OCEAN MODELLING ACTIVITIES
&
PRODUCTS

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TPG

INCOIS

INCOIS MISSION

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

Predictability

of

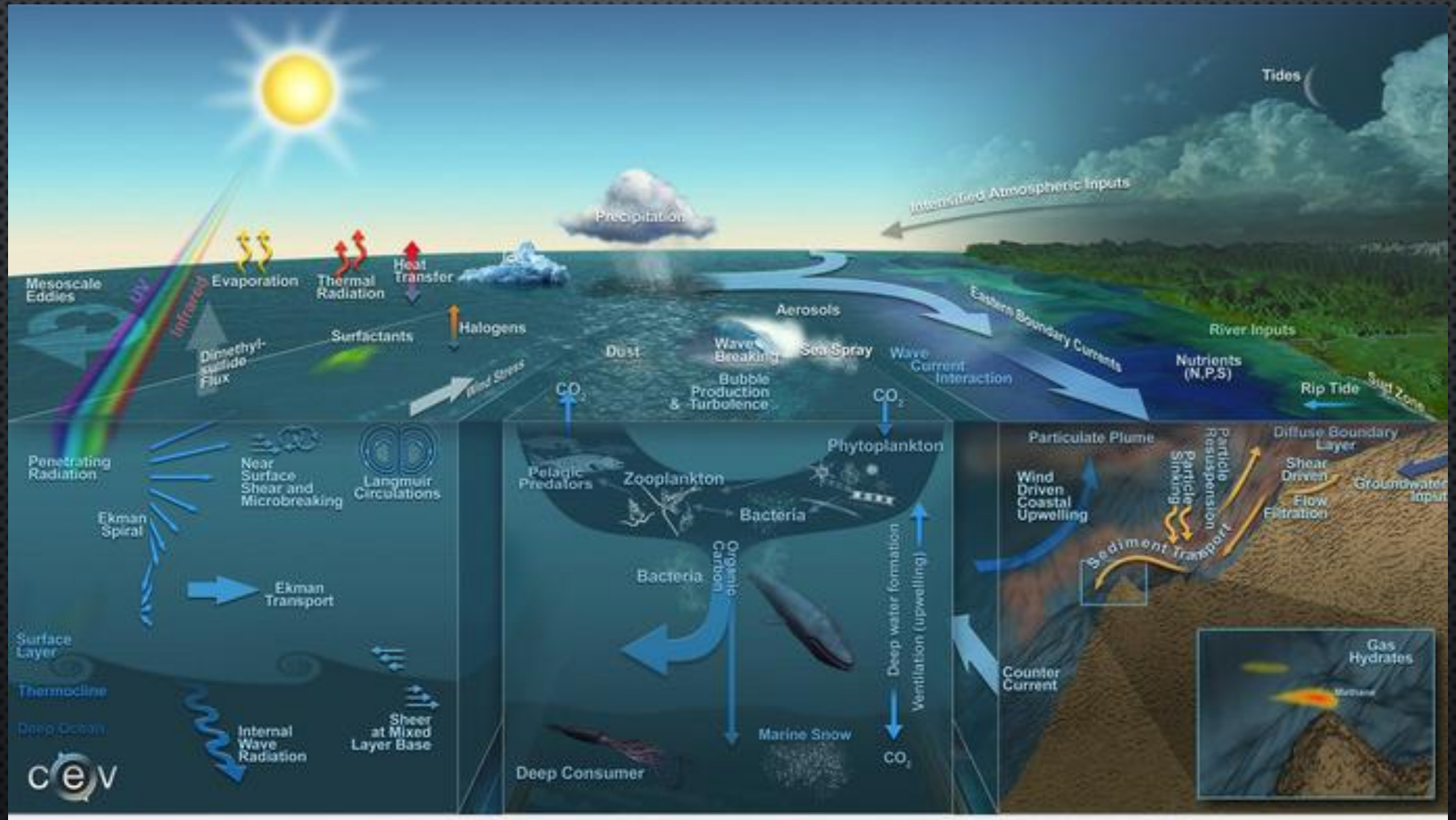
Ocean & Climate

Coastal Processes

Catastrophic Weather events

We want to Predict the Ocean

PROCESSES IN THE OCEAN

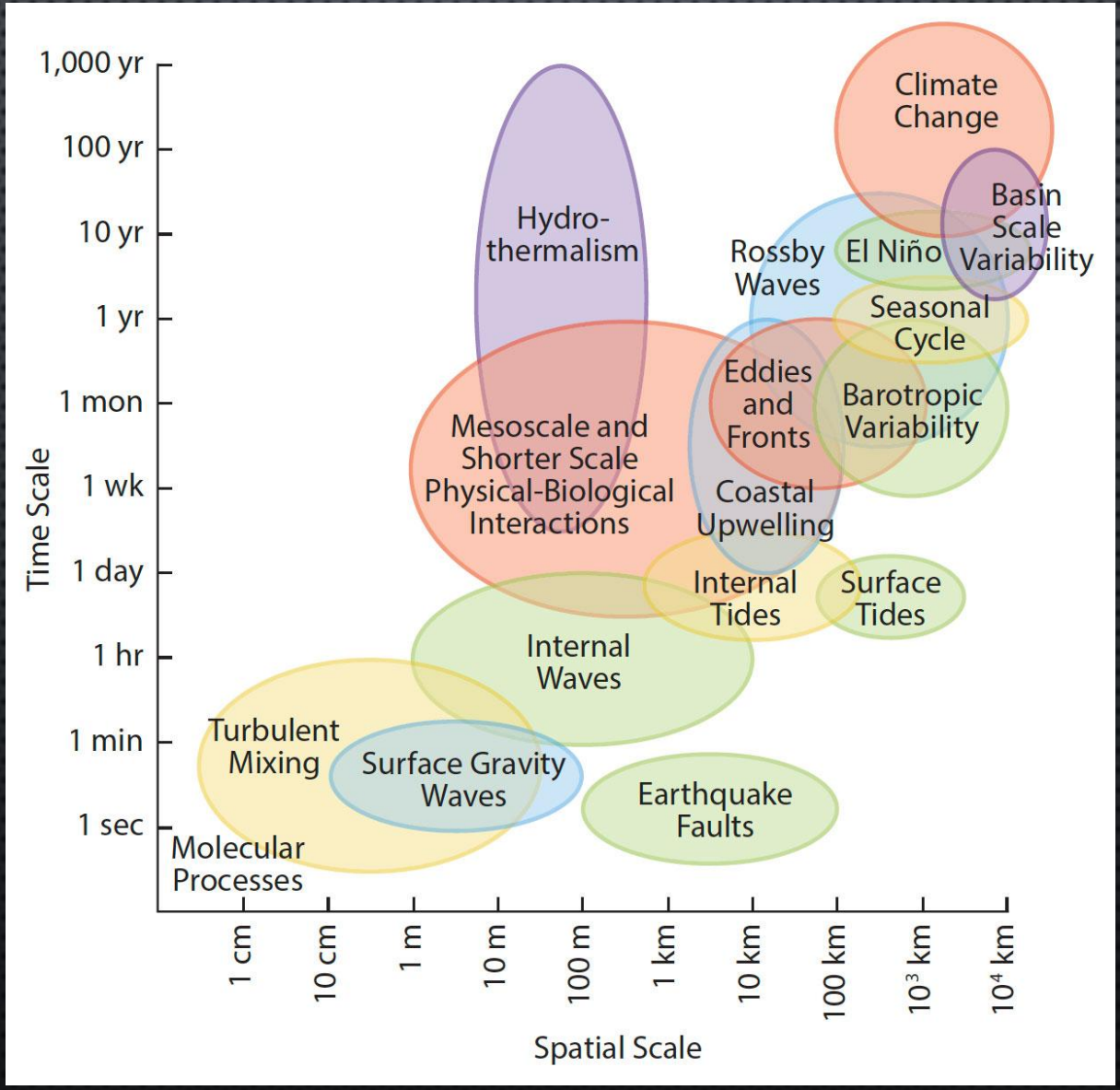


INTERACTIVEOCEANS

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

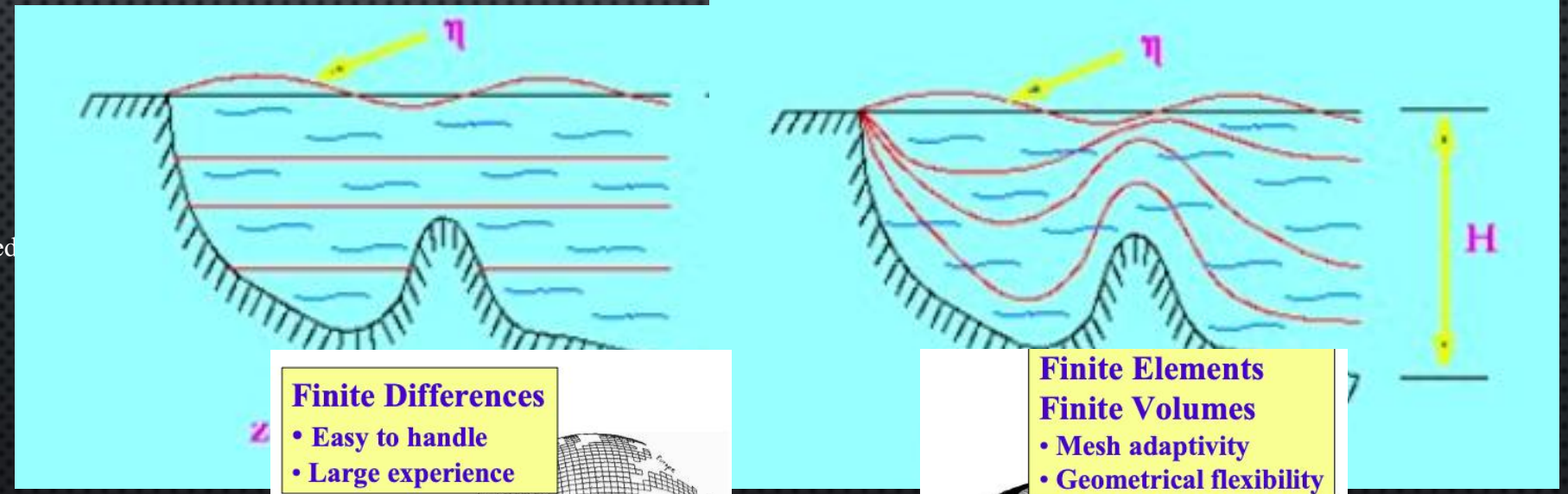
Physical — Hydrodynamic — Hydro-Thermodynamic

Biology

Vertical degree of freed

Density Variation

Grid type

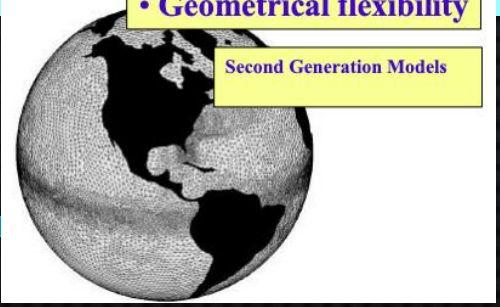


Finite Differences
- Easy to handle
- Large experience

First Generation Models
K. Bryan (1969)

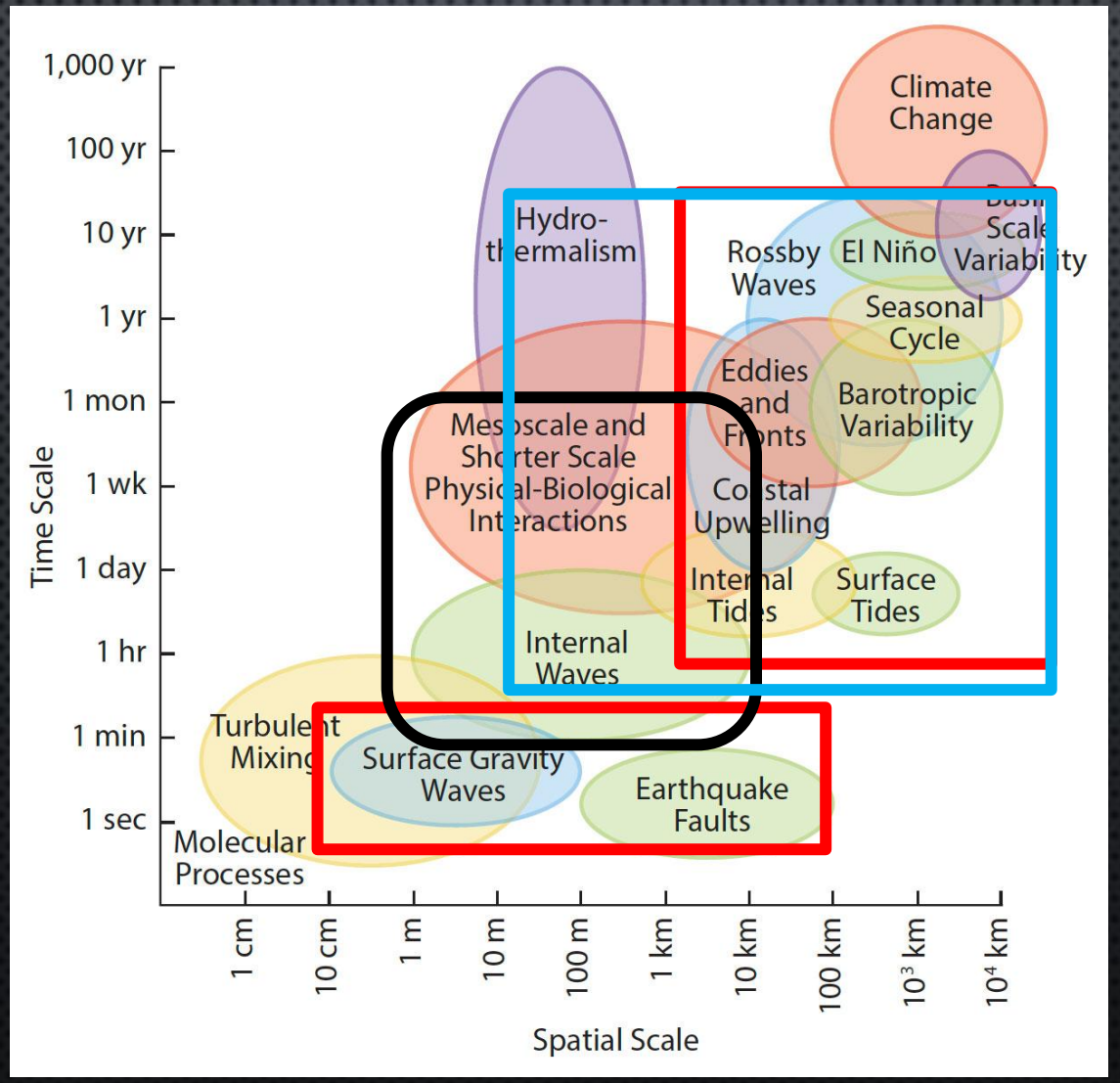
Finite Elements
Finite Volumes
- Mesh adaptivity
- Geometrical flexibility

Second Generation Models



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

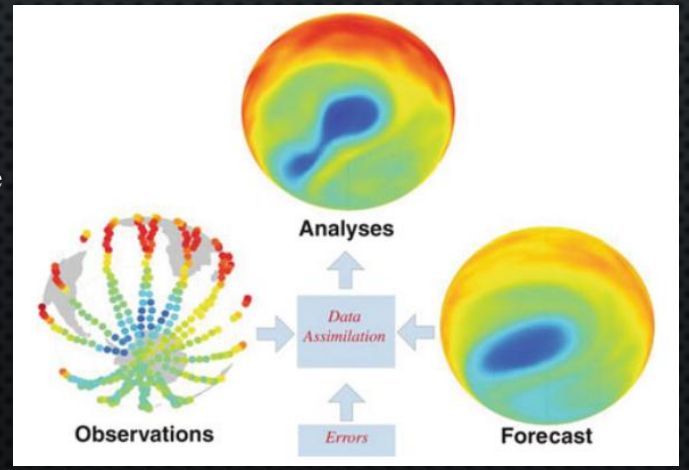
SWAN

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

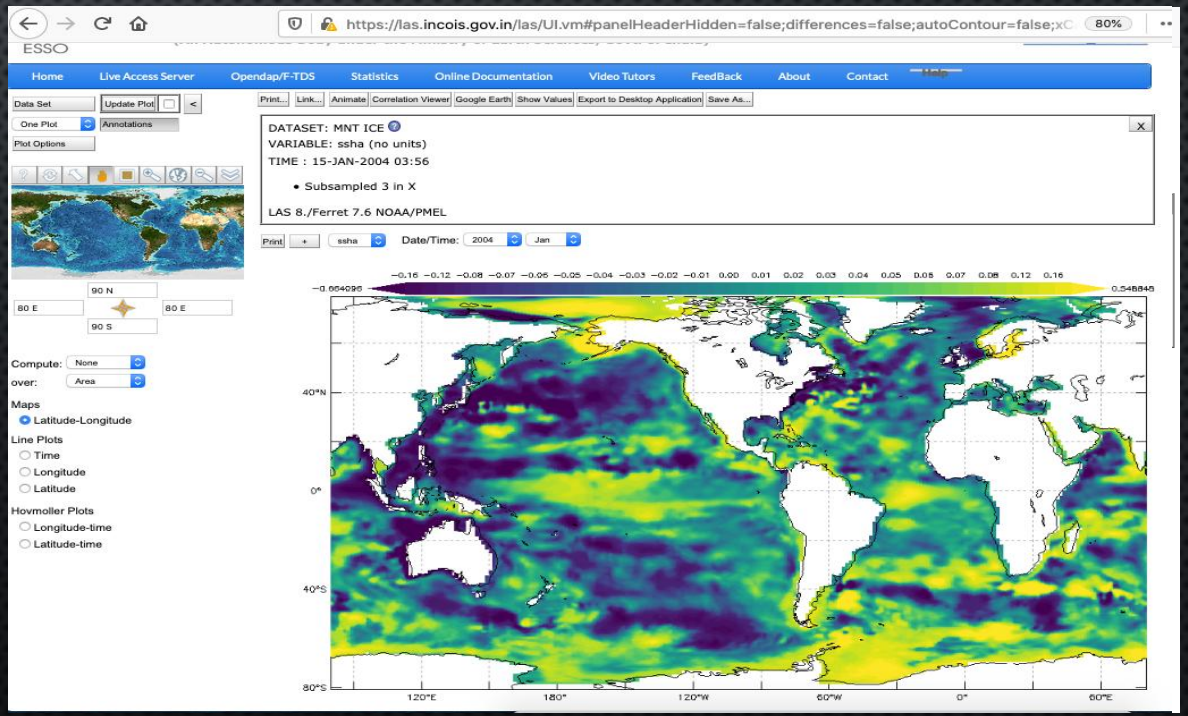
Products : Temperature, Salinity, SSHA

, 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

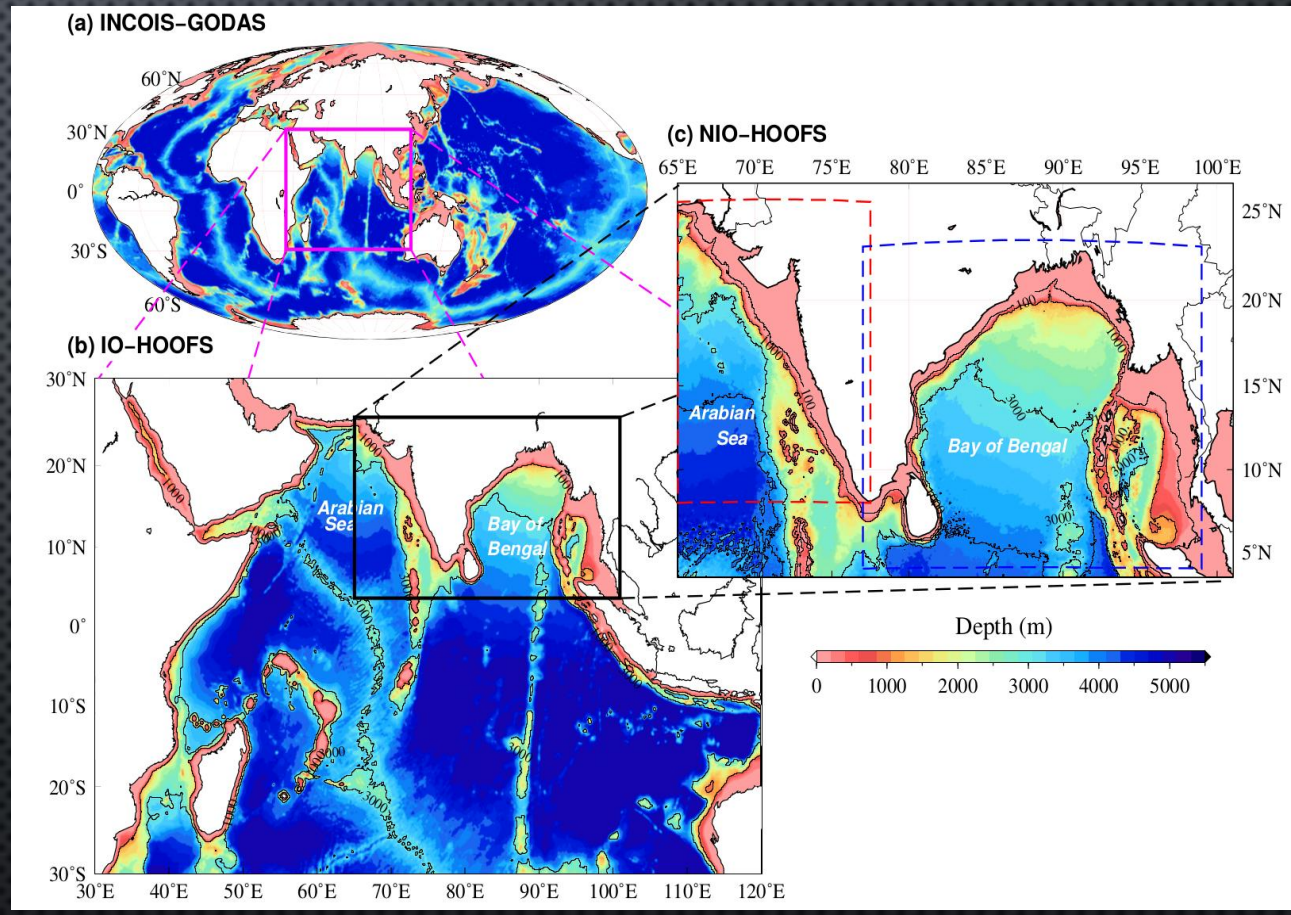
Resolution :Horizontal 1/48 degree ~2.23km

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)

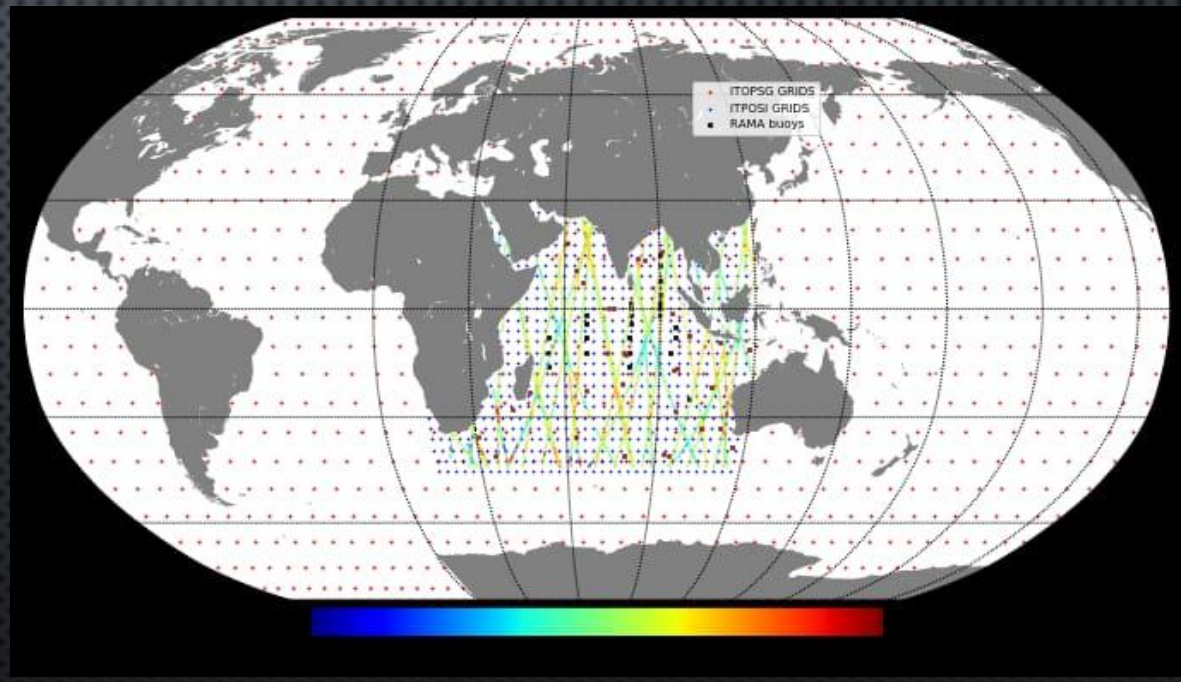
ITOPSG

Resolution : Horizontal ~ 0.25 degree global grid

vertical – 32 hybrid layers

Period : 2013 – till date

Assimilation



Nested grid

ITOPSI

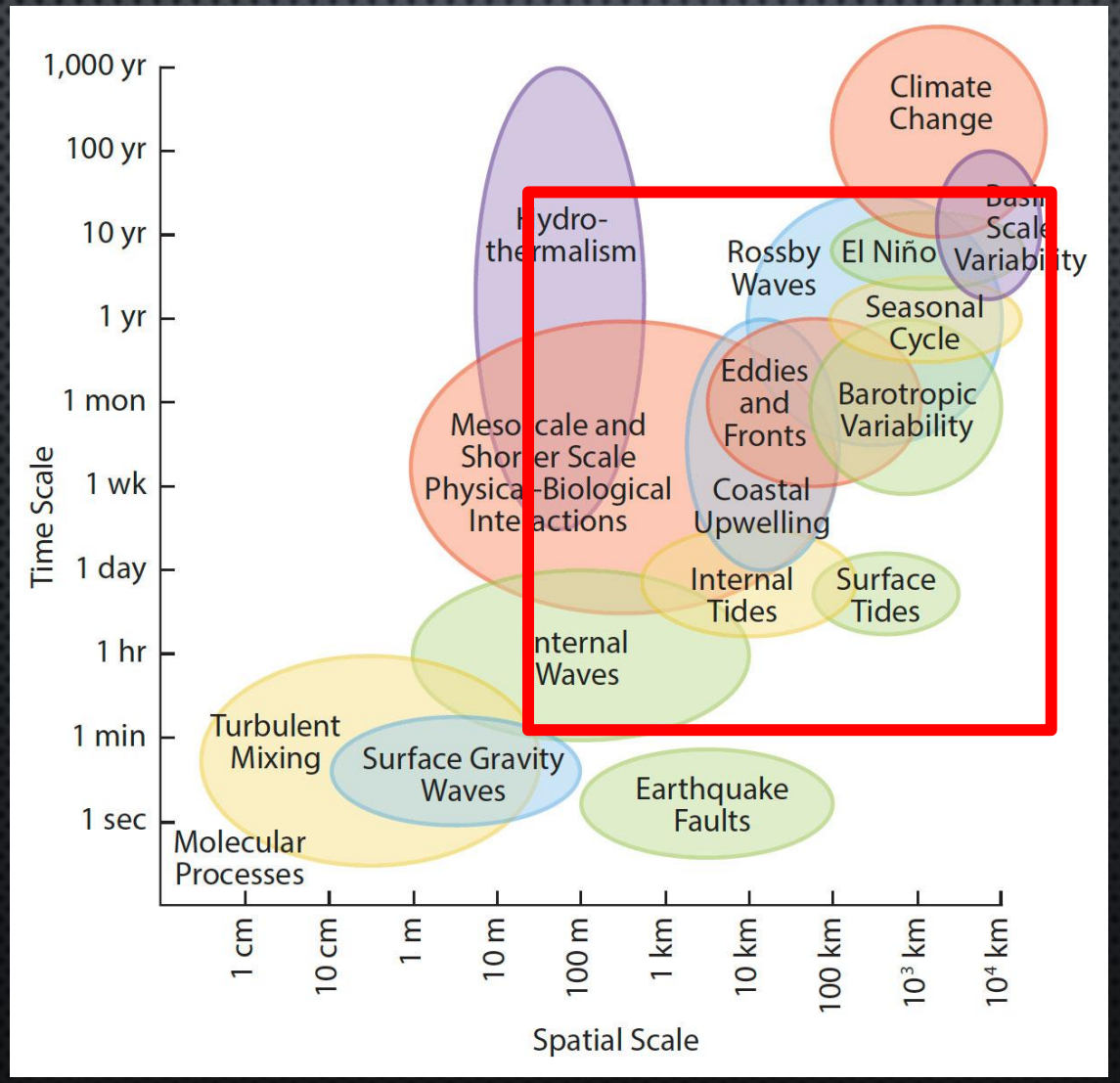
Resolution : Horizontal 1/16 degree (~ 6 km) Indian Ocean

vertical – 32 hybrid layers

Period : 2013 – till date

Assimilation

SPATIAL & TEMPORAL SCALES

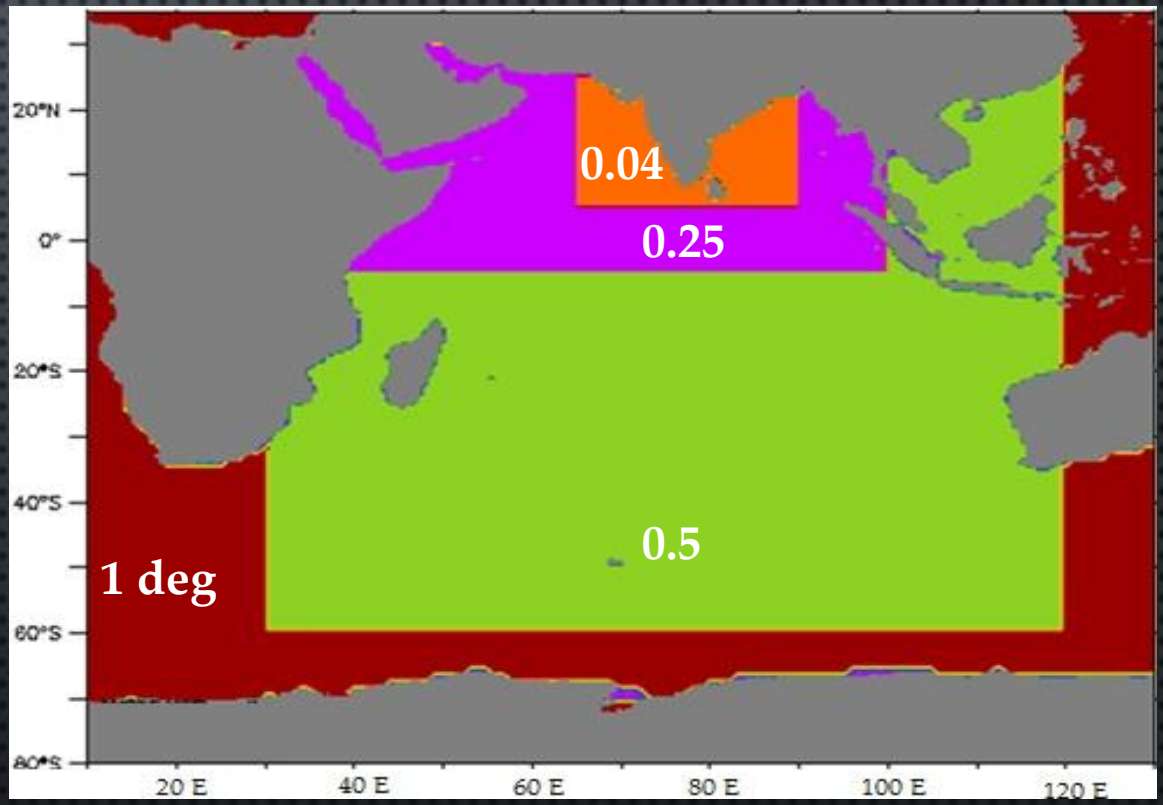


WAVEWATCH III

Period : 2014 – till date

Assimilation

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



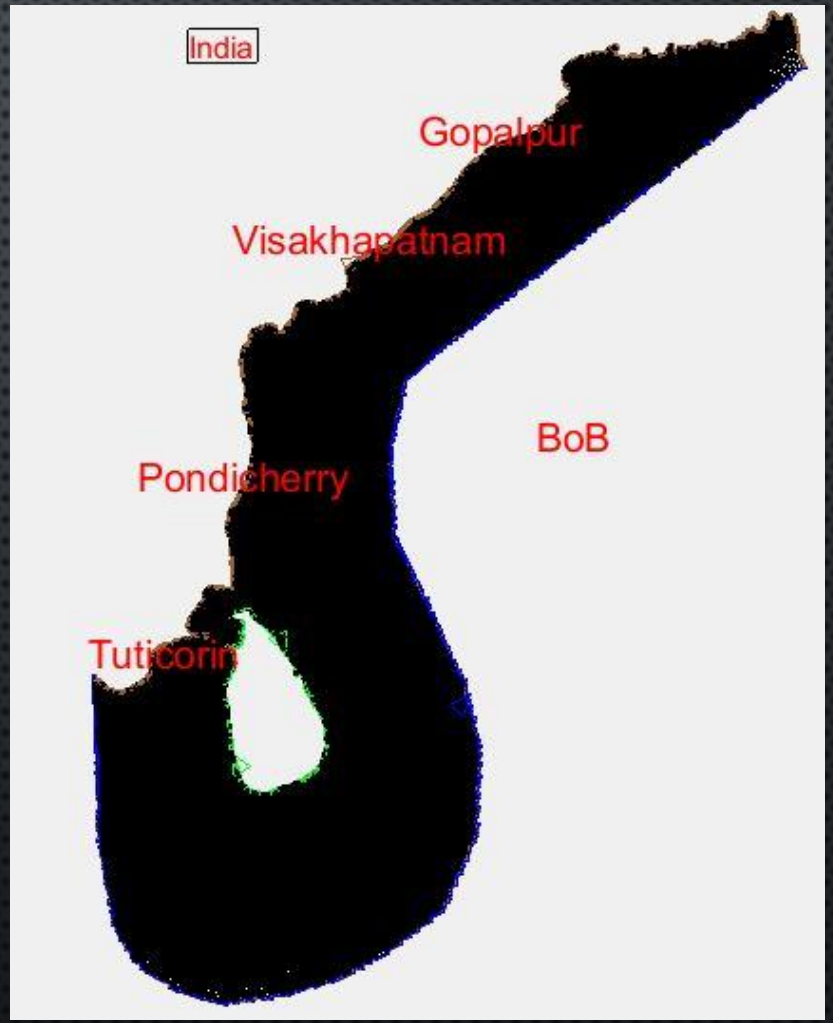
SIMULATING WAVES NEARSHORE (SWAN)

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

Storm Surge Forecast

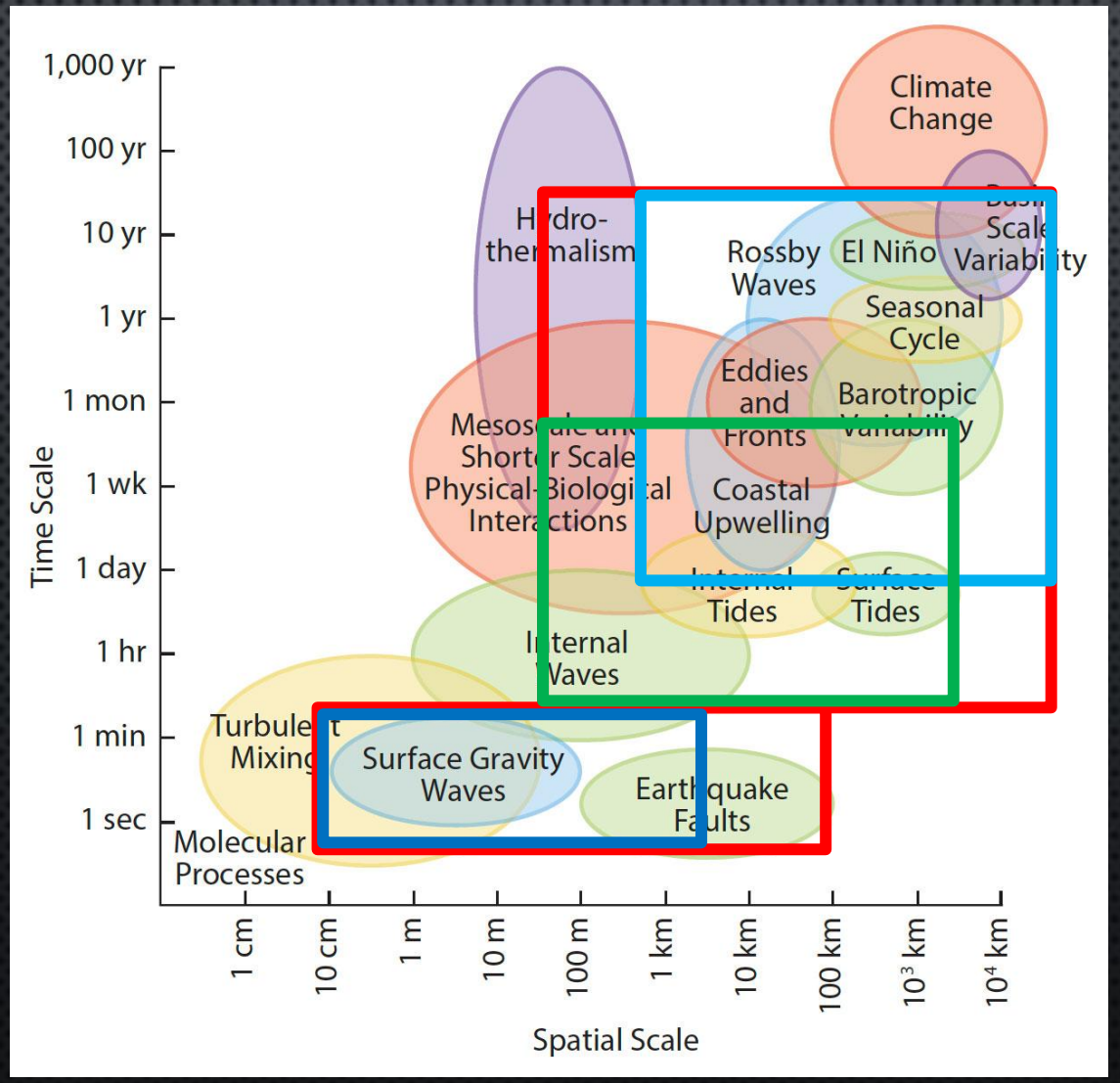
Grid : Finite element

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



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