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Supplement of

**Autocalibration of a one-dimensional hydrodynamic-ecological model
(DYRESM 4.0-CAEDYM 3.1) using a Monte Carlo approach:
simulations of hypoxic events in a polymictic lake**

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Physical parameters				
Name	Unit	Min_value	Max_value	Description or default value from literature
Bulk aerodynamic mmt. transport coeff.		0.001	0.0015	0.0013
Mean albedo of water		0.08	0.09	0.08
Emissivity of a water surface		0.8	0.98	0.088
Critical wind speed	m/s	3.0	8.0	4.0
Bubbler entrainment coefficient		0.01	0.015	0.012
Buoyant plume entrainment coefficient		0.07	0.09	0.083
Shear production efficiency		0.05	0.1	0.08
Potential energy mixing efficiency		0.15	0.4	0.25
Wind stirring efficiency		0.15	0.4	0.25
Effective surface area coefficient		0.50E+06	1.5E+08	1.0E+07
BBL dissipation coefficient		0	0.2	
Vertical mixing coeff.		50	500	200
Ranges of the minimum layer thickness		0.5	0.8	
Ranges of the maximum layer thickness		1	3	
Chemical parameters				
Name	Unit	Min_value	Max_value	Description or default value from literature
Decay rate for colour/tracer		0	0	
Setting rate for colour/tracer		0	0	
Maximum limit of polychaete biomass	g/m ²	40	60	50
Respiration stoichiometric ratio of C to O ₂	mg C/mg O	2.66667	2.66667	stoichiometric
Fraction of net DO allocated to seagrass roots		0.09	0.11	0.1
Stoichiometric factor, seagrass C : DO	mg seagC/mg O	2.66667	2.66667	Stoichiometric
Stoichiometric factor, jellyfish C : DO	mg jelC/mg O	2.66667	2.66667	stoichiometric
Minimum DO in the bottom layer	mg/L	0	0	
Photo-respiration phytoplankton DO loss		0	0.5	
KDOB: Half sat. const. for DO dependence of POM/DOM decomposition – water column	mg/L	2.0	3.0	2.5
KDOB: Half sat. const. for DO dependence of POM/DOM decomposition – sediment	mg/L	2.0	3.0	2.5
fanB: aerobic/anaerobic factor–water column		0.2	0.4	0.3
fanB: aerobic/anaerobic factor–sediment		0.2	0.4	0.3
vT - temperature multiplier for bacteria		1.08	1.08	1.08
Tsta - standard temperature	Deg C	16	20	18
Topt - optimum temperature	Deg C	20	24	22
Tmax - maximum temperature	Deg C	28	32	30
KrB - respiration of Bacteria – water column	/day	0.005	0.015	0.01
KrBs - respiration of Bacteria – sediment	/day	0.005	0.015	0.01
kexB - Bacterial Excretion of DOC–water column	/day	0.1	0.3	0.2
kexB - Bacterial Excretion of DOC–sediment	/day	0.0	0.0	0.0
Half sat const for bacteria function f(BAC) - water column	/day	0.4	0.6	0.5
Half sat const for bacteria function f(BAC) - sediment	/day	0.0	0.0	0.0
Bacterial "grazing" preferences (decimal %) – pbPOM (labile)		0.75	0.75	0.75
Bacterial "grazing" preferences (decimal %) – pbPOM (refractory)		0.05	0.05	0.05
Bacterial "grazing" preferences (decimal %) – pbDOM (labile)		0.15	0.15	0.15
Bacterial "grazing" preferences (decimal %) – pbDOM (refractory)		0.05	0.05	0.05

Max transfer of POCL->DOCL	/day	0.001	0.01	0.005
Max transfer of POCL->DOCR	/day	0.001	0.01	0.005
Max transfer of POPL->DOPL	/day	0.001	0.01	0.005
Max transfer of POPR->DOPR	/day	0.001	0.01	0.005
Max transfer of PONL->DONL	/day	0.0008	0.004	0.002
Max transfer of PONR->DONR	/day	0.001	0.01	0.005
Diameter of POM particles – POM1	m	0.100E-04	1.00E-04	0.50E-04
Diameter of POM particles – POM2	m	0.100E-04	1.00E-04	0.50E-04
Density of POM particles – POM1	kg/m ³	0.1 E+04	0.12 E+04	0.11E+04
Density of POM particles – POM2	kg/m ³	0.1 E+04	0.12 E+04	0.11E+04
Critical shear stress for resuspension – POM1	N/m ²	0.01	0.05	
Critical shear stress for resuspension – POM2	N/m ²	0.5	10.0	
Specific attenuation coefficient of POC1	mg/L/m	0.001	0.01	
Specific attenuation coefficient of POC2	mg/L/m	0	0	
Max mineralisation of DOCL->DIC	/day	0.002	0.008	0.005
Max mineralisation of DOCL->DIC	/day	0.002	0.008	0.005
Max mineralisation of DOPL->PO4	/day	0.003	0.009	0.006
Max mineralisation of DOPR->PO4	/day	0.002	0.008	0.005
Max mineralisation of DONL->NH4	/day	0.001	0.005	0.002
Max mineralisation of DONR->NH4	/day	0.002	0.008	0.005
Specific attenuation coefficient of DOC1	mg/L/m	0.006	0.015	0.010
Specific attenuation coefficient of DOC2	mg/L/m	0.006	0.015	0.010
flocculation rate constant		0.5	0.5	0.5
Rate of DOCr Photolytic Decay		0.3	0.3	0.3
Temp multiplier for denitrification		1.07	1.08	1.08
Denitrification rate coefficient	/day	0.01	0.6	0.02
Half sat const for denitrification	mg/L	0.1	5.5	5.0
Temp multiplier for nitrification		1.07	1.08	1.08
Nitrification rate coefficient	/day	0.01	0.4	0.08
Half sat constant for nitrification	mg O/L	0.1	1.5	1.0
Ratio of O2 to N for nitrification	mg N/mg O	3.4258	3.4258	3.4258
Constant for IRON, MANGANESE, SULFUR, ALUMINIUM, ZINC, AND ORGANIC COMPONENTS				
Biological parameters				
1- DINFOF 2- CYANO 3- NODUL 4- CHLOR 5- CRYPT 6- MDIAT 7- FDIAT				
Name	Unit	Min_value	Max_value	Description or default value from literature
Maximum potential growth rate - 1	/day	0.4	0.7	0.5
Maximum potential growth rate - 2	/day	0.4	1.5	1.1
Maximum potential growth rate - 3	/day	1.0	1.0	1.0
Maximum potential growth rate - 4	/day	1.0	1.5	1.3
Maximum potential growth rate - 5	/day	1.0	1.5	1.2
Maximum potential growth rate - 6	/day	1.0	1.5	1.3
Maximum potential growth rate - 7	/day	1.0	1.5	1.14
Parameter for initial slope of P_I curve - 1	microE/m ² /s	100	160	140
Parameter for initial slope of P_I curve - 2	microE/m ² /s	150	300	150
Parameter for initial slope of P_I curve - 3	microE/m ² /s	60	100	80
Parameter for initial slope of P_I curve - 4	microE/m ² /s	80	120	100
Parameter for initial slope of P_I curve - 5	microE/m ² /s	30	50	40
Parameter for initial slope of P_I curve - 6	microE/m ² /s	110	130	120
Parameter for initial slope of P_I curve - 7	microE/m ² /s	15	25	20
Light saturation for maximum production - 1	uE/m ² /s	200	400	390
Light saturation for maximum production - 2	uE/m ² /s	100	300	200
Light saturation for maximum production - 3	uE/m ² /s	100	300	200
Light saturation for maximum production - 4	uE/m ² /s	100	100	100
Light saturation for maximum production - 5	uE/m ² /s	100	300	200

Light saturation for maximum production - 6	uE/m ² /s	60	100	80
Light saturation for maximum production - 7	uE/m ² /s	5	80	10
Specific attenuation coefficient - 1	ug chla/L/m	0.01	0.03	0.02
Specific attenuation coefficient - 2	ug chla/L/m	0.03	0.05	0.04
Specific attenuation coefficient - 3	ug chla/L/m	0.01	0.03	0.02
Specific attenuation coefficient - 4	ug chla/L/m	0.01	0.03	0.02
Specific attenuation coefficient - 5	ug chla/L/m	0.01	0.03	0.02
Specific attenuation coefficient - 6	ug chla/L/m	0.01	0.03	0.02
Specific attenuation coefficient - 7	ug chla/L/m	0.01	0.03	0.02
Half saturation constant for phosphorus - 1	mg/L	0.003	0.004	0.00393
Half saturation constant for phosphorus - 2	mg/L	0.003	0.007	0.006
Half saturation constant for phosphorus - 3	mg/L	0.06	0.06	0.06
Half saturation constant for phosphorus - 4	mg/L	0.0065	0.01	0.0085
Half saturation constant for phosphorus - 5	mg/L	0.0011	0.0051	0.0031
Half saturation constant for phosphorus - 6	mg/L	0.002	0.006	0.004
Half saturation constant for phosphorus - 7	mg/L	0.008	0.012	0.01
Half saturation constant for nitrogen - 1	mg/L	0.01	0.04	0.019
Half saturation constant for nitrogen - 2	mg/L	0.015	0.035	0.03
Half saturation constant for nitrogen - 3	mg/L	0.04	0.05	0.045
Half saturation constant for nitrogen - 4	mg/L	0.008	0.015	0.011
Half saturation constant for nitrogen - 5	mg/L	0.035	0.055	0.045
Half saturation constant for nitrogen - 6	mg/L	0.005	0.007	0.006
Half saturation constant for nitrogen - 7	mg/L	0.03	0.1	0.045
Minimum internal N concentration - 1	mg N/mg Chla	1.5	4.5	2.0
Minimum internal N concentration - 2	mg N/mg Chla	1.5	5.5	2.5
Minimum internal N concentration - 3	mg N/mg Chla	1.5	3.5	2.5
Minimum internal N concentration - 4	mg N/mg Chla	2.0	4.0	3.0
Minimum internal N concentration - 5	mg N/mg Chla	1.5	3.5	2.5
Minimum internal N concentration - 6	mg N/mg Chla	1.5	3.5	2.5
Minimum internal N concentration - 7	mg N/mg Chla	1.0	5.0	2.0
Maximum internal N concentration - 1	mg N/mg Chla	4	9	6
Maximum internal N concentration - 2	mg N/mg Chla	3	8	4
Maximum internal N concentration - 3	mg N/mg Chla	8	10	9
Maximum internal N concentration - 4	mg N/mg Chla	8	10	9
Maximum internal N concentration - 5	mg N/mg Chla	8	10	9
Maximum internal N concentration - 6	mg N/mg Chla	8	10	9
Maximum internal N concentration - 7	mg N/mg Chla	3	9.5	4.5
Maximum rate of nitrogen uptake - 1	mg N/mg Chla/day	1.2	2.0	1.5
Maximum rate of nitrogen uptake - 2	mg N/mg Chla/day	1.0	3.5	1.5
Maximum rate of nitrogen uptake - 3	mg N/mg Chla/day	1.0	2.0	1.5
Maximum rate of nitrogen uptake - 4	mg N/mg Chla/day	1.0	3.0	2.0
Maximum rate of nitrogen uptake - 5	mg N/mg Chla/day	1.0	2.0	1.5
Maximum rate of nitrogen uptake - 6	mg N/mg Chla/day	1.0	2.0	1.5
Maximum rate of nitrogen uptake - 7	mg N/mg Chla/day	1.8	4.0	3.0
Minimum internal P concentration - 1	mg P/mg Chla	0.2	0.8	0.5
Minimum internal P concentration - 2	mg P/mg Chla	0.2	0.8	0.5
Minimum internal P concentration - 3	mg P/mg Chla	0.2	0.4	0.3
Minimum internal P concentration - 4	mg P/mg Chla	0.2	0.4	0.3
Minimum internal P concentration - 5	mg P/mg Chla	0.2	0.4	0.3
Minimum internal P concentration - 6	mg P/mg Chla	0.2	0.4	0.3
Minimum internal P concentration - 7	mg P/mg Chla	0.1	0.5	0.25
Maximum internal P concentration - 1	mg P/mg Chla	1	3	2
Maximum internal P concentration - 2	mg P/mg Chla	1	2	1.4
Maximum internal P concentration - 3	mg P/mg Chla	1	3	2
Maximum internal P concentration - 4	mg P/mg Chla	1	3	2

Maximum internal P concentration – 5	mg P/mg Chla	1	3	2
Maximum internal P concentration – 6	mg P/mg Chla	1	3	2.2
Maximum internal P concentration – 7	mg P/mg Chla	1	1.6	1.3
Maximum rate of phosphorus uptake – 1	mg P/mg Chla/day	0.5	0.9	0.6
Maximum rate of phosphorus uptake – 2	mg P/mg Chla/day	0.1	1.0	0.2
Maximum rate of phosphorus uptake – 3	mg P/mg Chla/day	0.1	1.0	0.2
Maximum rate of phosphorus uptake – 4	mg P/mg Chla/day	0.1	1.0	0.2
Maximum rate of phosphorus uptake – 5	mg P/mg Chla/day	0.1	1.0	0.2
Maximum rate of phosphorus uptake – 6	mg P/mg Chla/day	0.1	1.0	0.2
Maximum rate of phosphorus uptake – 7	mg P/mg Chla/day	0.5	1.5	1.0
Constant internal P ratio if no internal P is modeled – 1	mg P/mg Chla	0.3	0.7	0.5
Constant internal P ratio if no internal P is modeled – 2	mg P/mg Chla	0.4	0.8	0.6
Constant internal P ratio if no internal P is modeled – 3	mg P/mg Chla	0.4	0.8	0.6
Constant internal P ratio if no internal P is modeled – 4	mg P/mg Chla	0.4	0.8	0.6
Constant internal P ratio if no internal P is modeled – 5	mg P/mg Chla	0.4	0.8	0.6
Constant internal P ratio if no internal P is modeled – 7	mg P/mg Chla	0.4	0.8	0.6
Constant internal N ratio if no internal N is modeled – 1	mg N/mg Chla	7	11	9
Constant internal N ratio if no internal N is modeled – 2	mg N/mg Chla	7	11	9
Constant internal N ratio if no internal N is modeled – 3	mg N/mg Chla	7	11	9
Constant internal N ratio if no internal N is modeled – 4	mg N/mg Chla	5	9	7
Constant internal N ratio if no internal N is modeled – 5	mg N/mg Chla	7	11	9
Constant internal N ratio if no internal N is modeled – 6	mg N/mg Chla	7	11	9
Constant internal N ratio if no internal N is modeled – 7	mg N/mg Chla	7	11	9
Maximum nitrogen fixation rate – 1	mg N/mg Chla /day	1	3	2
Maximum nitrogen fixation rate – 2	mg N/mg Chla /day	1	3	2
Maximum nitrogen fixation rate – 3	mg N/mg Chla /day	1	3	2
Maximum nitrogen fixation rate – 4	mg N/mg Chla /day	1	3	2
Maximum nitrogen fixation rate – 5	mg N/mg Chla /day	1	3	2
Maximum nitrogen fixation rate – 6	mg N/mg Chla /day	1	3	2
Maximum nitrogen fixation rate – 7	mg N/mg Chla /day	1	3	2
Growth rate reduction under maximal N fixation – 1		0.5	1.5	1
Growth rate reduction under maximal N fixation – 2		0.5	1.5	1
Growth rate reduction under maximal N fixation – 3		0.5	1.5	1
Growth rate reduction under maximal N fixation – 4		0.5	1.5	1
Growth rate reduction under maximal N fixation – 5		0.5	1.5	1
Growth rate reduction under maximal N fixation – 6		0.5	1.5	1
Growth rate reduction under maximal N fixation – 7		0.5	1.5	1

fixation - 7				
Optimum temperature - 1	Deg C	20	24	22
Optimum temperature - 2	Deg C	26	30	28
Optimum temperature - 3	Deg C	25	29	27
Optimum temperature - 4	Deg C	27	31	29
Optimum temperature - 5	Deg C	28	32	30
Optimum temperature - 6	Deg C	18	22	20
Optimum temperature - 7	Deg C	25	29	27
Maximum temperature - 1	Deg C	26	30	28
Maximum temperature - 2	Deg C	33	37	35
Maximum temperature - 3	Deg C	31	35	33
Maximum temperature - 4	Deg C	35	39	37
Maximum temperature - 5	Deg C	38	42	40
Maximum temperature - 6	Deg C	30	34	32
Maximum temperature - 7	Deg C	33	37	35
Respiration rate coefficient - 1	/day	0.05	0.09	0.07
Respiration rate coefficient - 2	/day	0.05	0.09	0.07
Respiration rate coefficient - 3	/day	0.08	0.16	0.12
Respiration rate coefficient - 4	/day	0.03	0.07	0.05
Respiration rate coefficient - 5	/day	0.1	0.3	0.2
Respiration rate coefficient - 6	/day	0.1	0.2	0.15
Respiration rate coefficient - 7	/day	0.08	0.16	0.12
Sediment parameters				
Name	Unit	Min_value	Max_value	Description or default value from literature
Density of SSOL1	kg/m ³	0.265E+04	0.265E+04	0.265E+04
Density of SSOL2	kg/m ³	0.265E+04	0.265E+04	0.265E+04
Density of SSOL3	kg/m ³	0.265E+04	0.265E+04	0.265E+04
Density of SSOL4	kg/m ³	0.265E+04	0.265E+04	0.265E+04
Density of SSOL5	kg/m ³	0.265E+04	0.265E+04	0.265E+04
Density of SSOL6	kg/m ³	0.265E+04	0.265E+04	0.265E+04
Diameter of SSOL1	m	3.00E-04	3.00E-04	3.00E-04
Diameter of SSOL2	m	3.00E-03	3.00E-03	3.00E-03
Diameter of SSOL3	m	3.00E-02	3.00E-02	3.00E-02
Diameter of SSOL4	m	3.00E-01	3.00E-01	3.00E-01
Diameter of SSOL5	m	3.00E+00	3.00E+00	3.00E+00
Diameter of SSOL6	m	3.00E+01	3.00E+01	3.00E+01
Specific attenuation coefficient of SSOL1	mg/L/m	0.05	0.05	0.05
Specific attenuation coefficient of SSOL2	mg/L/m	0.05	0.05	0.05
Specific attenuation coefficient of SSOL3	mg/L/m	0.05	0.05	0.05
Specific attenuation coefficient of SSOL4	mg/L/m	0.05	0.05	0.05
Specific attenuation coefficient of SSOL5	mg/L/m	0.05	0.05	0.05
Specific attenuation coefficient of SSOL6	mg/L/m	0.05	0.05	0.05
Critical shear stress of SSOL1	N/m ²	0.035	0.035	0.035
Critical shear stress of SSOL2	N/m ²	0.05	0.05	0.05
Critical shear stress of SSOL3	N/m ²	0.091	0.091	0.091
Critical shear stress of SSOL4	N/m ²	0.1	0.1	0.1
Critical shear stress of SSOL5	N/m ²	0.15	0.15	0.15
Critical shear stress of SSOL6	N/m ²	0.2	0.2	0.2
Temp multiplier of sediment fluxes		1.05	1.09	1.08
Sediment oxygen demand	g/m ² /day	1	8	2.5
Sat. const. for DO sediment flux	mg O/L	1	8	2.5
PO4 release rate	g/m ² /day	0.01	0.5	0.08
Controls sed. release of PO4 via O and NO3	g/m ³	0.1	2.5	1.5
NH4 release rate	g/m ² /day	0.02	1.5	0.28

Controls sed. release of NH4 via O and NO3	g/m ³	0.1	2.0	1.5
NO3 release rate	g/m ² /day	-0.8	0.2	-0.6
Controls sed. release of NO3 via O	g/m ³	0.8	1.2	1.0
Si release rate	g/m ² /day	0.01	0.02	0.015
Controls sed. release of Si via O	g/m ³	0.1	1.5	0.5
DOCL release rate	g/m ² /day	0.003	0.007	0.005
DOCR release rate	g/m ² /day	0.003	0.007	0.005
Controls sed. release of DOC via O	g/m ³	1.2	1.8	1.5
DOPL release rate	g/m ² /day	0	0	0
DOPR release rate	g/m ² /day	0	0	0
Controls sed. release of DOP via O	g/m ³	1.5	1.5	1.5
DONL release rate	g/m ² /day	0.07	0.11	0.09
DONR release rate	g/m ² /day	0	0	0
Controls sed. release of DON via O	g/m ³	1.4	1.6	1.5
Metal fluxes are constant from CWR sample sediment file				