

# Model information for assignment 1, GEF9660

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## 1 Model setup

A model of a mid latitude, stratified gyre was set up using the Regional Ocean Modeling System (ROMS). The gyre was started from an initial state of rest, and forced by a cosine wind stress of the form,  $\tau = \tau_0 * \cos(\pi/L * y)$ , where  $\tau$  is the wind stress (with units  $N/m^2$ ),  $y$  is the distance in the north-south direction, and  $L$  is the meridional extent of the model domain. The domain size is  $2000 \times 2000$  km with a lateral resolution of 10 km, configured on a Cartesian grid. The model was run for 2.5 years, and advection of momentum was left out in order to investigate the near-linear evolution of the system. ROMS is a generalized vertical sigma-coordinate model that facilitate stretching of the layers to obtain higher vertical resolution where desired. This model run however was simulated without any stretching applied, each layer is thereby 100m deep.

The model setup and model parameters is summarized in the tables below:

### Model setup

RUNTIME	2.5 years
BETAPLANE APPROXIMATION	$f = f_0 + \beta_0 y$
SIZE OF DOMAIN	$2000 \times 2000$ km
LATERAL RESOLUTION	$10 \times 10$ [km]
NUMBER OF VERTICAL LAYERS	10
VERTICAL RESOLUTION	100m
ADVECTION OF MOMENTUM	OFF
SLIPPERINESS PARAMETER	Free-slip
LINEAR BOTTOM DRAG	ON
HARMONIC FRICTION	ON

### PARAMETER VALUES:

$f_0$	=7.5e-05	[1/s]
$\beta_0$	= 2e-11	[1/ms]
$R$	= 5e-04	[m/s]
$A_h$	= 400	[m <sup>2</sup> /s]
$\tau_0$	= 0.03	[N/m <sup>2</sup> ]
$T_{top}$	= 15	[Celsius]
$\frac{dT}{dN}$	= -1.5	[Celsius/layer]

### LINEAR EQUATION OF STATE PARAMETERS:

$\rho_0$	= 1027.0d0	[kg/m <sup>3</sup> ]
$T_0$	= 10.0d0	[Celsius]
$S_0$	= 32.0d0	[ ]
$\beta_S$	= 7.6d-4	[ ]
$\alpha_T$	= 1.7d-4	[1/Celsius]