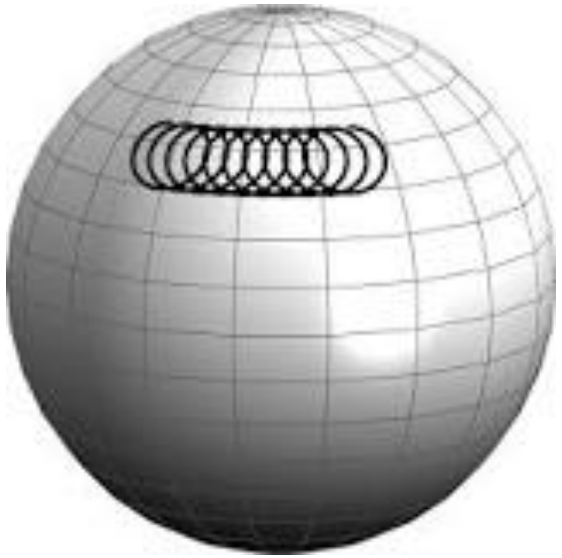
USING REGIONAL OCEAN MODELLING SYSTEMS TO MODEL INERTIAL OSCILLATIONS



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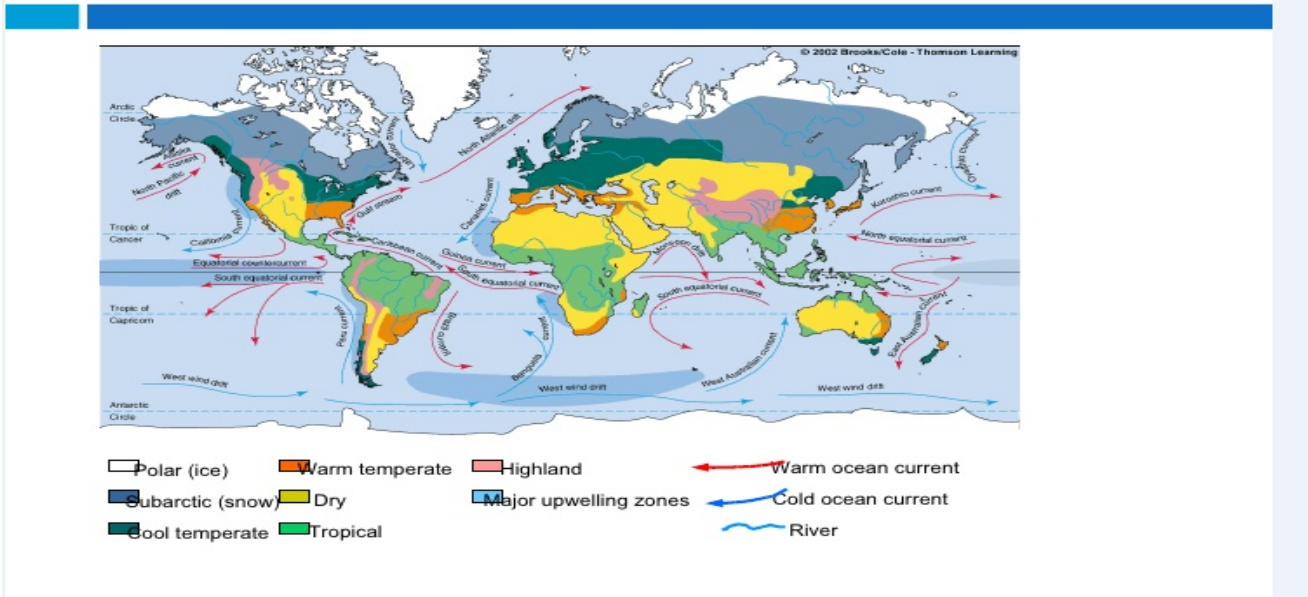
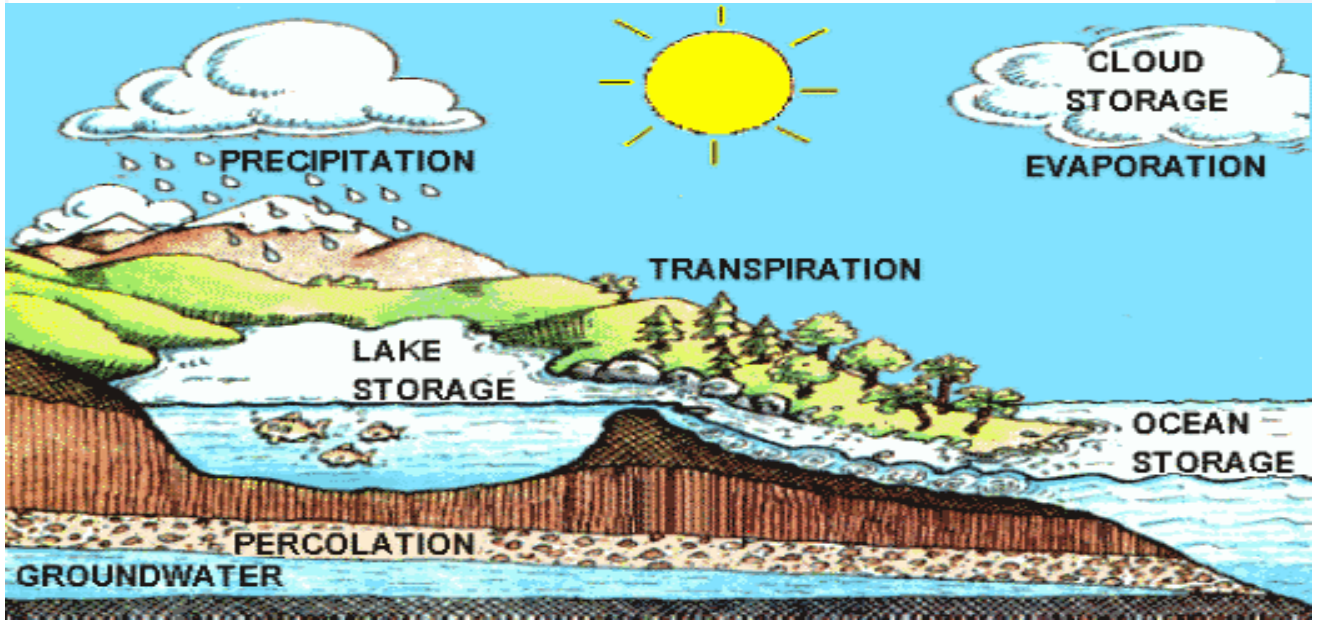
PRESENTATION OUTLINE

- ✓ Ocean models
- ✓ ROMS
- ✓ Inertial Oscillations
- ✓ Conclusion

Ocean models are numerical models with a focus on the properties on the oceans and their circulation.

Ocean models play a large role in aiding our understanding of the oceans influence on weather and climate





EXAMPLES OF OCEAN MODELS

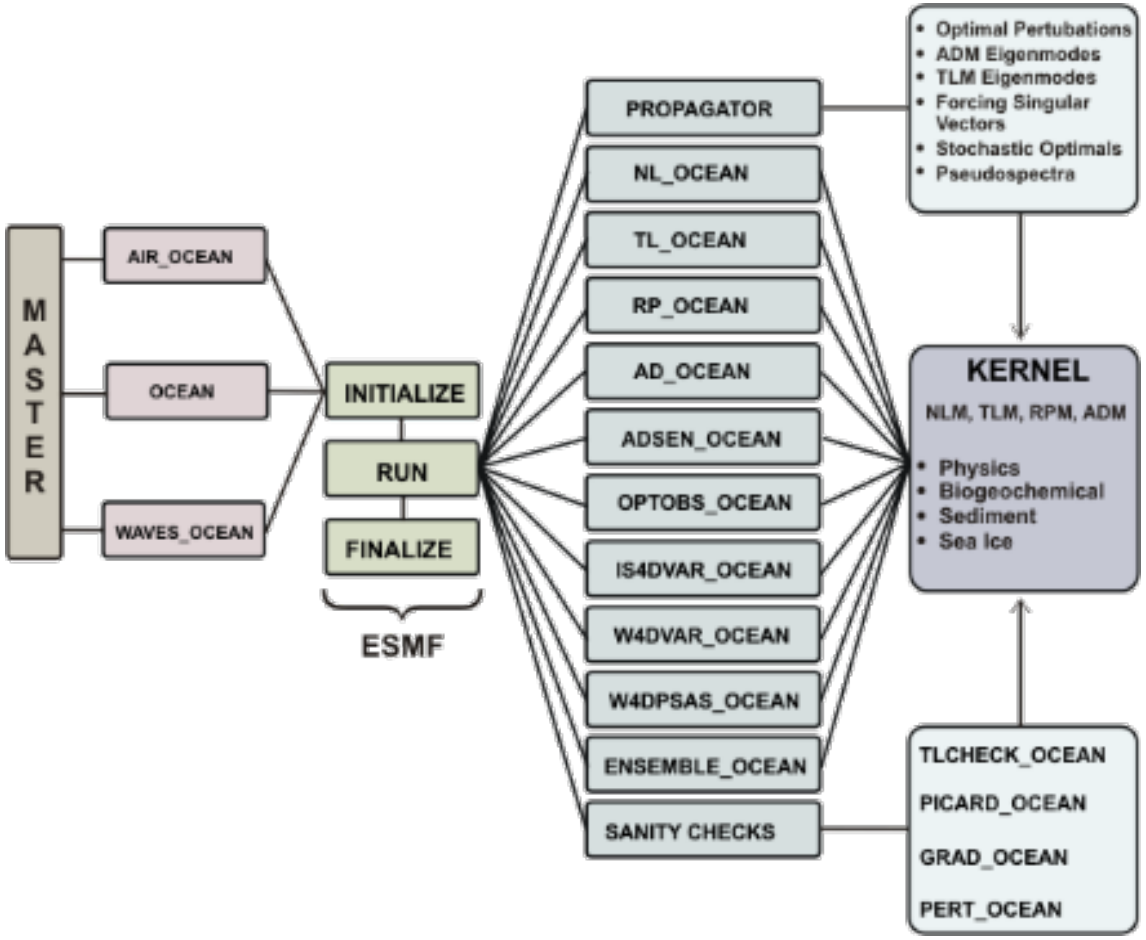
- Regional Ocean Modelling Systems (ROMS)
- Modular Ocean Model (MOM)
- Parallel Ocean Program (POM)
- MIT General Circulation Model (MITGCM)
- Hybrid Coordinate Ocean Model (HYCOM)

…

THE REGIONAL OCEAN MODELLING SYSTEMS (ROMS)

ROMS is a numerical ocean model widely used by the scientific community for a diverse range of applications.

The model was developed and is supported by researchers at the Rutgers University of California and contributors worldwide.

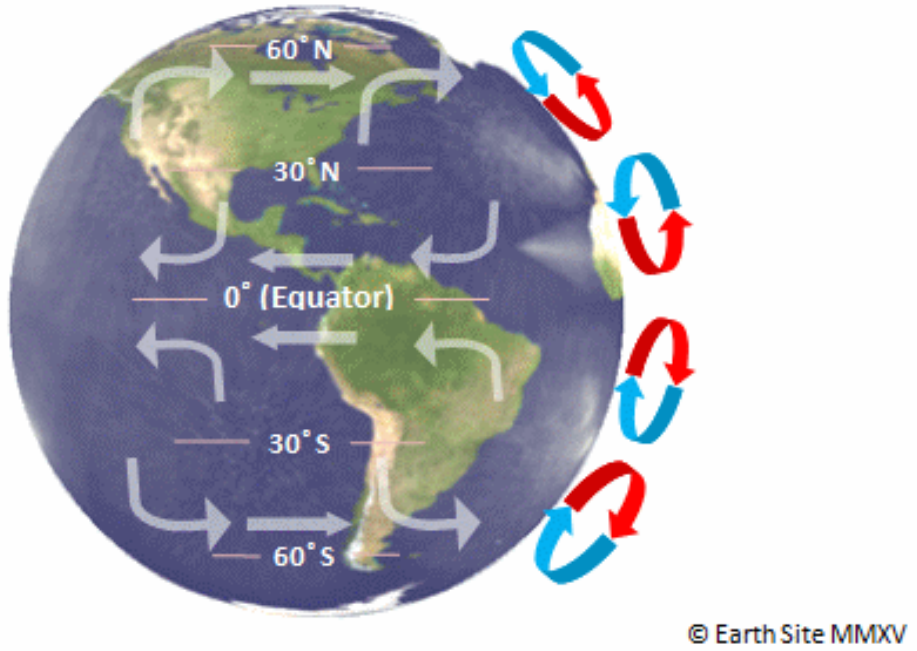


Framework of ROMS

INERTIAL OSCILLATION

Inertial oscillations which ae also referred to as inertial waves are types of mechanical wave possible in rotating fluids.

They are the simplest type of time dependent motion caused by Coriolis force, which arises as a result of the rotation of the earth.



INERTIAL OSCILLATION *CON'T*

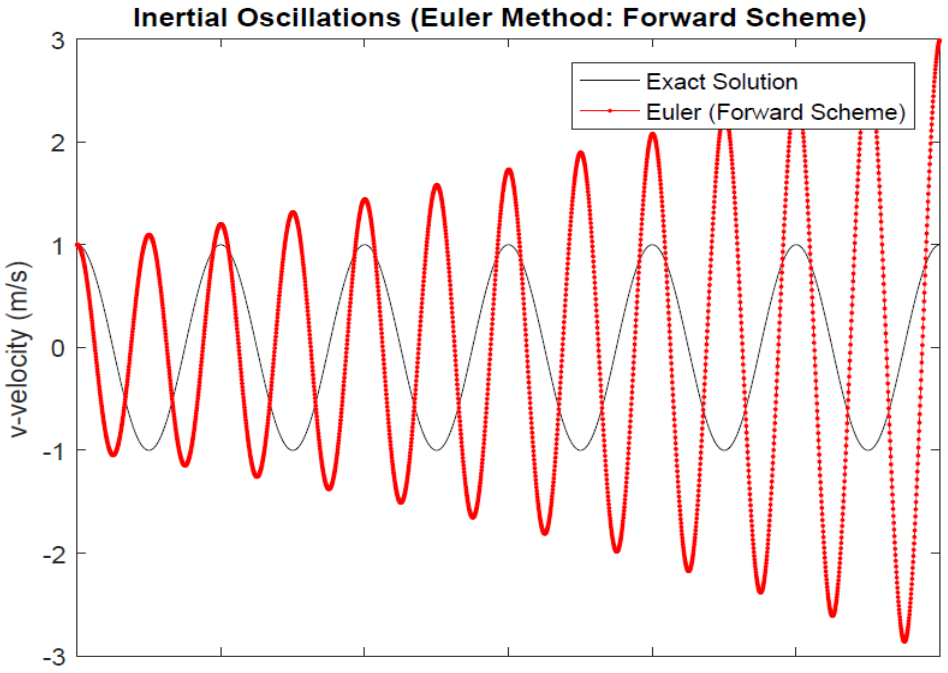
The equations
governing purely motions are given by

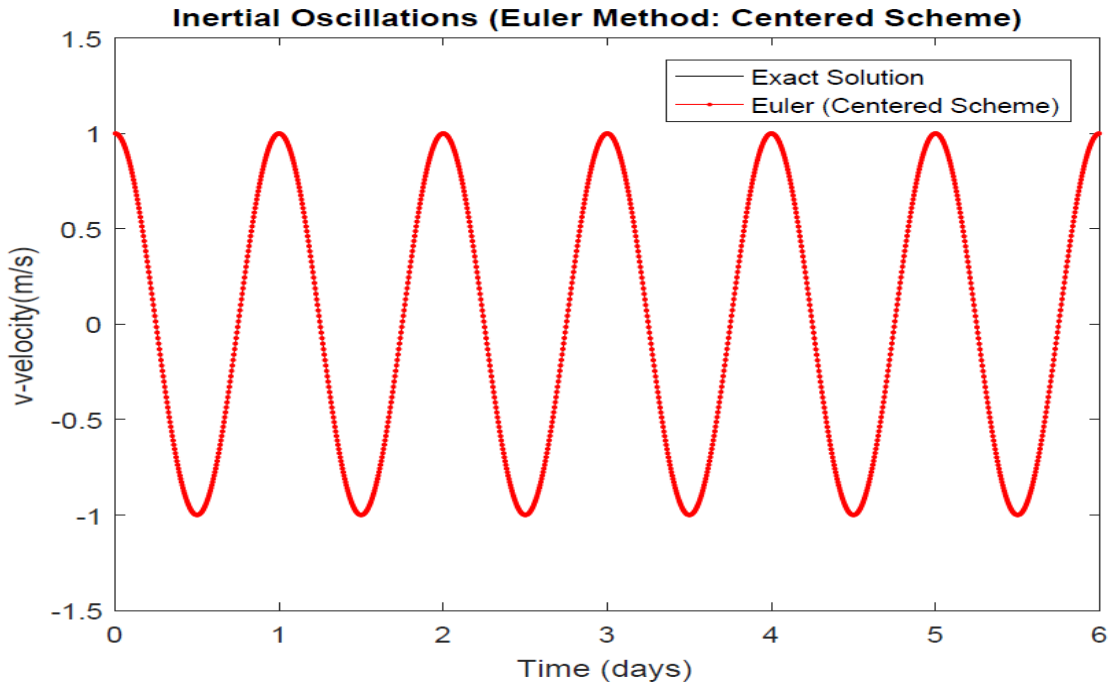
$$\frac{du}{dt} - fv = 0,$$
$$\frac{dv}{dt} + fu = 0,$$

where u and v are the velocities in the zonal (x-axis) and meridional (y-axis) directions, and f is the Coriolis parameter which is given by f = 2 sin().

INERTIAL OSCILLATION *CON'T*

SOLVING INERTIAL OSCILLATION USING OTHER MATHEMATICAL METHODS





INERTIAL OSCILLATION WITH ROMS

ROMS can be used to solve the equations governing the inertial oscillations.

This is done by running scripts for Coriolis scenarios (tweaking the conditions in order to mimic exact situation)

Eg.

✓wind speed

✓Currents

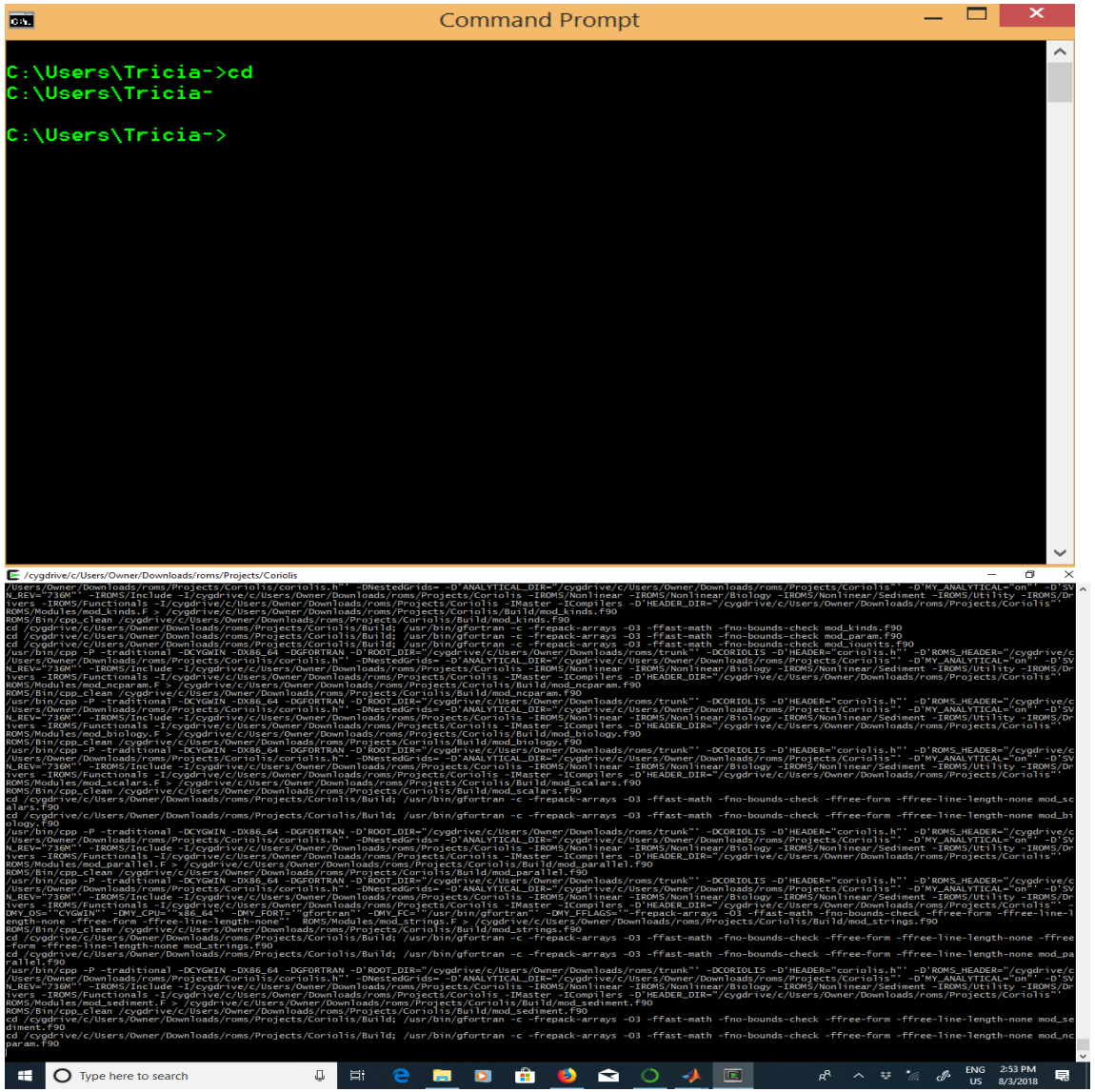
✓Wave heights

…

INERTIAL OSCILLATION WITH ROMS

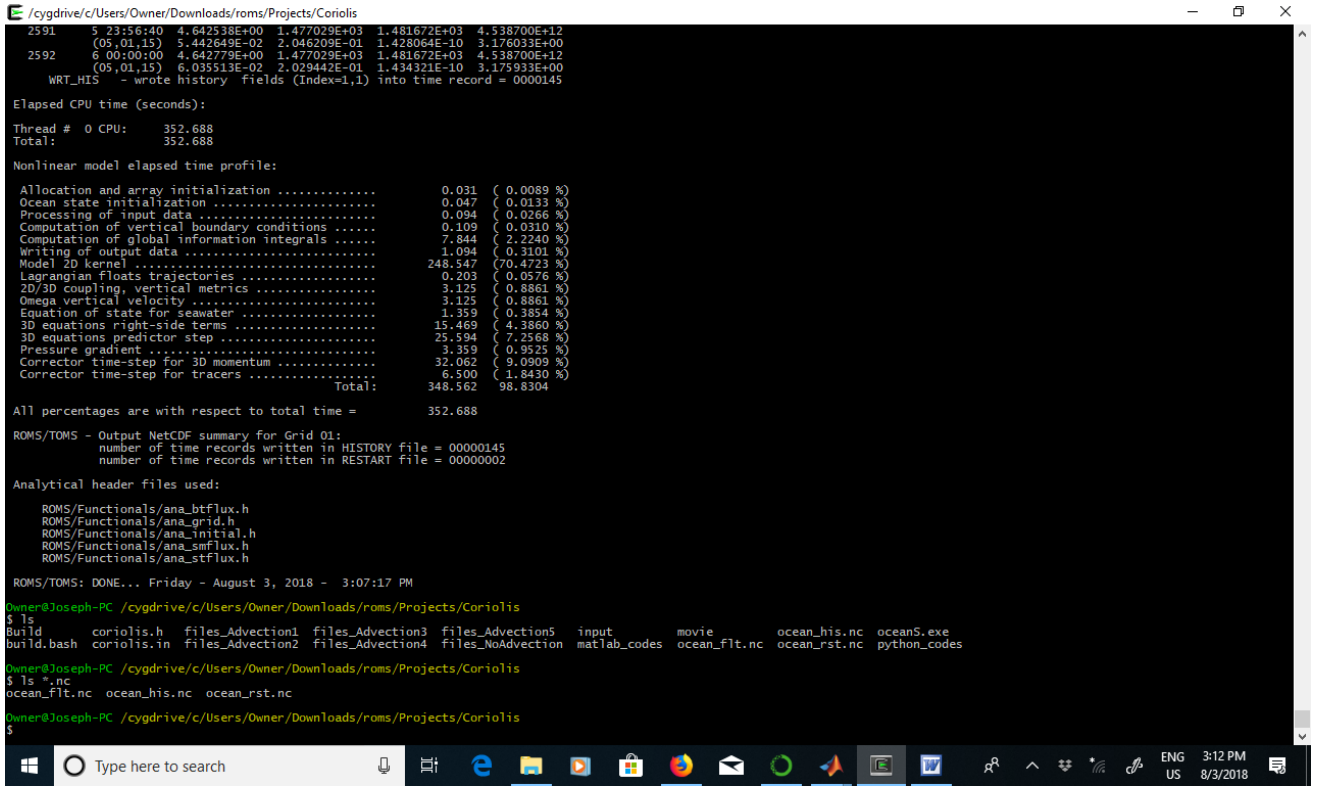
To use ROMS to calculate inertial oscillations:

- ✓ First you go into the truck to write or edit scrips for Coriolis
- ✓ Open your terminal (Cygwin or Ubuntu) and navigate into the folder containing ROMS
- ✓ You compile the code by using the build. bash command



INERTIAL OSCILLATION WITH ROMS

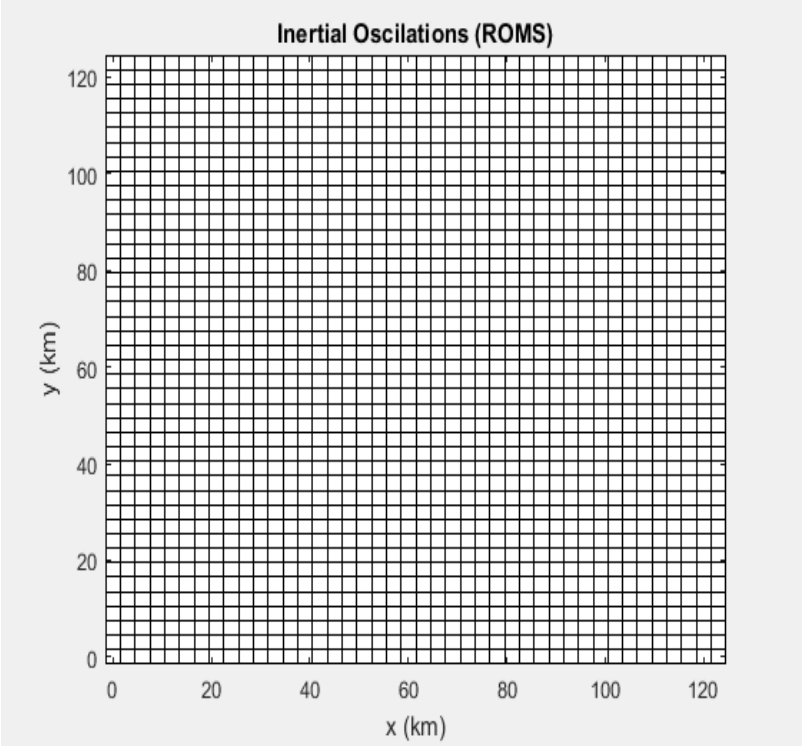
- ✓After compiling the code you get an executable file. After that you have to run the file.
- ✓After running the file it produces a netCDF file which can then be used to plot a graph or make an animation in matlab or python

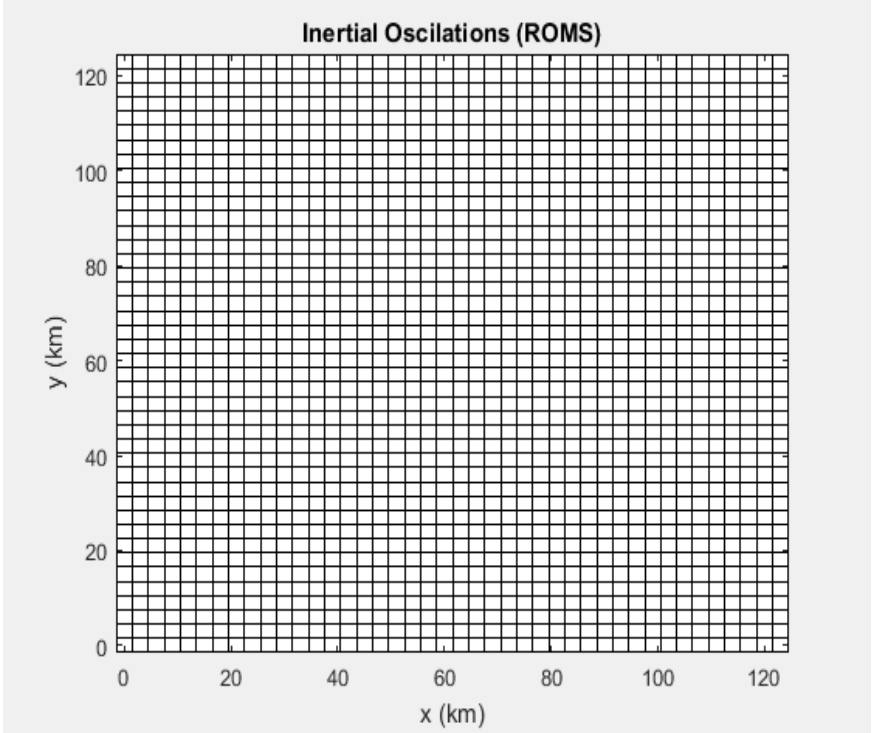


ROMS PROJECT (COESSING 2017)

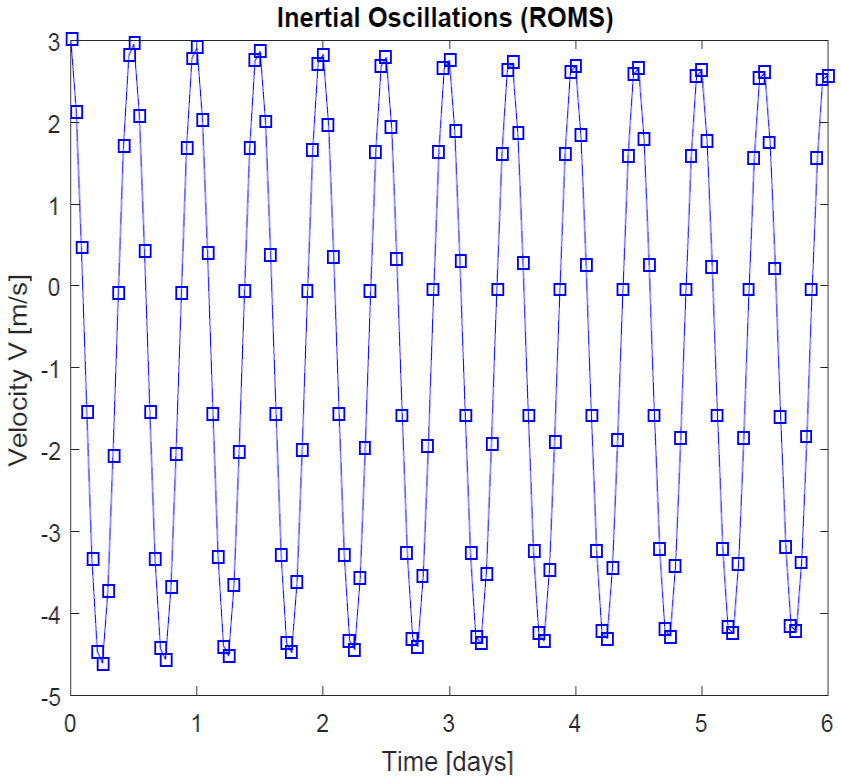
Mimicking the movement of a float when: *velocity (ana_initial) u=1m/s and v=2m/s*
Amplitude ana_flux u=0.0003N/m v=0.0001

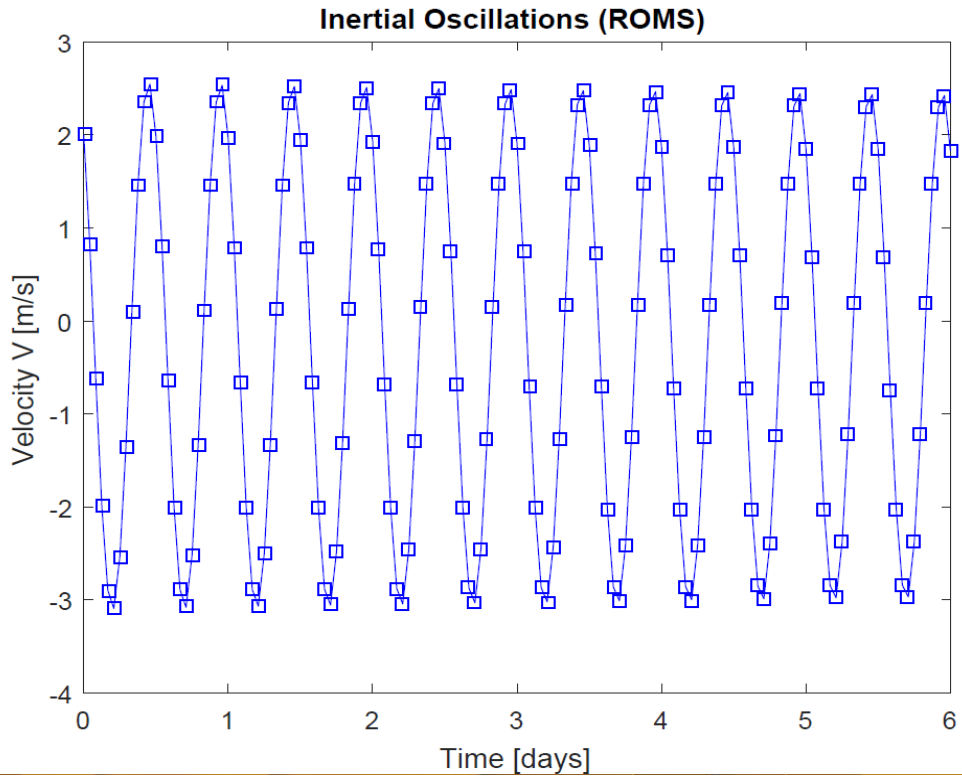
And velocity when ana_initial u=2m/s and v=2m/s
Amplitude ana_flux u=0.0001 and v=0.0001





INERTIAL OSCILLATION WITH ROMS





Thank You