Ocean Modelling Activities & Products

Rohith B

Project Scientist,

INCOIS, Hyderabad, India

rohith.b@incois.gov.in

Discovery and Use of Operational Ocean Data Products and Services

25 – 29, October 2021

ITCOocean, INCOIS, Hyderabad

With the support of the Government of Flanders, Belgium

INCOIS Mission

To enhance the basic understanding and knowledge base on Oceanic and Atmospheric processes for

Predictability

of

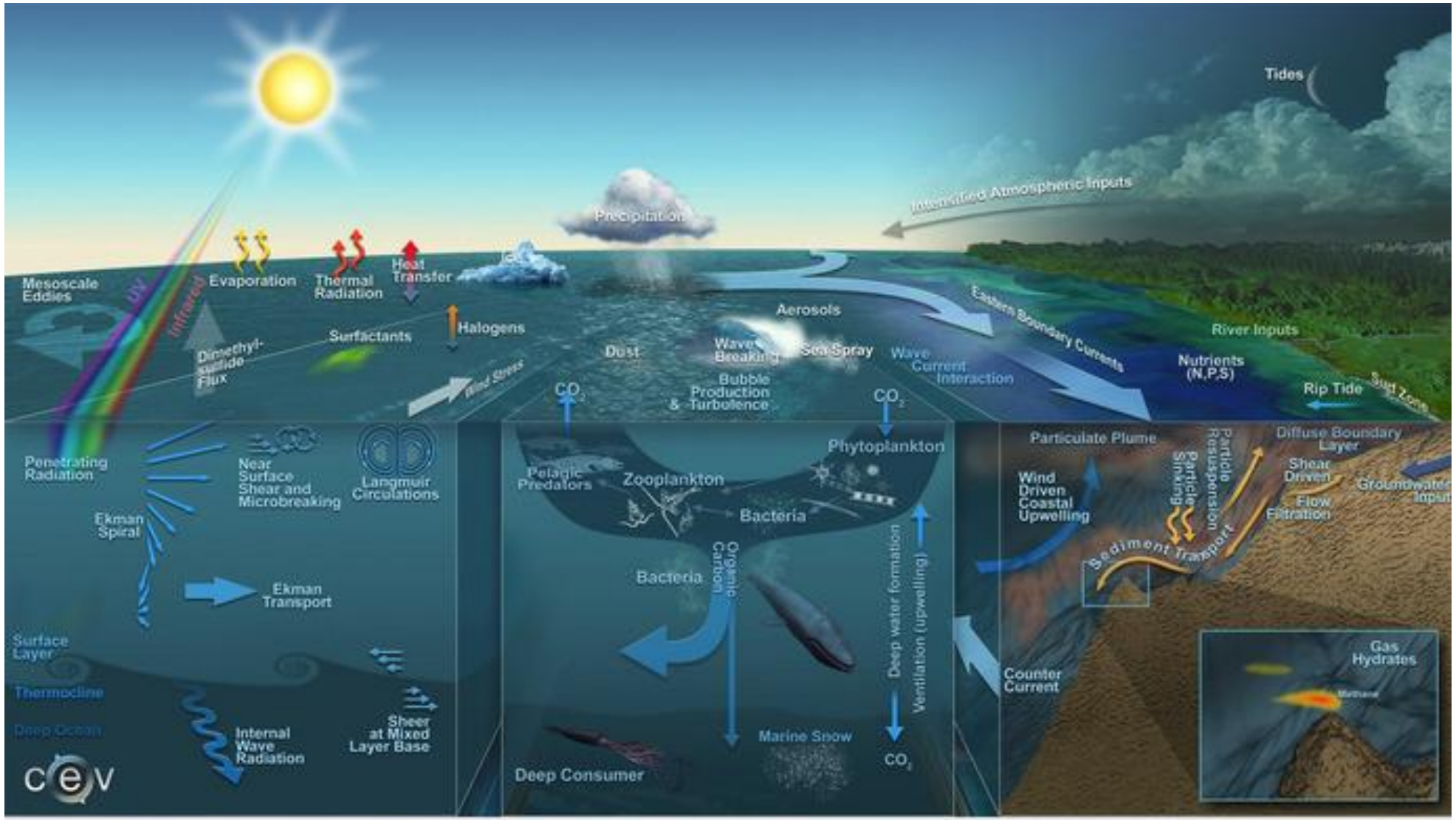
Ocean & Climate

Coastal Processes

Catastrophic Weather events

We want to Predict the Ocean

PROCESSES IN THE OCEAN

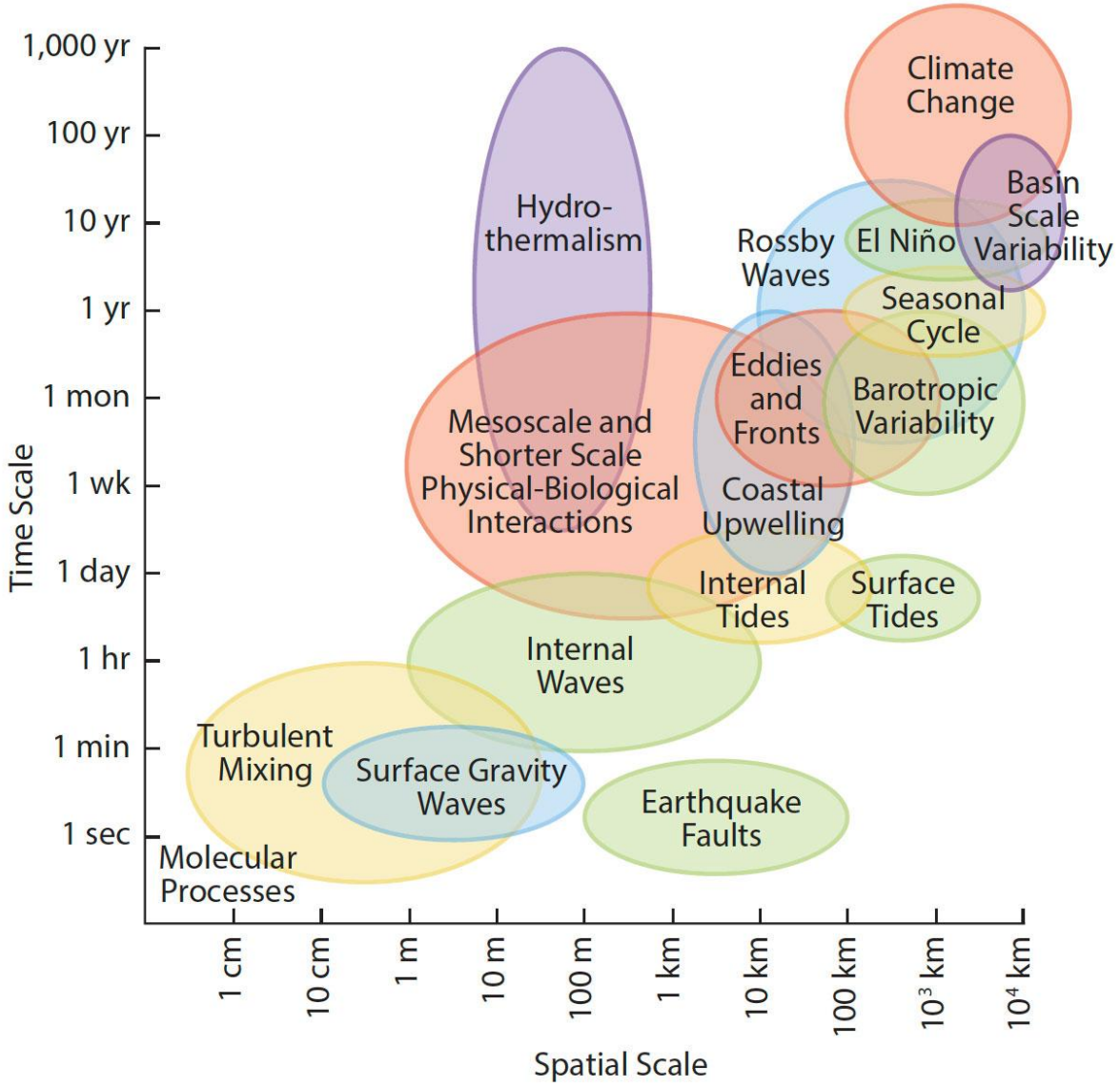


INTERACTIVEOCEANS

IMAGE CONCEPT: JOHN R. DELANEY

UNIVERSITY of WASHINGTON

SPATIAL & TEMPORAL SCALES



Is it possible to have a

"UNIVERSAL" OCEAN MODEL

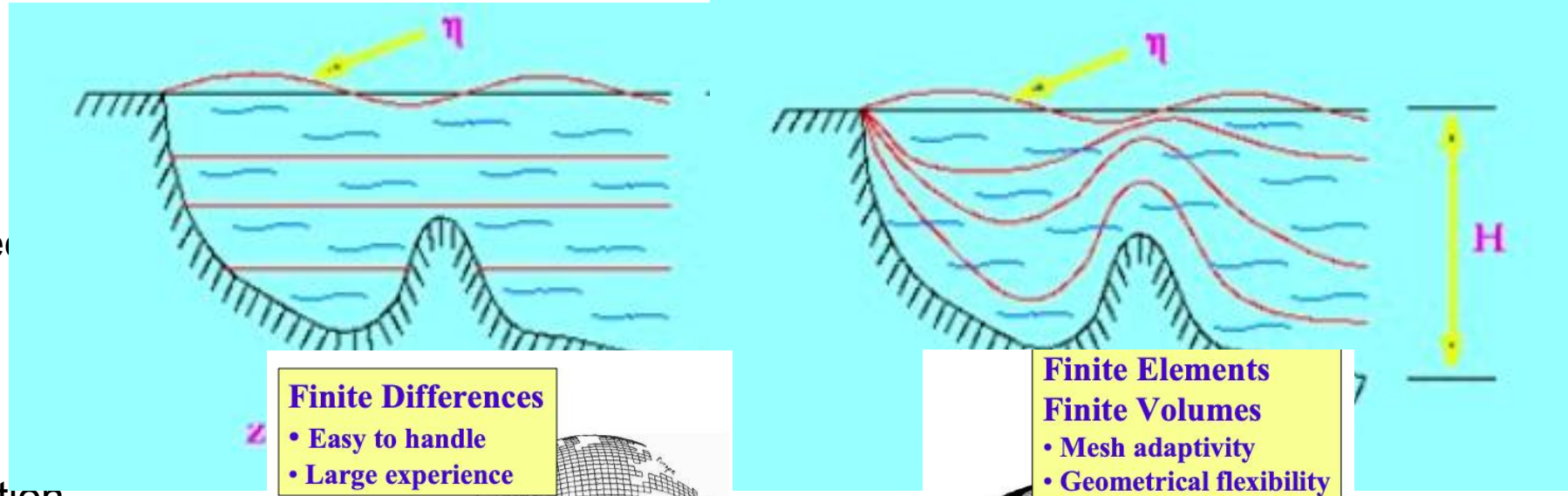
- Finite grid size
- CPU speed
- Imperfect description of the physical/biological processes
- Turbulence

So, to model different processes in the ocean, we use different types of models.

CLASSIFICATION OF OCEAN MODELS

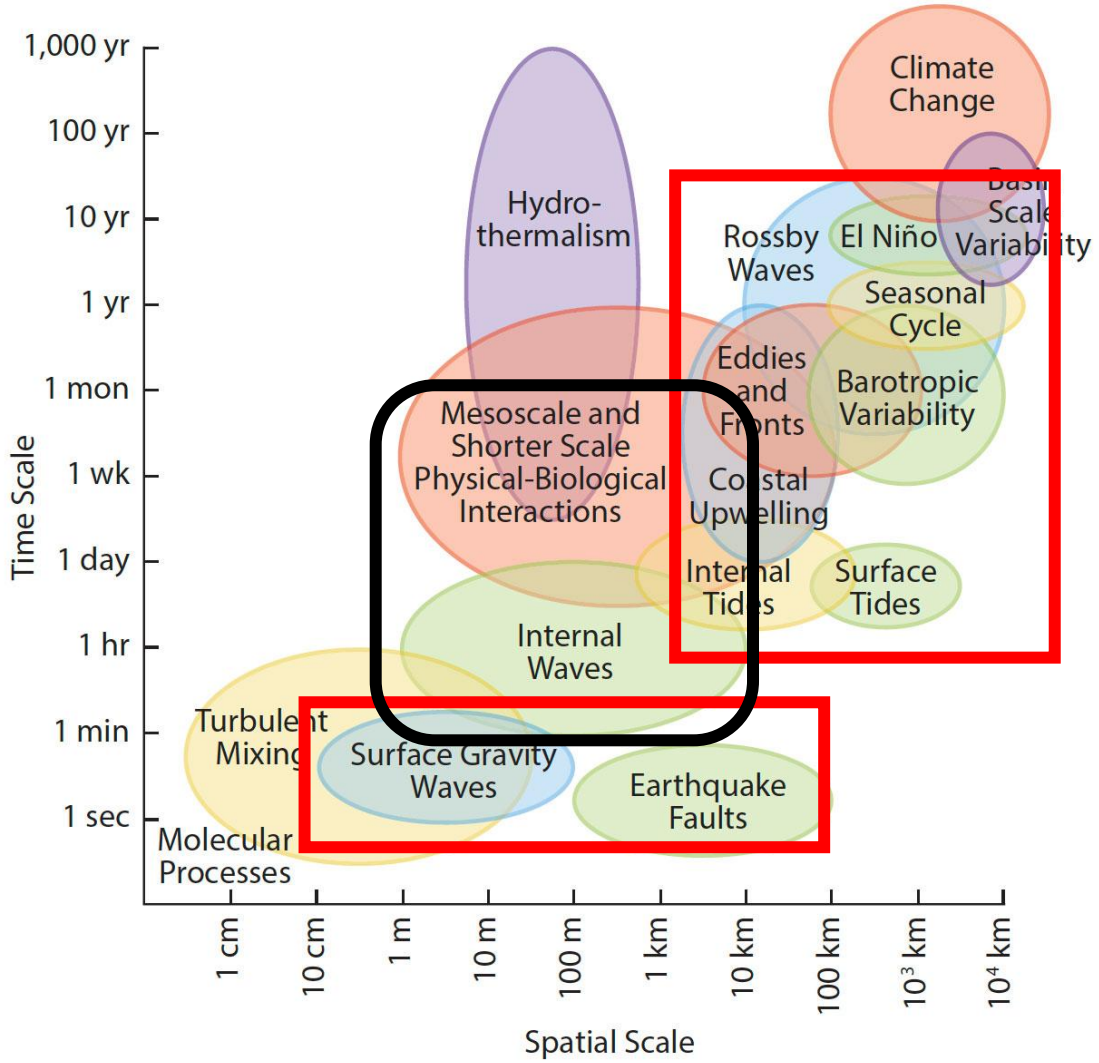
Ocean Models

Geographical	Global	Region
Physical	Hydrodynamic	Hydro-
Biology		
Vertical degree freedom		
Density Variation		
Grid type		



SPATIAL & TEMPORAL SCALES

Parameterization



General Circulation model

Wave/shallow water model

INCOIS MODELS

Ocean general circulation model

Modular Ocean Model (MOM)

Regional Ocean Modeling System (ROMS)

Hybrid co-ordinate ocean model (HYCOM)

Wave models

WAVEWATCH III

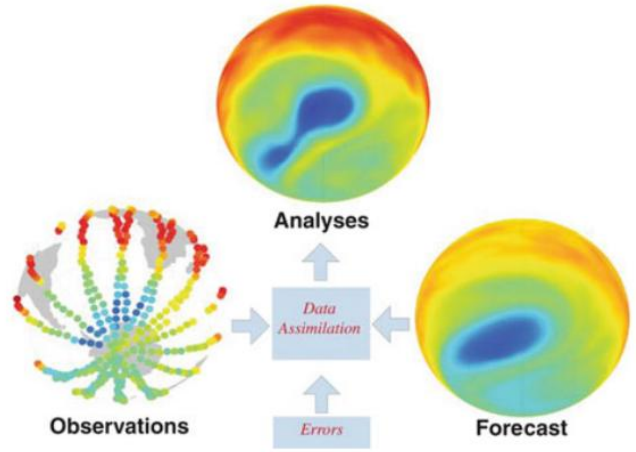
SWAN

Shallow water models

ADCIRC

Assimilation

Add ocean observations in to ocean model to provide the best estimates



INCOIS- GLOBAL OCEAN DATA ASSIMILATED SYSTEM (GODAS)

Model : MOM 4p0

Resolution : Horizontal ~ 0.25 degree
vertical – 40 levels z co-ordinate

Temporal Resolution – 6 hourly

Period : 1999 – till date

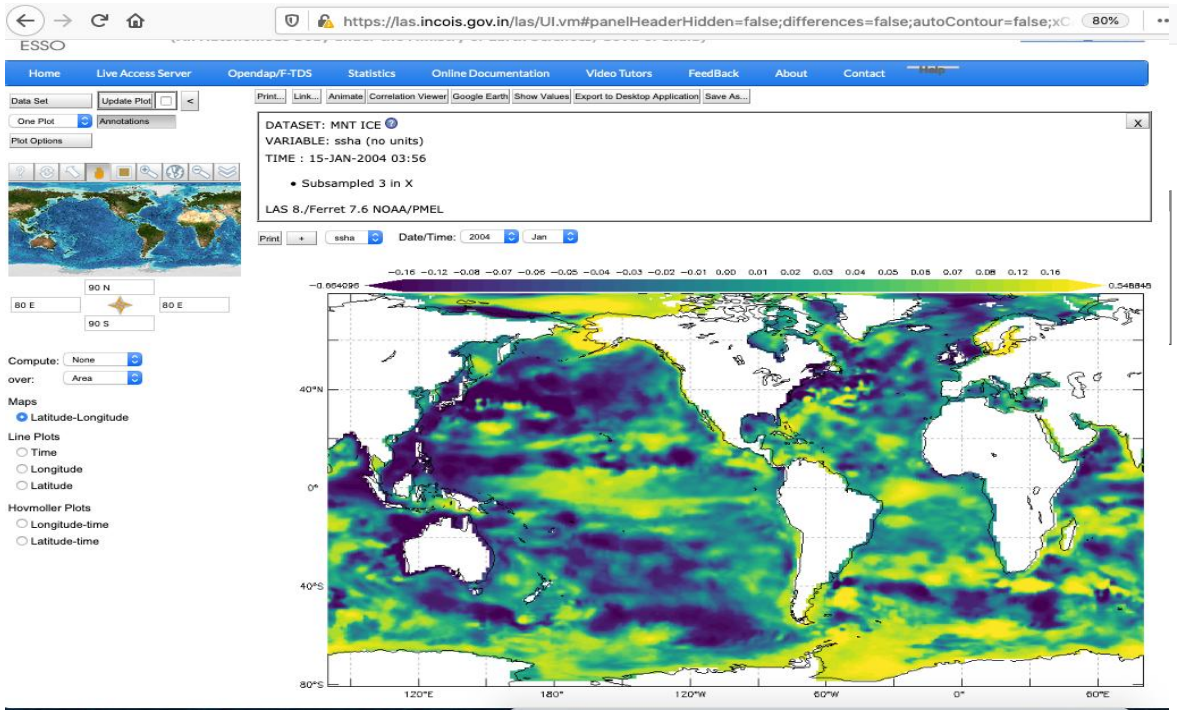
Climatological River runoff

Assimilation – 3D-var

Products : Temperature, Salinity, SSHA
, Zonal and Meridional velocities

Derived products : MLD, D20, D23, TCHP,
IOD index & ENSO index

Downloaded from INCOIS - LAS



ROMS

IO – ROMS

Resolution : Horizontal 1/12 degree ~9 km
vertical – 40 levels sigma co-ordinate

Period : 2013 – till date
Temporal resolution : 3 hours

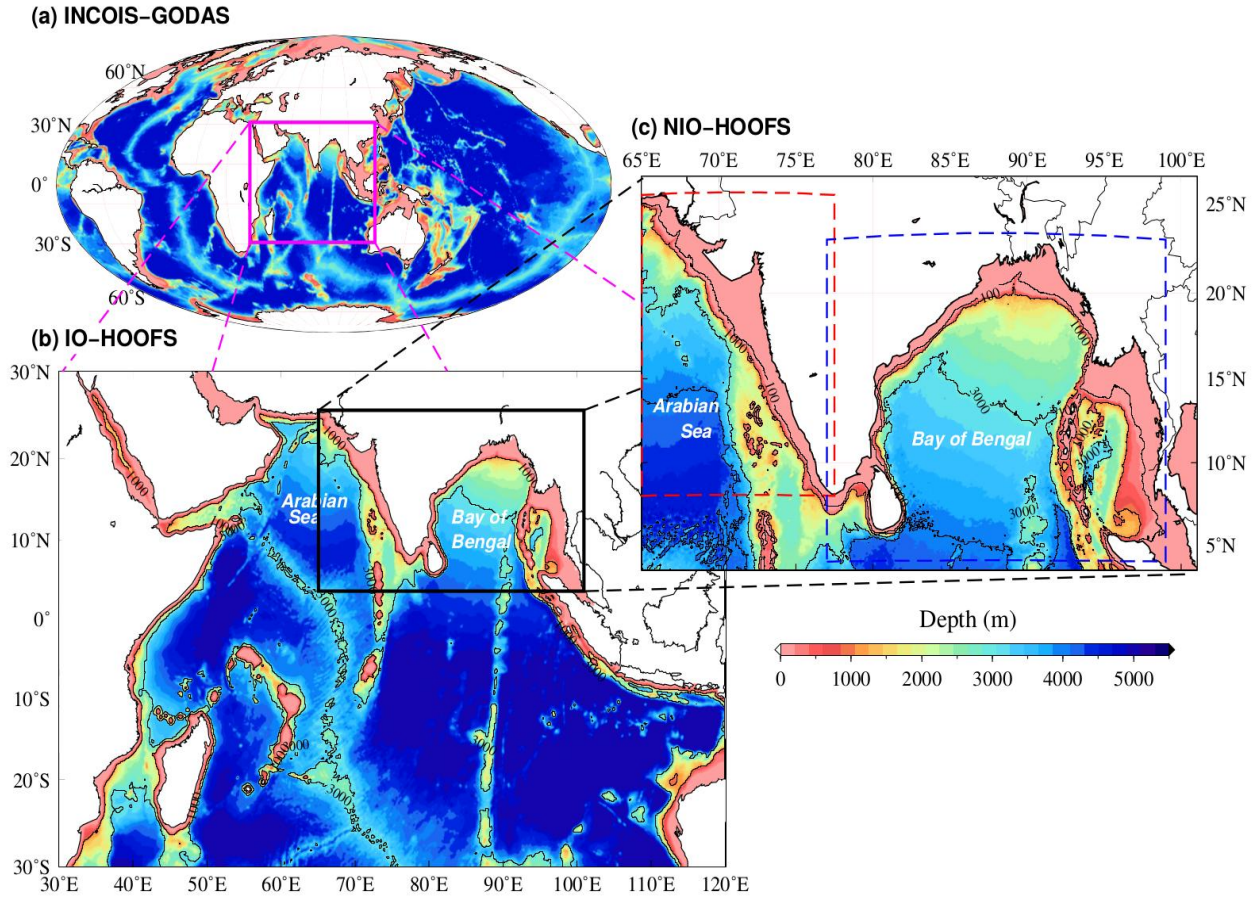
> Tide > Assimilation

NIO-ROMS

Resolution :Horizontal 1/48 degree ~2.23km
vertical – 40 levels sigma co-ordinate

Period : 2017 – till date
Temporal resolution : 3 hours

> Tide > Assimilation



Temperature, Salinity, SSH, Zonal, Meridional velocities, MLD, D20 and D23

PFZ and SEARCH & RESCUE

Chlorophyll-a, Dissolved Oxygen, Dissolved Inorganic Carbon & Total Alkalinity

INCOIS TENDRAL OCEAN PREDICTION SYSTEM (HYCOM)

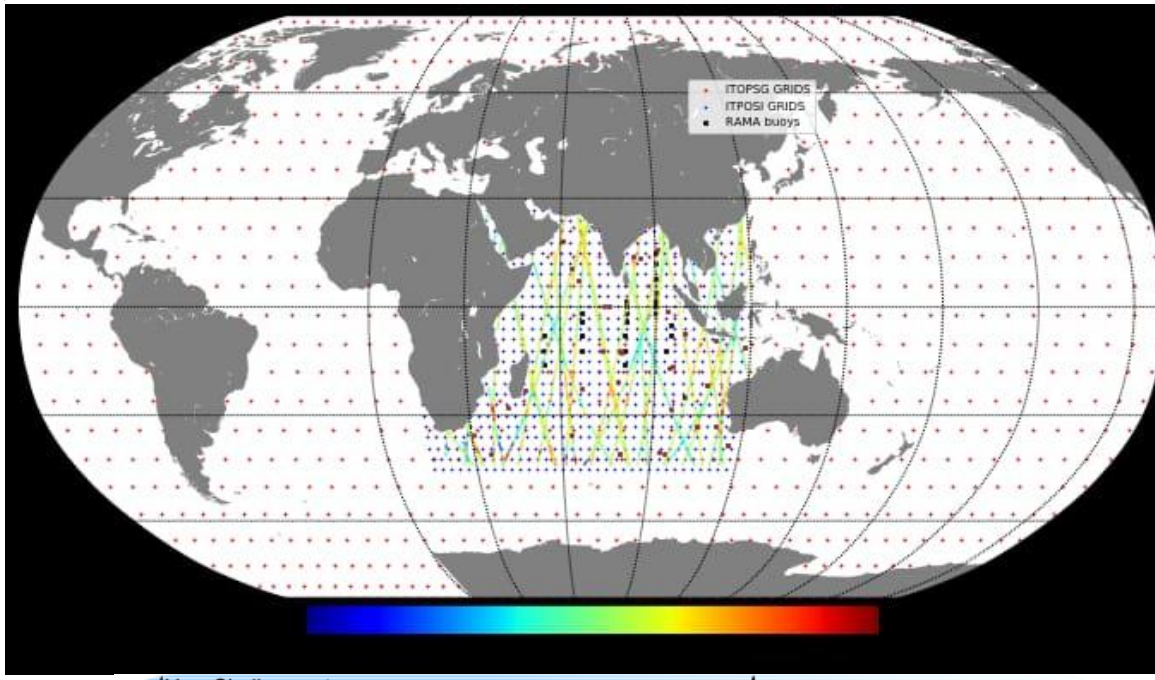
ITOPSG

Resolution : Horizontal ~ 0.25 degree global grid

vertical – 32 hybrid layers

Period : 2013 – till date

Assimilation



Nested grid

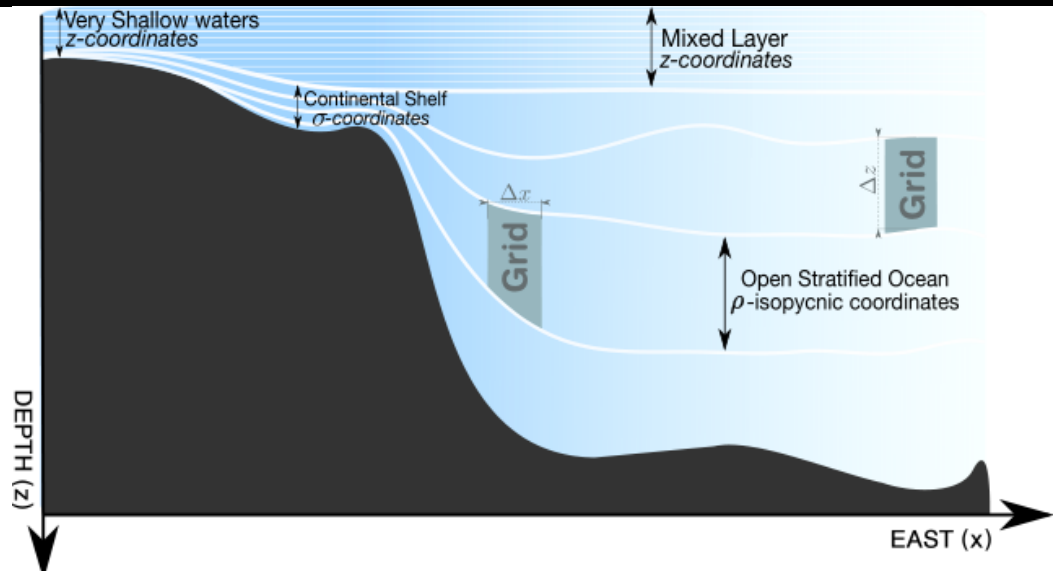
ITOPSI

Resolution : Horizontal 1/16 degree (~ 6 km) Indian Ocean

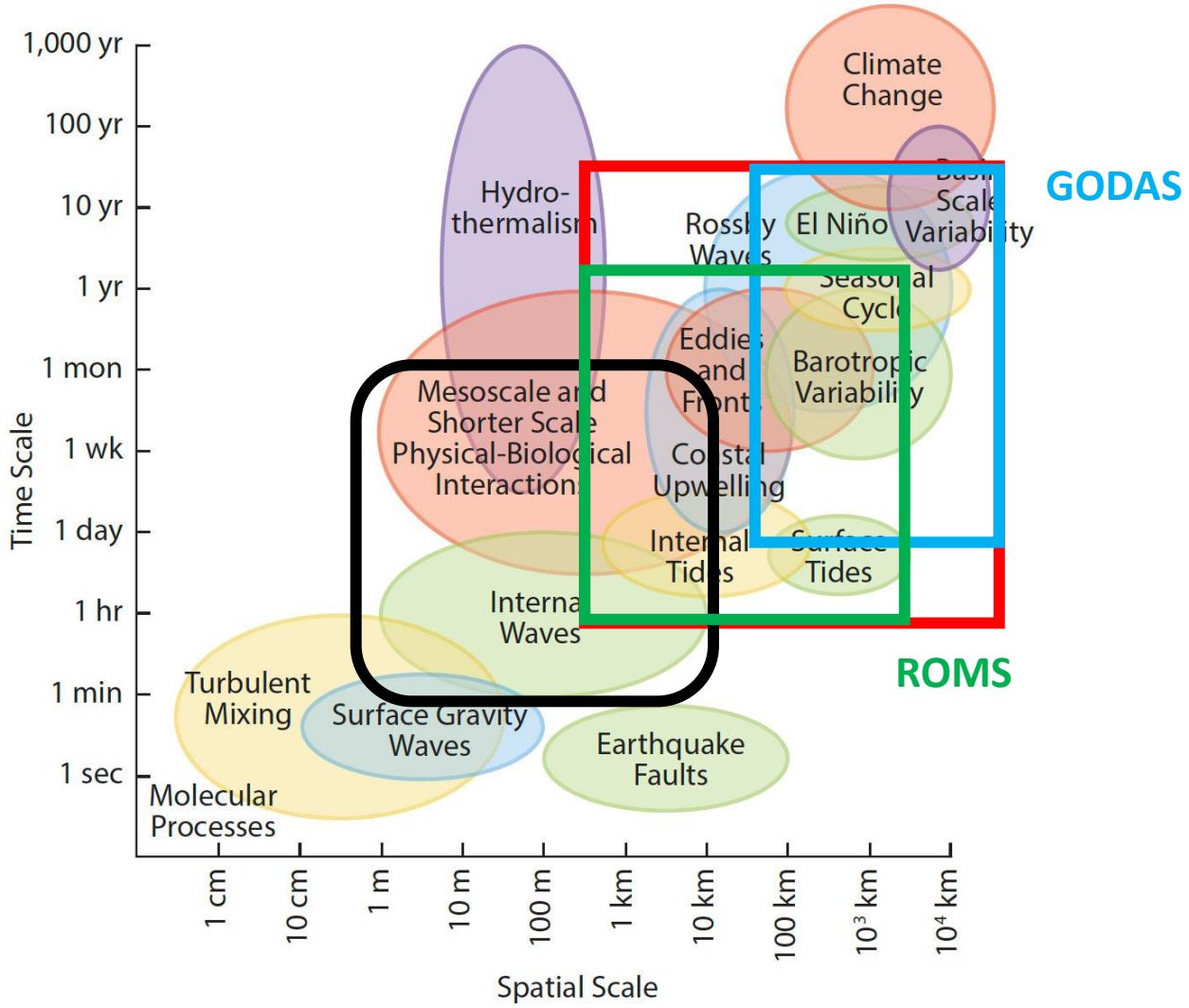
vertical – 32 hybrid layers

Period : 2013 – till date

Assimilation



SPATIAL & TEMPORAL SCALES

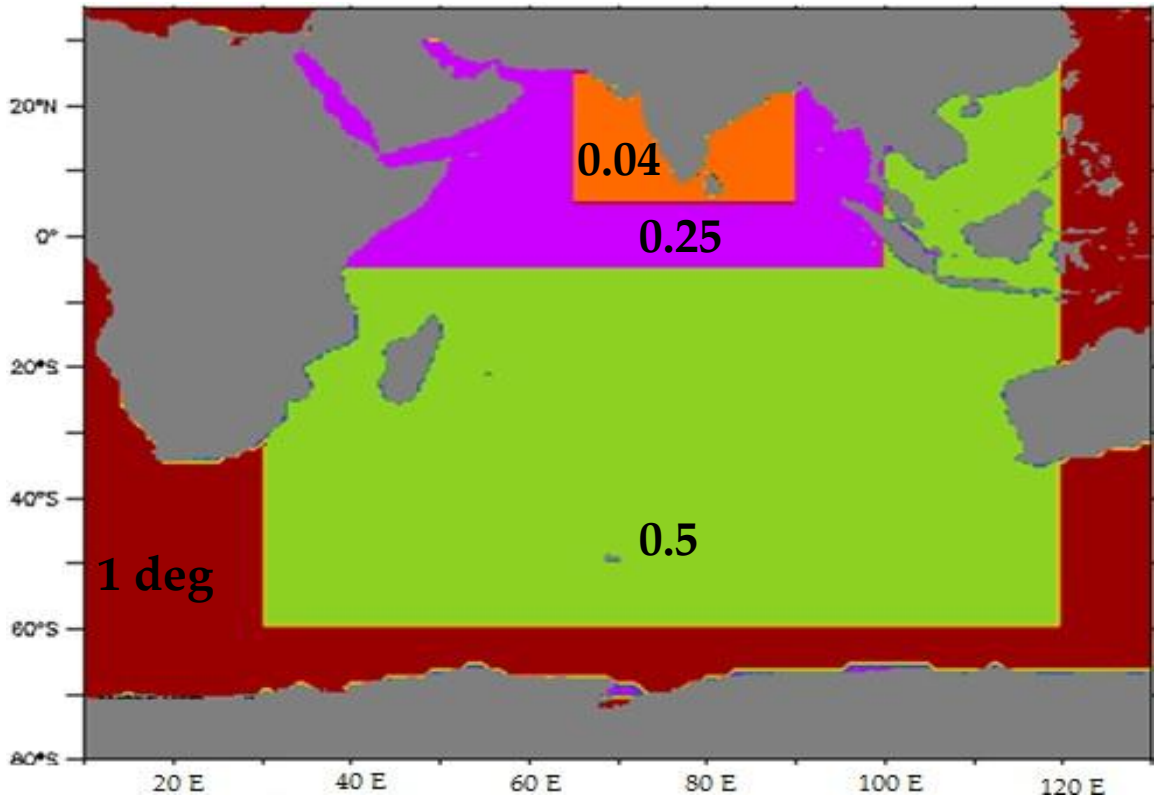


WAVEWATCH III

Period : 2014 – till date

Assimilation

Products : significant wave height & direction, swell height, wave periods, etc.



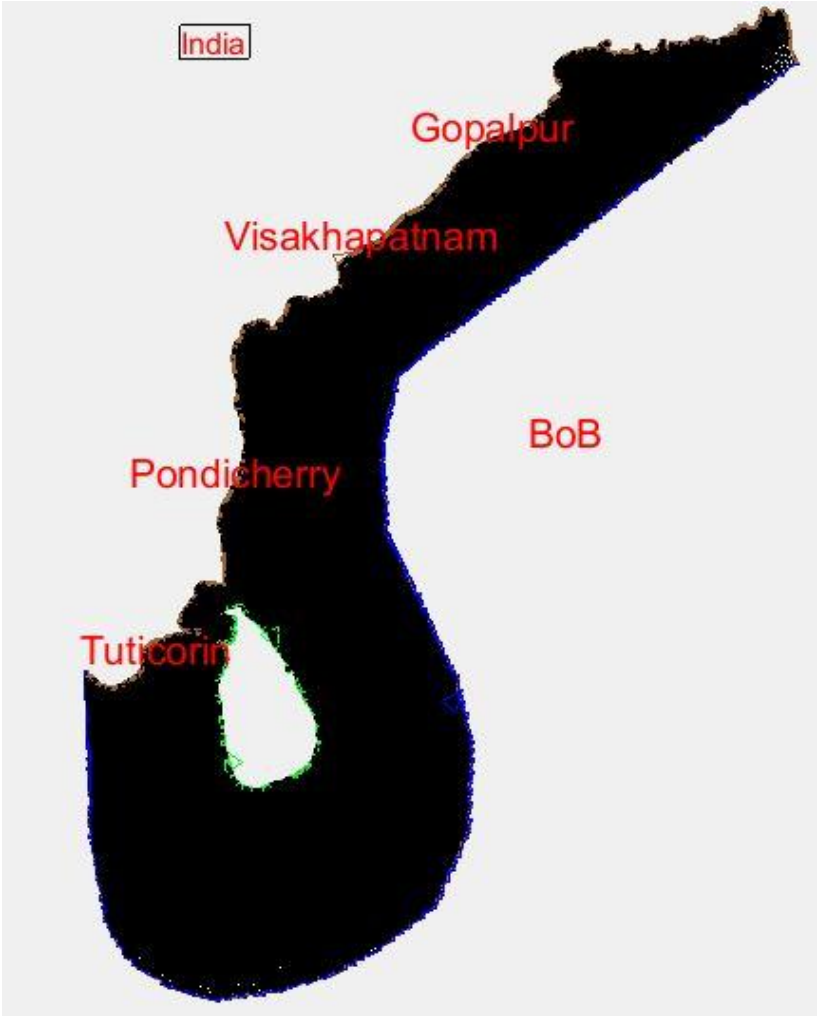
SIMULATING WAVES NEARSHORE (SWAN)

Grid : Finite element

resolution : varying from 350 m near coast to 5 km offshore

Temporal resolution : 3-hrly interval from 2014

Products : significant wave height & direction, swell height, wave periods, etc.



ADCIRC

Grid : Finite element

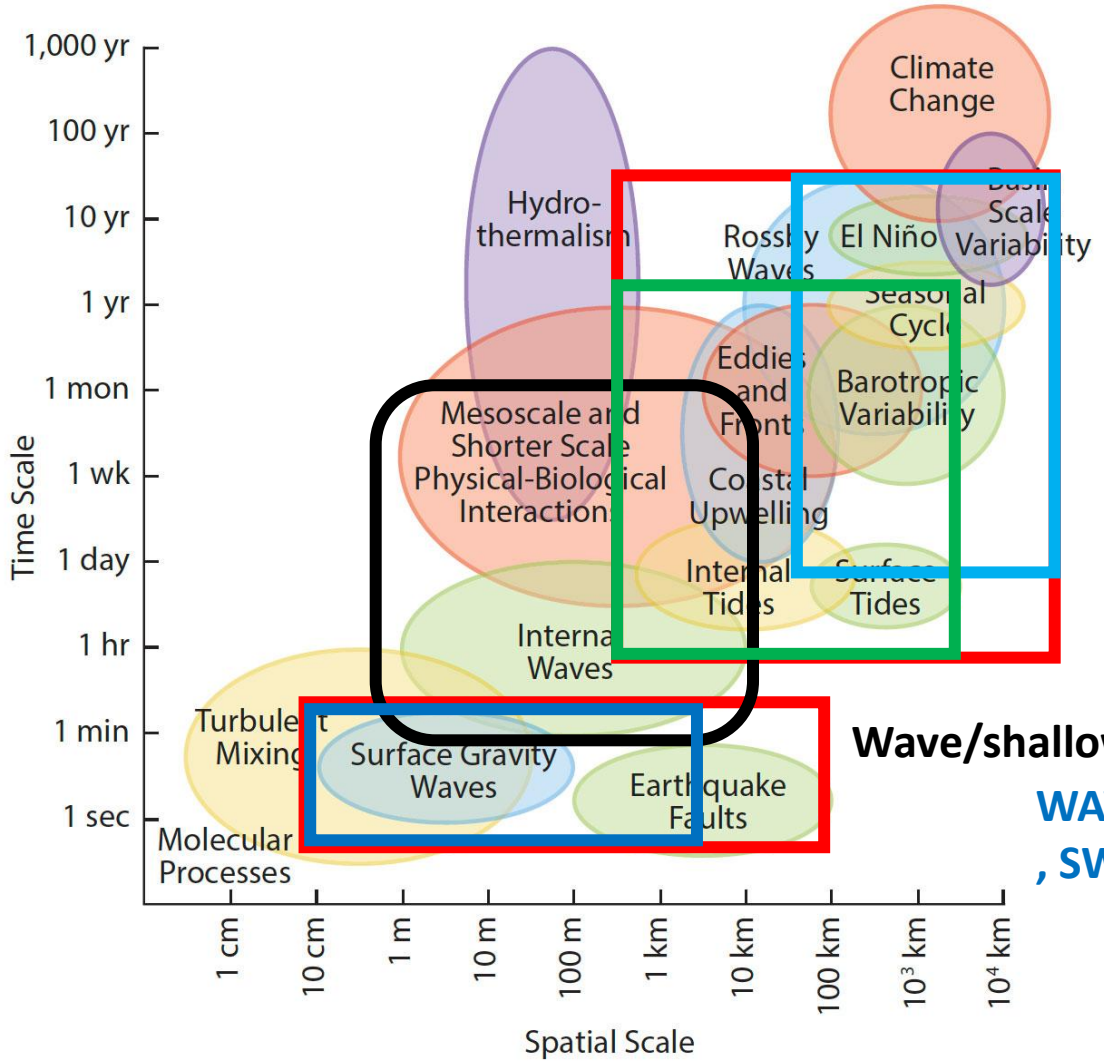
Resolution : varying from 100 m near coast to 50 km offshore

Temporal resolution : 1-hrly interval

Products : Surge height, Tide , inundation extend etc.

SPATIAL & TEMPORAL SCALES

Parameterization



GODAS

General Circulation model

ROMS

Wave/shallow water model

WAVEWATCH III , SWAN and ADCIRC

WHICH MODEL TO CHOOSE ?

- Processes of interest
- Spatial scale of the process
- Coastal or open ocean process