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Impact of small-scale disturbances on geochemical conditions, biogeochemical processes and element fluxes in surface sediments of the eastern Clarion–Clipperton Zone, Pacific Ocean

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Figure S1: Measured porosity (dots) and numerical approximation (solid line) for the BGR-RA (left) and IOM (right) sites. See Table S2 for fitting details.

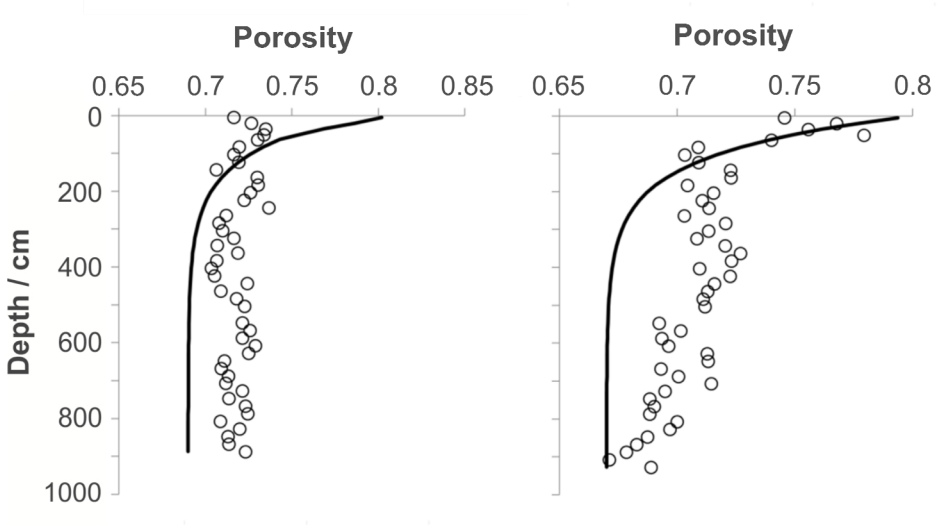

Table S1: Electron-equivalent redox reactions used in the transient transport-reaction model for the 1-day-old EBS disturbance in the BGR-RA area and for the 20-year-old IOM-BIE disturbance in the IOM area.

Reaction name	**Reaction**	**Redox reaction**
Aerobic respiration	R_1	$(CH_2O)(NH_4^+)_{\frac{16}{106}} + O_2 \rightarrow CO_2 + \frac{16}{106}NH_4^+ + H_2O$
Heterotrophic denitrification	R_2	$5(CH_2O)(NH_4^+)_{\frac{16}{106}} + 4NO_3^- + 4H^+ \rightarrow 2N_2 + 5CO_2 + 5\frac{16}{106}NH_4^+ + 7H_2O$
Dissimilatory Mn(IV) reduction	R_3	$(CH_2O)(NH_4^+)_{\frac{16}{106}} + 2MnO_2 + 4H^+ \rightarrow 2Mn^{2+} + CO_2 + \frac{16}{106}NH_4^+ + 3H_2O$
Mn2+ oxidation	R_4	$2Mn^{2+} + O_2 + 2H_2O \rightarrow 2MnO_2 + 4H^+$
Nitrification	R_5	$NH_4^+ + 2O_2 \rightarrow NO_3^- + 2H^+ + H_2O$
Mn-anammox	R_6	$3MnO_2 + 2NH_4^+ + 4H^+ \rightarrow 3Mn^{2+} + N_2 + 6H_2O$

Table S2: Species, boundary conditions and fitted parameter values used in the transient transport-reaction models for the 1-day-old EBS disturbance in the BGR-RA area and the 20-year-old IOM-BIE disturbance in the IOM area.

	Symbol	Unit	BGR	IOM
Species and boundary conditions				
Porosity at SWI	φ_0		0.82	0.8
Porosity at compacted depth	φ_∞		0.69	0.67
Sedimentation rate	ω_i	cm kyr^{-1}	0.65	1.15
Oxygen$_{bw}$	O_2	µM	120	150
Ammonium$_{bw}$	NH_4^+	µM	1	1
Nitrate$_{bw}$	NO_3^-	µM	50	38
Dissolved reduced manganese$_{bw}$	Mn^{2+}	µM	1	1
Fitted parameters				
Sediment thickness		m	10	10
Removed sediment thickness		cm	10	7
Labile C_{org}	TOC_1	mol m^{-2} yr^{-1}	6.0E-02	4.5E-02
Metabolizable C_{org}	TOC_2	mol m^{-2} yr^{-1}	1.2E-04	1.1E-03
Refractory C_{org}	TOC_3	mol m^{-2} yr^{-1}	5.0E-04	7.8E-04
Oxygen$_{bas}$	O_2	µM	18	55
Ammonium$_{bas}$	NH_4^+	µM	1	1
Nitrate$_{bas}$	NO_3^-	µM	19	30
Dissolved reduced manganese$_{bas}$	Mn^{2+}	µM	1	1
1st order deg. coeff. TOC_1	σ_1	yr^{-1}	1.0E-03	1.0E-02
1st order deg. coeff. TOC_2	σ_2	yr^{-1}	1.0E-06	5.5E-06
1st order deg. coeff. TOC_3	σ_3	yr^{-1}	2.0E-09	2.5E-09
Bioturbation coefficient	B_0	cm^2 yr^{-1}	0.5	0.2
Biomixing half depth	z_{mix}	cm	7.0	7.0
Biomixing attenuation	zz_{att}	cm	0.1	0.1
Bioirrigation coefficient	α_0	yr^{-1}	0.65	2.0
O_2 inhibition concentration for R_1	h_1	µM	0.008	0.006
NO_3^- inhibition concentration for R_2	h_2	µM	45	25
R_4 rate constant	k_4	µM^{-1} yr^{-1}	0.1	0.1
R_5 rate constant	k_5	µM^{-1} yr^{-1}	0.005	0.1
R_6 rate constant	k_6	µM^{-1} yr^{-1}	0.001	0.001

Table S3: Electron-equivalent redox reactions and associated expressions used in the numerical diagenetic model.

Reaction name	Reaction	Rate expression
Aerobic respiration	R_1	$\left(\sigma_1 C_{TOC1} + \sigma_2 C_{TOC2} + \sigma_3 C_{TOC3}\right) \frac{C_{O_2}}{C_{O_2} + h_1}$
Heterotrophic denitrification	R_2	$\left(\sigma_1 C_{TOC1} + \sigma_2 C_{TOC2} + \sigma_3 C_{TOC3}\right) \gamma \frac{C_{NO_3^-}}{C_{NO_3^-} + h_2}$
Dissimilatory Mn(IV) reduction	R_3	$\left(\sigma_1 C_{TOC1} + \sigma_2 C_{TOC2} + \sigma_3 C_{TOC3}\right) \gamma \frac{h_2}{C_{NO_3^-} + h_2}$
Mn^{2+} oxidation	R_4	$k_4 C_{O_2} C_{Mn^{2+}}$
Nitrification	R_5	$k_5 C_{O_2} C_{NH_4^+}$
Mn-annamox	R_6	$k_6 C_{NH_4^+} C_{MnO_2} \gamma \frac{h_2}{C_{NO_3^-} + h_2}$

$$\gamma = \frac{h_1}{\left(h_1 + C_{O_2}\right)}$$