SISSOMA

Model: The basic model is run by the call

simo = coagfunTidylnln(a,alpha,epsilon,Ptotal,Tmax,season,rem,simi)

where the input parameters are

|  |  |
| --- | --- |
| a | the self-similarity parameter e.g. 1.7 to 2.1 |
| alpha | the stickiness factor, in the range 0 to 1. |
| epsilon | turbulent dissipation rate e.g. 1E-4 units: m2 s-3 |
| Ptotal | rate of production of primary particles e.g. 1E6 units [µg C m-2 day-1] |
| Tmax | the time span of simulations e.g. 3\*365 units [days] |
| season | 0 for steady and 1 for a simple seasonal production cycle. |
| rem | Remineralization rate e.g. 0.1 units [day-1] |
| simi | input structure |

All relevant output is passed through the structure simo.

Most relevant are

|  |  |
| --- | --- |
| simo.N | Aggregate distribution at Tmax: Size and density resolved number [m-3] |
| simo.M | Aggregate distribution at Tmax: Size and density resolved mass [µg m-3] |
| simo.p | All run parameters |
| simo.w | Sinking speed [m day-1] |
| simo.d | Excess density [µg µm-3] |
| simo.m | Mass [µg] |
| simo.Flux | Export flux at Tmax: Size and density resolved number [µg C m-3 day-1] |

For the sensitivity plots, sweeps across parameter space can be set up using the batchrunlnln script containing instruction sets such as

A = 2; % self-similarity

P = 1E6; % production rate [µg C m^-2 day^-1]

T = 1E-6; % turbulent dissipation rate [m^3 s^-2]

S = 0.1; % stickiness

R = 0.1; % remineralization rate [day^-1]

sima.sima200 = coagfunTidylnln(2.00,S,T,P,2000,0,R,[]);

sima.sima205 = coagfunTidylnln(2.05,S,T,P,2000,0,R,sima.sima200);

……

exp.a = sima;

In this case, the sensitivity variable is a, the self-similarity parameter. Here output from one run is used as input for the next run when the offset in parameter space is relatively small. This allows for slightly faster convergence.

All the results for sensitivity on a are stored in the structure exp.a. Similarly the results for sensitivity for other sensitivity parameters are stored in the structures exp.s (stickiness), exp.e (dissipation rate) and exp.p (productivity).

Finally

save expA.mat exp

writes all results to the file expA.mat

The runs produce diagnostic plots

A screenshot of a computer

Description automatically generated

To plot sensitivity results, use batchplotx. Load the appropriate sensitivity file

load expA.mat

and reset the paramset to ‘a’, ‘e’ or ‘s’ for the appropriate sensitivity sweeps. These produce the panels found in Figure 5 of the manuscript.