**Notes on the code for marsh growth**

Marsh vertical growth

We based the marsh growth model based on Morris et al., 2002 and adapted the formulation of Kirwan and Murray, 2006 where biomass can be calculated as a function of marsh cell depth below a Mean High High Water (MHHW). In these two studies, the biomass productivity formulations were based on measurements from Spartina Alterniflora.Biomass productivity (is based on a parabolic biomass curve where the upper (and lower limits ( of the parabola are a function of MHHW and is defined as:

= (6)

where is the optimal biomass in kg/(sq.m-year) that is a user input, = and and where is the mean tidal range and is assumed to be = . in eq. 6 is a scaling factor that does not allow the value of to not exceed a maximum value of and is defined as:

(7)

is calculated internally as a moving average over a number of user defined days by keeping a track of maximum water level in a given day. The upper and lower limits correspond to reference depths where the macrophyte survives and leads to accretion of organic matter. The integrated per year amount of below ground biomass (AMC) corresponding to 180.0 days of growth in kg/(sq.m-year) is calculated as:

= 180.0 (8)

where

The effective biomass after accounting for recalcitrant Carbon is calculated as:

(9)

where is the

The rate of marsh vertical accretion rate (is calculated from using

(10)

where is the bulk density of marsh.

**Marsh vegetation *(D’Alpaos et al., 2006)***

***Change marsh veg properties based on peak biomass (marsh\_vert\_growth.F)***

where = 250.0,

where = 0.0609 ,

where = 0.0006,

= marsh stem density

= marsh stem height

= marsh stem diameter

**Other algorithms (In works)**

**Initiating marsh mask (Colonizing marsh)**

If the cells are is dry at any time of the simulation, the marsh mask of the cell is converted to one i.e. the grid cell has marsh.

**Decolonizing marsh**

The only way marsh mask can be converted back to non-marsh mask is when the peak biomass of the cell goes back to zero. This would happen if there is a calculation of peak biomass.

The peak biomass and rest of the calculations mentioned below only happen after a user defined number of days (in the current runs is set to 30 days).

The number of user defined number of days is set to 30 days because the model calculates the tidal range internally.

Note that in the model, the bed mass that is changed due to the vertical accretion is set to only use 1 sediment class. Later this can be expanded to multiple sediment classes

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