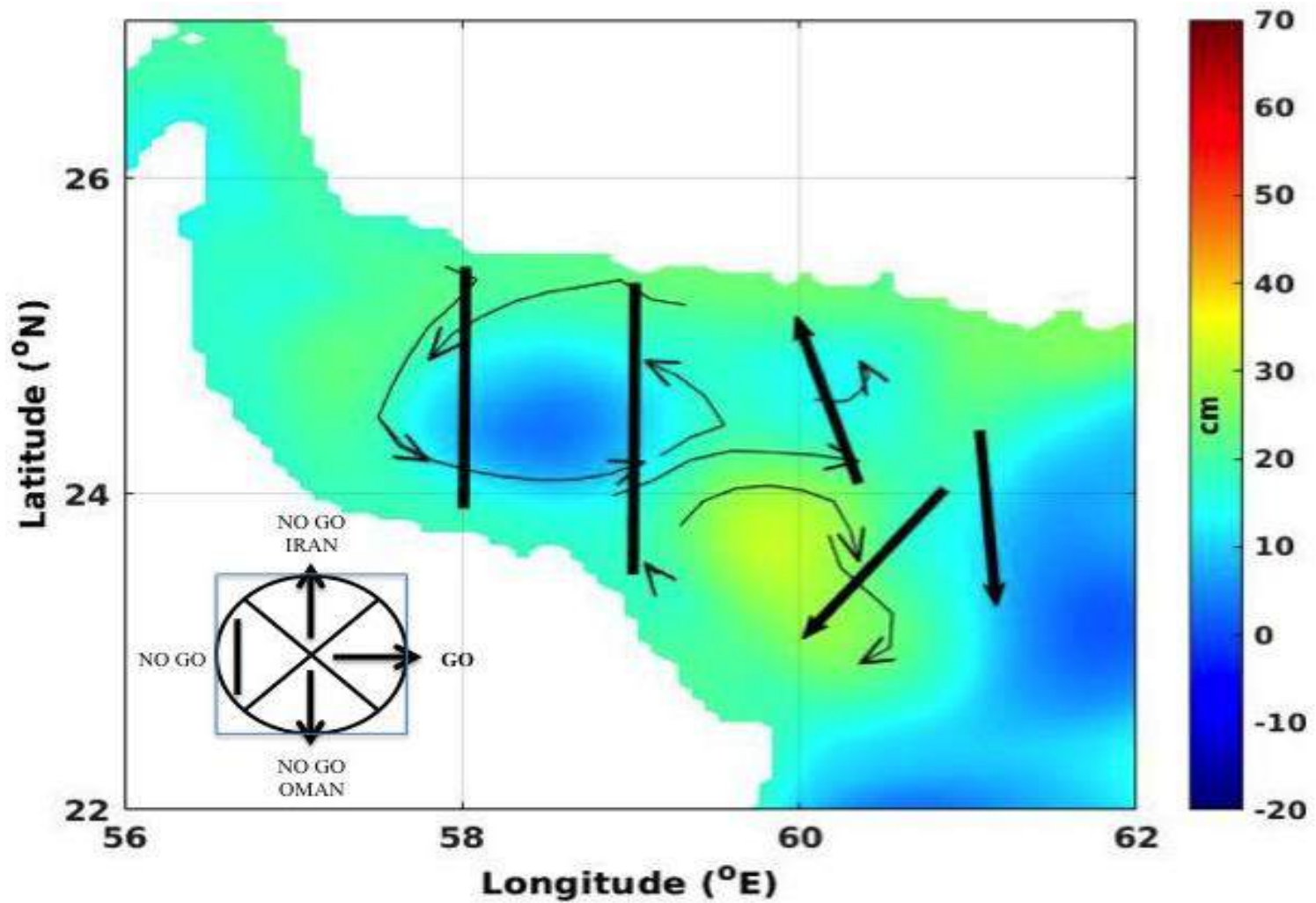
Comparison of NCOM-COSiNE outputs with ARGO Float data off the coast of Oman



Level-3 image for Dec. 16, 2018 derived from DISCO-MSC, 750m resolution chlorophyll concentration (left), compared to publicly available standard products (middle, 4 Km), (right, 9 Km)

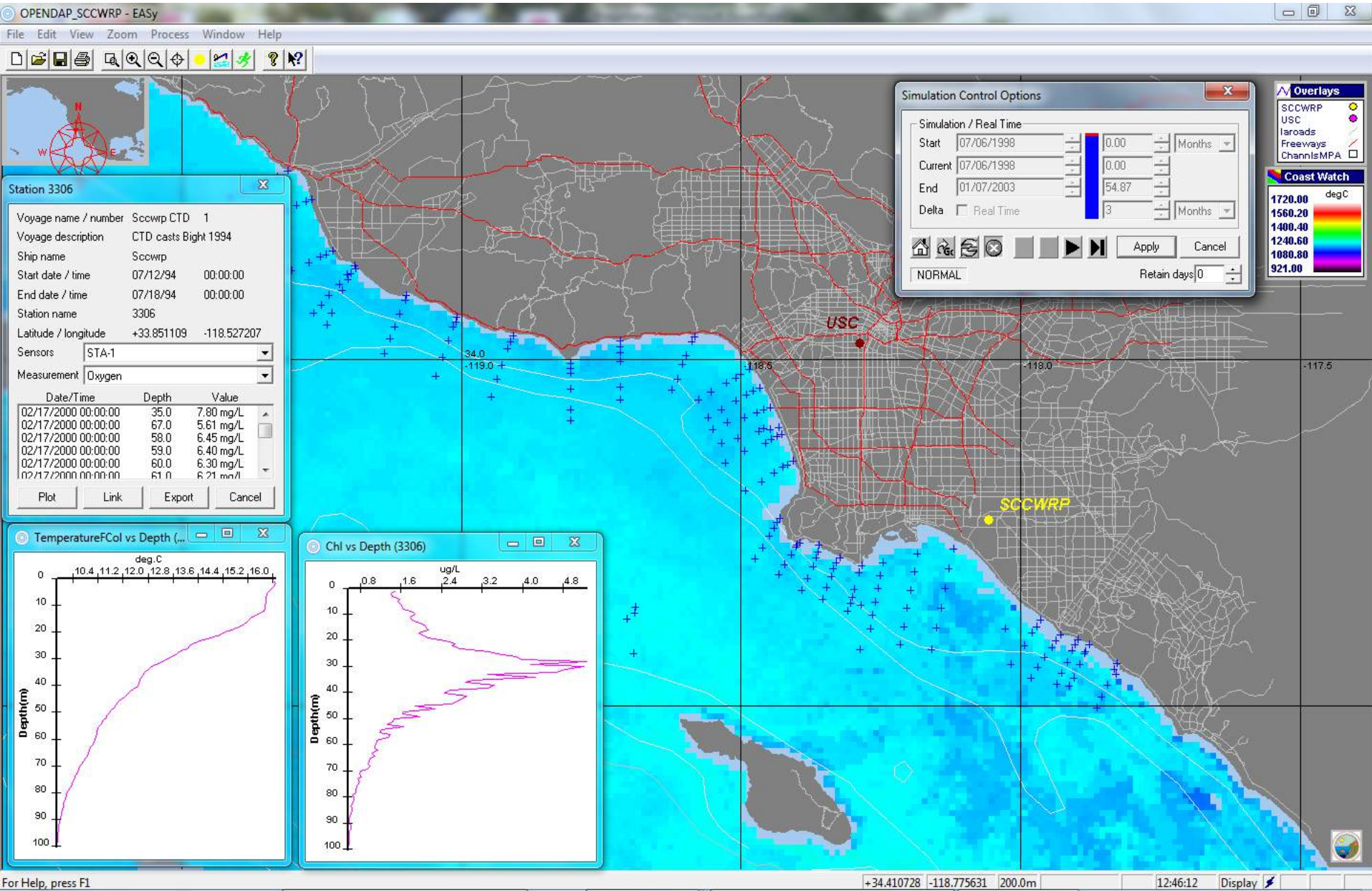


**Particle tracking for monitoring bloom dispersal
and evolution**

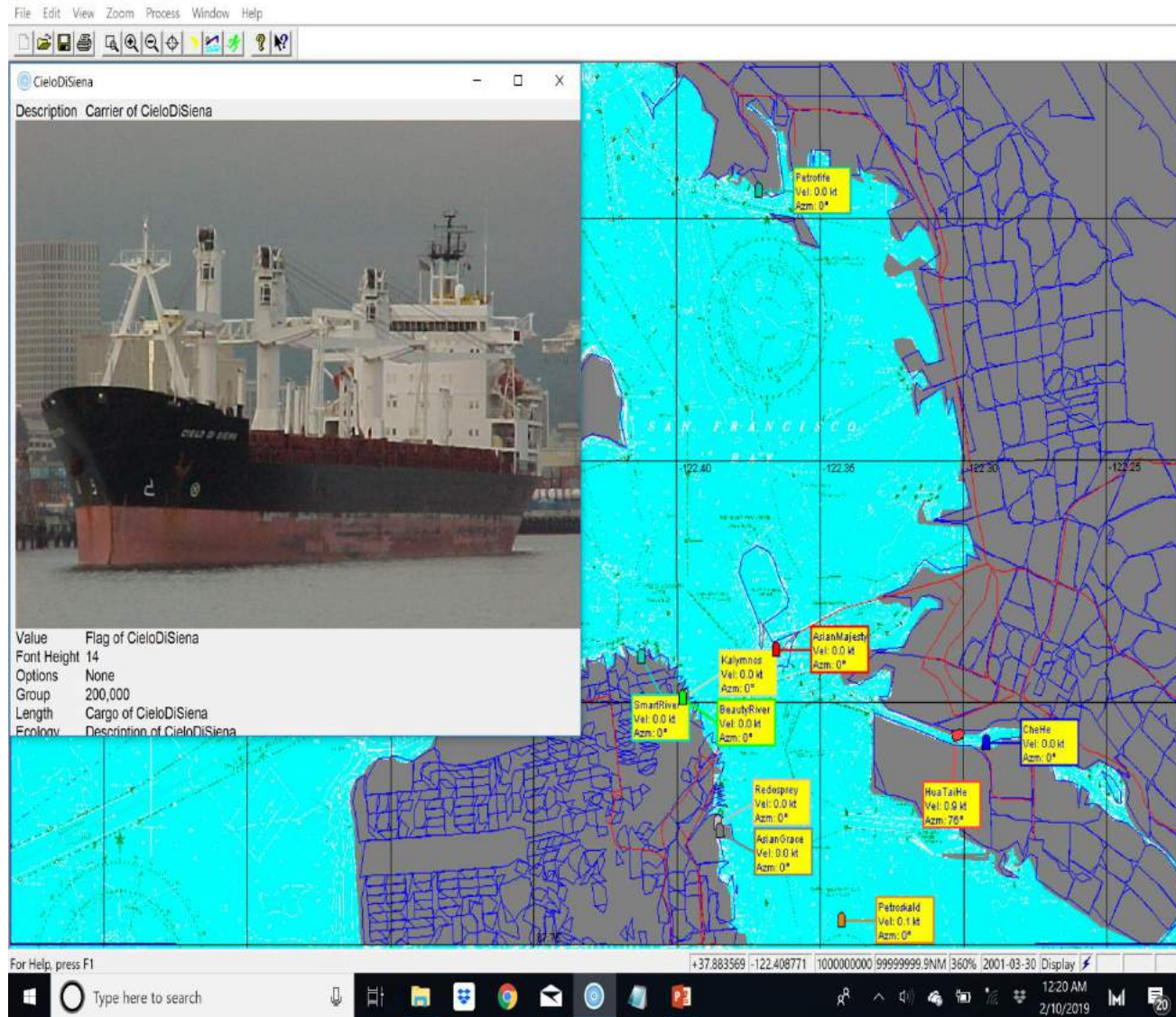


Ballast Discharge Guidance Tool

WATER QUALITY DATA INTEGRATION AND MONITORING SYSTEM

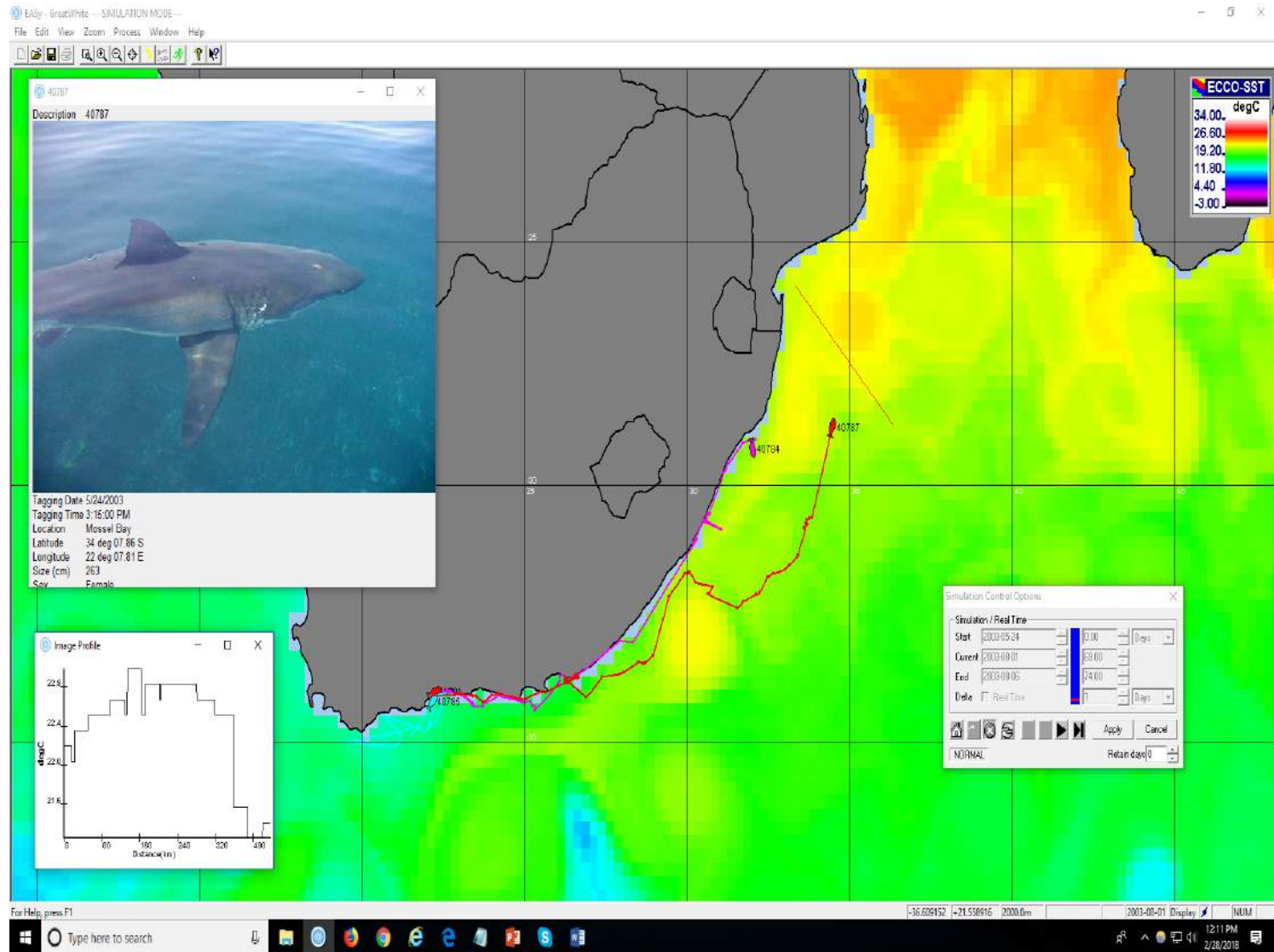


FISH VESSEL TRACKING FOR IMPROVED MANAGEMENT OF FISHERIES



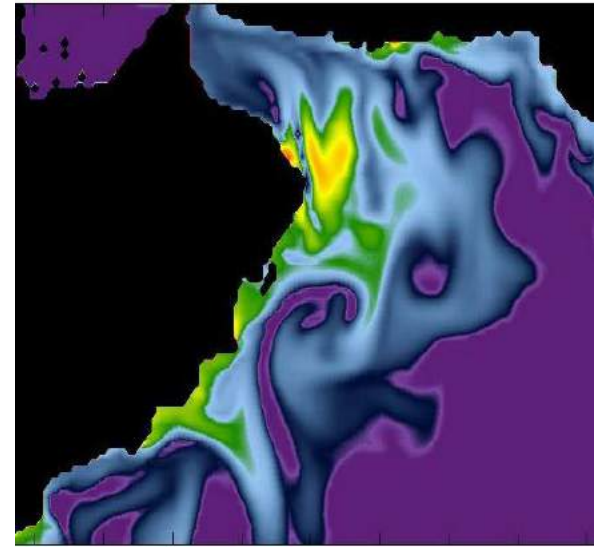
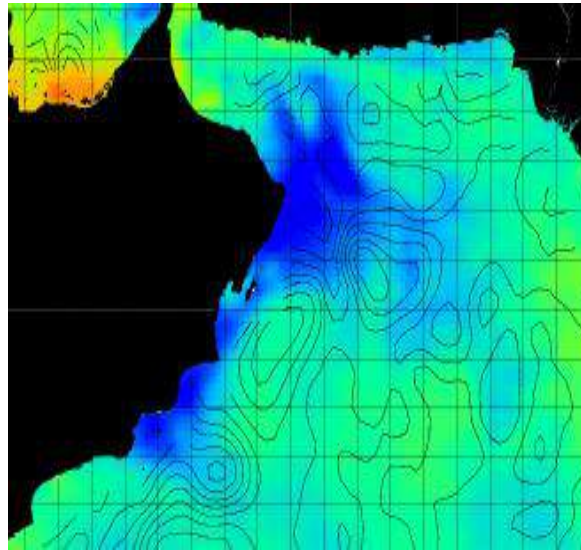
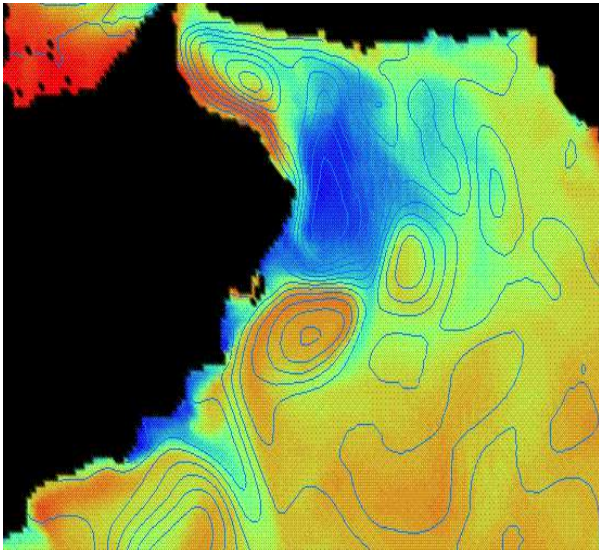
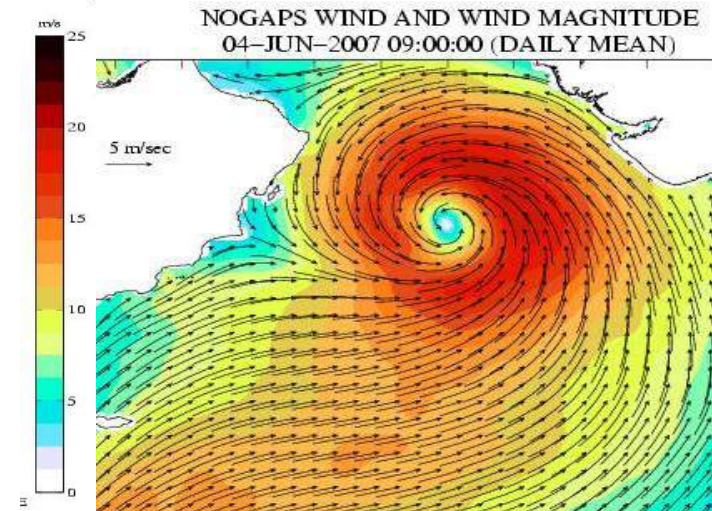
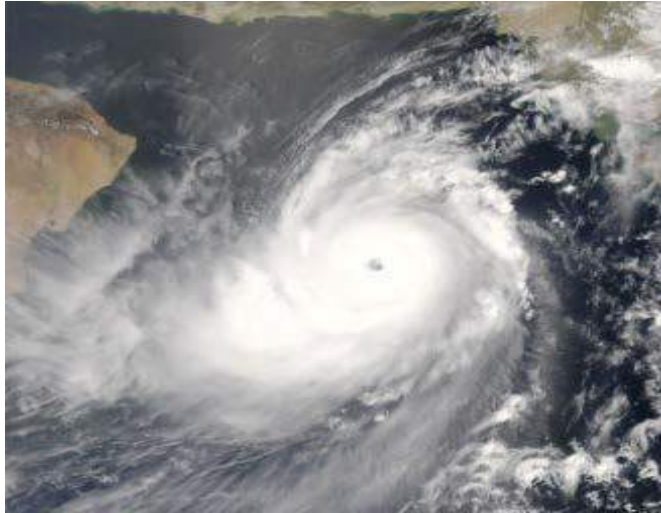
Fish Vessel Tracking using Automated Identification System (AIS) for Critical Fish Habitat

TAGGING AND MARINE CONSERVATION



Tracking Great white sharks off the coast of South Africa tagged with satellite pop-up tags. Data from tags can be ingested EASy's Fishtracker

CYCLONE TRACKING FOR PROTECTION OF COASTAL RESOURCES



**DISCO-EASy outputs generated for super cyclone Gonu
(1st June 2007)**

DEVELOPMENT OF END-TO-END SUSTAINABLE OFFSHORE MARINE FISH AND SHELLFISH FARMS INCLUDING TRAINING FOR FISHERMEN



OMAN BLUE ECONOMY AND FUTURE TECHNOLOGY CONFERENCE

