

1 **Supplementary material**

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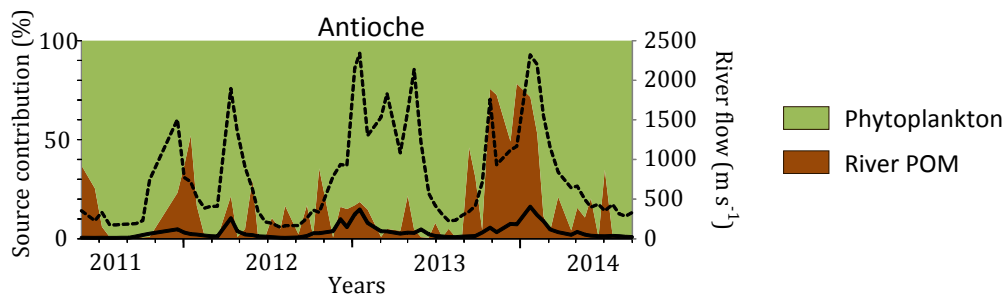
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Figure S1: Time series of the contribution of organic matter sources to the coastal POM pool in the station Antioche with Gironde (dashed black line) and Charente (solid black line) flows.

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	Station	Model ($\delta^{15}\text{N} =$ (‰))	uncertainty
Eng. Channel	Côte	$6.997 - 0.178 (1+\ln(f))$	1.5
	Large	$6.682 - 0.307 (1+\ln(f))$	1.2
	Luc/mer	$6.895 - 0.523 (1+\ln(f))$	1.5
	Bizeux	$5.582 - 0.339 (1+\ln(f))$	0.8
	Estacade	7.0	1.0
	Astan	6.9	1.4
Atl. Ocean	Portzic	$5.833 - 0.242 (1+\ln(f))$	0.9
	Antioche	$4.838 - 0.328 (1+\ln(f))$	1.8
	Comprian	$5.396 - 1.404 (f)$	1.2
	Eyrac	$5.038 - 0.227 (1+\ln(f))$	1.2
Med.	Bouée13	$5.169 - 0.314 (1+\ln(f))$	0.9
	Sola	4.0	1.2
	Frioul	3.3	1.1
	PointB	3.2	1.3

$$f = [\text{NO}_3^-]_t / [\text{NO}_3^-]_{\max}$$

$[\text{NO}_3^-]_t$: nitrate concentration at a given time (t)

$[\text{NO}_3^-]_{\max}$: the most recent maximum of nitrate concentration (usually observed during previous winter)

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12 Table S1: Model equations used for estimating phytoplankton $\delta^{15}\text{N}$. Uncertainty is standard deviation of
13 model residuals. Eng. Channel: English Channel, Atl. Ocean : Atlantic Ocean, Med. : Mediterranean Sea.

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River	Model (C:N =) (mol mol ⁻¹)	uncertainty	Model ($\delta^{13}\text{C}$ =) (‰)	uncertainty	Model ($\delta^{15}\text{N}$ =) (‰)	uncertainty
Canche	10.3	0.7	-29.2	0.4	4.2	0.5
Somme	9.6	0.8	-30.6	1.0	5.2	0.5
Seine	10.977 - 816.616/Q	0.6	-26.759 - 1341.776/Q	0.4	4.251 - 983.417/Q	1.1
Orne	10.416 - 9.924/Q	0.7	-29,3	1.0	5.083 + 0.081/Q	0.7
Elorn	12.175 - 3.579/Q	1.1	-28.163 + 1.249/Q	0.9	6.6	0.9
Aulne	10.380 - 6.239/Q	1.0	-28.5	1.1	5.120 + 9.475/Q	1.6
Charente	12.467 - 90.214/Q	1.9	-28.611 - 27.697/Q	0.6	6.9	1.6
Gironde	8.5	0.8	-25.2	0.3	5.5	0.4
Leyre	15.0	1.7	-28.234 - 4.065/Q	0.4	2.464 + 14.069/Q	0.9
Baillaury	11.2	0.1	-25.5	0.6	2.9	0.6
Têt	6.3	1.9	-26.360 - 0.554/Q	0.9	7.6	1.9
Aude	8.580 - 11.997/Q	2.3	-27.221 - 11.951/Q	1.1	4.828 + 13.928/Q	1.3
Hérault	7.5	2.5	-27.931 - 5.739/Q	1.2	5.641 + 5.254/Q	1.5
Rhône	8.6	1.8	-27.4	0.7	5.1	1.1

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21 Table S2: Model equations or mean value used for estimating river-POM C:N ratio, $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$. Q is
 22 the river flow. Uncertainty is the standard deviation of model residuals or standard deviation of raw data.

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25 Table S3: Signatures (C/N ratio, $\delta^{13}\text{C}$, $\delta^{15}\text{N}$) of the organic matter sources. sd: standard deviation.
 26 Signatures used for running the mixing models are modelled data or mean values when model was not
 27 significant. * calculated following Savoye et al. (2012). For the Gironde estuary, phytoplankton signature
 28 ranges from freshwater to marine phytoplankton.

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Type of source / Station / River	C:N (mol mol ⁻¹)		δ ¹³ C (‰)		δ ¹⁵ N (‰)	
	raw data (mean±sd)	modelled data (mean±sd)	raw data (mean±sd)	modelled data (mean±sd)	raw data (mean±sd)	modelled data (mean±sd)
Phytoplankton						
Côte	7.3±0.9	-	-21.6±1.5	-21.6±1.0	7.3±1.7	7.1±0.8
Large	7.2±0.8	-	-21.7±1.9	-21.7±1.3	7.2±1.8	7.2±0.5
Luc/mer	6.7±0.6	-	-21.4±1.5	-21.7±1.2	7.4±2.1	7.0±0.8
Bizeux	6.2±0.5	-	-22.7±1.5	-23.0±0.9	6.3±1.1	6.0±0.9
Estacade	6.5±0.8	-	-22.3±0.9	-	7.3±1.8	-
Astan	6.2±0.8	-	-23.1±1.1	-	7.0±1.3	-
Portzic	6.3±0.5	-	-21.3±1.2	-21.0±1.1	6.1±1.2	6.0±0.5
Antioche	6.1±0.7	-	-21.7±1.3	-22.1±1.1	5.2±1.7	4.9±0.4
Bouée13	7.1±0.6	-	-21.8±1.4	-22.0±0.6	5.4±1.1	5.6±0.5
Eyrac	7.1±0.7	-	-21.3±1.9	-21.8±1.1	5.1±1.3	5.2±0.4
Comprian	6.9±0.9	-	-21.6±1.2	-22.0±1.0	4.9±1.2	4.8±0.6
Sola	6.9±1.5	-	-22.5±1.1	-	4.3±1.3	-
Frioul	6.1±0.9	-	-22.5±1.3	-22.8±0.5	2.7±1.5	-
PointB	7.4±1.7	-	-23.6±1.7	-	2.9±1.0	-
Gironde estuary	-	7.5±1.6	-	-33.4 to -20.5	-	-
Diazotrophs						
Sola, Frioul, PointB	5.7±0.5	-	-22.2±0.8	-	-1.2±0.9	-
Riverine POM						
Canche	10.3±0.7	-	-29.2±0.4	-	4.2±0.5	-
Somme	9.7±0.8	-	-30.6±1.0	-	5.3±0.5	-
Côte (weighted values)	9.9±0.7	-	-29.9±0.5	-	4.7±0.4	-
Large (weighted values)	9.9±0.7	-	-30.0±0.6	-	4.8±0.4	-
Seine	8.8±1.3	8.8±0.6	-30.4±2.0	-30.4±0.4	6.4±2.9	6.9±1.1
Orne	9.5±1.0	9.5±0.7	-29.3±1.0	-	4.2±2.2	5.1±0.7
Luc/mer (weighted values)	8.8±0.6	-	-30.5±0.7	-	6.9±1.6	-
Rance	6.8±1.0	-	-28.0±2.1	-	8.0±2.5	-
Elorn	10.9±1.4	11.0±1.1	-27.7±0.9	-27.7±0.9	6.6±1.1	-
Aulne	9.5±1.3	9.6±1.0	-28.0±1.5	-	6.7±1.5	6.4±1.5
Portzic (weighted values)	10.0±0.7	-	-28.2±0.8	-	6.4±1.1	-
Charente	10.5±2.2	10.5±1.9	-29.2±0.7	-29.2±0.6	6.9±1.6	-
Gironde (refractory)	8.7±0.7	-	-25.2±0.2	-	5.5±0.4	-
Gironde (labile)*	-	7.9±2.0	-	-28.9±1.0	-	-
Antioche (weighted values)	8.9±0.8	-	-26.0±0.3	-	5.8±0.5	-
Leyre	15.0±1.7	-	-28.6±0.5	-28.6±0.4	3.7±1.2	3.8±0.9
Baillaury	11.2±0.1	-	-25.5±0.6	-	2.9±0.6	-
Têt	6.3±1.9	-	-26.9±1.1	-26.9±0.9	7.6±1.9	-
Aude	7.8±2.8	7.4±2.3	-28.4±1.5	-28.4±1.1	6.1±1.8	6.2±1.3
Hérault	7.5±2.5	-	-28.6±1.4	-28.6±1.2	6.2±1.6	6.2±1.5
Rhône	8.6±1.8	-	-27.4±0.7	-	5.1±1.1	-
Sola (weighted values)	8.5±1.7	-	-27.4±0.6	-	5.2±0.1	-
Anthropogenic POM						
Biganos	6.5±0.7	-	-26.1±0.5	-	1.8±1.0	-
SKCP	6.7±1.5	-	-24.0±0.4	-	-0.9±0.9	-
La Teste	6.3±1.0	-	-26.0±1.1	-	0.7±1.1	-
Cazaux	5.9±0.3	-	-25.9±0.4	-	4.4±1.9	-
Bouée13 (weighted values)	6.3±0.3	-	-24.3±0.4	-	-0.7±0.7	-
Cortiou	5.7±0.3	-	-24.3±1.2	-	1.2±0.9	-
Microphytobenthos						
Bizeux	9.1±0.9	-	-20.4±0.7	-	7.1±0.7	-
Eyrac/Comprian	9.8±0.7	-	-19.5±0.6	-	4.0±0.6	-
Macrophytes						
Luc/mer (Brown algae)	17.5±1.9	-	-17.8±1.8	-	7.7±1.1	-
Luc/mer (Red algae)	14.8±1.8	-	-22.6±1.3	-	6.8±1.0	-
Luc/mer (Green algae)	11.9±1.3	-	-17.3±1.2	-	8.3±1.5	-
Bizeux (Brown algae)	22.8±7.8	-	-16.2±1.8	-	7.7±1.2	-
Bizeux (Red algae Group 1)	13.7±3.1	-	-21.3±2.0	-	8.2±0.9	-
Bizeux (Red algae Group 2)	12.0±3.2	-	-32.9±0.8	-	7.4±1.1	-
Astan/Estacade (Brown algae Group 1)	24.7±7.5	-	-16.6±1.5	-	6.6±0.9	-
Astan/Estacade (Brown algae Group 2)	15.9±3.8	-	-18.1±1.6	-	5.6±1.1	-
Portzic (Mixed Group)	15.3±4.0	-	-17.8±2.3	-	9.6±1.3	-
Portzic (Red algae)	7.2±2.3	-	-32.1±1.0	-	7.6±1.0	-
Eyrac/Comprian (Macroalgae)	11.6±4.1	-	-17.1±1.6	-	9.8±1.6	-
Eyrac/Comprian (seagrasses)	22.0±3.7	-	-12.3±1.7	-	6.6±1.2	-