Data : Input file for gulf of mexico-MT1 under-determined LIM

Units : Fluxes: mmol /m2/d

Standing stocks: mmol /m2

Tung 2021.10.20

#####################################################################

################################ PARAMETERS

! Parameter names are linked to a value

! These are used later to increase the readability of the file (see below)

!-- Tlim

Tlim =0.35

!-- Stocks

SEDSS =76000

BACSS =2585

MEISS =208

MACSS =816

MEGSS =30.6

FISSS =35.9

!-- Maintenance Respiration

MEImr= Tlim \* 0.01 \* MEISS

MACmr= Tlim \* 0.01 \* MACSS

MEGmr= Tlim \* 0.01 \* MEGSS

FISmr= Tlim \* 0.01 \* FISSS

!-- Constraints

minBACge = 0.02 ! Meio assimilation efficiency

maxBACge = 0.61

minMEIae = 0.456 ! Meio assimilation efficiency

maxMEIae = 0.699

minMEIpb = 0.009 ! Meio PB ratio

maxMEIpb = 0.0493

minMEInge = 0.3 !Meio NGE

maxMEInge = 0.5

minMACae = 0.6 ! Macro assimilation efficiency

maxMACae = 0.7

minMACpb = 0.46 ! Macro PB ratio

maxMACpb = 7.9

minMACnge = 0.6 ! Macro net growth efficiency

maxMACnge = 0.72

minMEGae = 0.48 !Mega assimilation efficiency

maxMEGae = 0.8

minMEGpb = 2.74\*10^-4 !Mega pb ratio

maxMEGpb = 1.42\*10^-2

minMEGnge = 0.276 !Mega nge

maxMEGnge = 0.725

minFISae = 0.84 !Fish assimilation efficiency

maxFISae = 0.865

minFISpb = 0.0018 !Fish PB ratio

maxFISpb = 0.0082

minFISnge = 0.37 !Fish nge

maxFISnge = 0.71

minSEDdr = 0.00025 !Sediment degradation rate

maxSEDdr = 0.016

################################ END PARAMETERS

################################ VARIABLES

! Defition of variables

! Each variable name is linked to a combination of flows

! Variables are used to increase the readability of the equalities and inequalities (see below)

MEIcs = SED -> MEI +BAC -> MEI !MEI consumption

MACcs = SED -> MAC + BAC -> MAC + MEI -> MAC !Mac consumption

MEGcs = SED -> MEG + BAC -> MEG + MEI -> MEG + MAC -> MEG !Mega consumption

FIScs = SED -> FIS + BAC -> FIS+ MEI -> FIS + MAC -> FIS+ MEG -> FIS !Fish consumption

MEIgr= MEI -> DIC\_W - MEImr !MEIo growth respiration

MACgr= MAC -> DIC\_W - MACmr !MACro growth respiration

MEGgr= MEG -> DIC\_W - MEGmr !MEGro growth respiration

FISgr= FIS-> DIC\_W - FISmr !FISh growth respiration

################################ END VARIABLES

################################ STOCK

! Definition of the compartments and their magnitude

! Values are defined in the parameter section

! Mass balances are set up for these compartments

SED =SEDSS

BAC =BACSS

MEI =MEISS

MAC =MACSS

MEG =MEGSS

FIS =FISSS

################################ END STOCK

################################ EXTERNALS

! Definition of the compartments that are part of

! the world external to the food web.

! No mass balances for these compartments are defined in the LIM

POC\_W

EXP\_S

DIC\_W

EXP\_B

################################ END EXTERNALS

################################ FLOW

! Definition of the trophic flows between the comparments and/or the externals

!-- SEDiment

POC\_w -> SED !POC particle rain to sediment

SED -> EXP\_S !Sediment export

SED -> BAC !detritus uptaken by bacteria

SED -> MEI !detritus uptaken by meiofauna

SED -> MAC !detritus uptaken by macrofauna

SED -> MEG !detritus uptaken by megafauna

SED -> FIS !detritus uptaken by fish

!-- BACteria

BAC -> SED !viral lysis

BAC -> MEI !bac grazed by meiofauna

BAC -> MAC !bac grazed by macrofauna

BAC -> MEG !bac grazed by megafauna

BAC -> DIC\_W !bacteria respiration

!-- MEIofauna

MEI -> SED !meiofauna feces

MEI -> MAC !meiofauna preyed by macro

MEI -> MEG !meiofauna preyed by mega

MEI -> DIC\_W !meio respiration

! MACrobenthos

MAC -> SED !macro feces

MAC -> MEG !macro preyed by mega

MAC -> FIS !macro preyed by fish

MAC -> DIC\_W !macro respiration

! Megafauna

MEG -> SED !mega feces

MEG -> FIS !mega preyed by fish

MEG -> DIC\_W !mega respiration

MEG -> EXP\_B !mega loss to predation

! Fish

FIS -> SED !fish feces

FIS -> DIC\_W !fish respiration

FIS -> EXP\_B !fish loss to predation and fishery

################################ END FLOW

################################ RATE

! The rate of change of each compartment

! These are zero for mass balances in steady-state

SED =0.0

BAC =0.0

MEI =0.0

MAC =0.0

MEG =0.0

FIS =0.0

################################ END RATE

################################ EQUATION

! Definition of the equalities for the equality equation

!--POC

POC\_W -> SED = 77.7

!-- SCOC

BAC -> DIC\_W + MEI -> DIC\_W + MAC -> DIC\_W+ MEG -> DIC\_W+ FIS -> DIC\_W = 36.5

################################ END EQUATION

################################ CONSTRAINT

! Inequalities for the inequality equation

! but assuming that the reported value has an error of +/- 25%

! The numerical values (min... and max...) are defined in the parameter section (see above)

! The definition of the variable names is in the variable section (see above)

!-- SED

SED -> EXP\_S + SED -> BAC + SED -> MEI + SED -> MAC + SED -> MEG + SED -> FIS = [minSEDdr,maxSEDdr]\*SEDSS !Detritus degradation rate

!-- BACteria

SED -> BAC - BAC -> DIC\_W = [minBACge,maxBACge]\* DOC ->BAC !Bacteria growth efficiency

!—MEI

MEIcs - MEI -> SED = [minMEIae ,maxMEIae]\* MEIcs !meio assimilation efficiency

MEIcs- MEI->SED-MEIgr =[minMEInge,maxMEInge]\*MEIcs-[minMEInge,maxMEInge]\* MEI->SED !meio net growth efficiency

MEIcs - MEI -> SED - MEIgr = [minMEIpb,maxMEIpb]\*MEISS !meio production

!-- MAC

MACcs - MAC -> DET = [minMACae ,maxMACae]\*MACcs !macrobenthos assimilation efficiency

MACcs - MAC -> DET - MACgr = [minMACnge,maxMACnge]\* MACcs-[minMACnge,maxMACnge]\* MAC -> DET ! macrobenthos net growth efficiency

MACcs - MAC -> DET - MACgr = [minMACpb,maxMACpb]\*MACSS ! macro production

!-- MEG

MEGcs - MEG -> SED = [minMEGae ,maxMEGae]\* MEGcs !mega assimilation efficiency

MEGcs- MEG->SED-MEGgr =[minMEGnge,maxMEGnge]\*MEGcs-[minMEGnge,maxMEGnge]\* MEG->SED !mega net growth efficiency

MEGcs - MEG -> SED- MEGgr = [minMEGpb,maxMEGpb]\*MEGSS !mega production

!-- FIS

FIScs - FIS -> SED = [minFISae ,maxFISae]\* FIScs !fish assimilation efficiency

FIScs- FIS->DET - FISgr =[minFISnge,maxFISnge]\*FIScs-[minFISnge,maxFISnge]\* FIS->SED !meio net growth efficiency

FIScs - FIS -> SED - FISgr = [minFISpb,maxFISpb]\*FISSS !fish production

################################ END CONSTRAINT