

Corrigendum to

“Technical note: Consistent calculation of aquatic gross production from oxygen triple isotope measurements” published in *Biogeosciences*, 8, 1793–1811, 2011

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In Fig. 1, $^{17}\Delta_S^\#$ was calculated with $\lambda = \ln(1 + ^{17}\varepsilon_R) / \ln(1 + ^{18}\varepsilon_R) = 0.5154$ instead of $\lambda = \gamma_R = 0.5179$, as intended. A correct version of Fig. 1 is shown below. The sentence “In particular, $^{17}\Delta_S^\#$ is only equal to $^{17}\Delta_P^\#$ for $f = 1$.” does not apply for this choice of λ value.

On p. 1801, the steady-state $^{18}\delta_S$ value of oxygen produced by *Acropora* was stated as -9.66‰ , but should be -9.16‰ . The stated $^{17}\Delta_S$ and $^{17}\Delta_P$ values of 224 ppm and 175 ppm, respectively, are correct.

The kinetic isotope fractionation during gas exchange was assumed to be $^{18}\varepsilon_I = -2.8\text{‰}$ for O_2 invasion. However, this value actually applies to kinetic isotope fractionation during O_2 evasion ($^{18}\varepsilon_E$) as per Eq. (8) in Knox et al. (1992). The same error appears in Luz et al. (2002). Consequently, $^{18}\varepsilon_E = -2.8\text{‰}$ and $^{18}\varepsilon_I = (1 + ^{18}\varepsilon_E) (1 + ^{18}\delta_{\text{sat}}) - 1 = -2.1\text{‰}$ for the base case. $^{17}\varepsilon_E$ and $^{17}\varepsilon_I$ are calculated as before. Updated values are shown in italics in Tables 2 and 3 below. This correction changes the calculated g values by 1.4‰ or less and is therefore not noticeable in the updated versions of Figs. 2 and 3 below.

In Table 2 of Juranek and Quay (2010) the $^{17}\text{O}/^{16}\text{O}$ fractionation factor for respiration is listed as 0.9896, which is equivalent to $^{17}\varepsilon_R = -10.4\text{‰}$. I previously assumed that this was calculated as $^{17}\varepsilon_R = 0.518$ $^{18}\varepsilon_R = 0.518$ (-20‰) $= -10.370\text{‰}$. However, it was actually calculated as $^{17}\varepsilon_R = (1 + ^{18}\varepsilon_R)^{0.518} - 1 = -10.410\text{‰}$ (L. Juranek, personal communication, 2011). Both values are indistinguishable from -10.4‰ if rounded to 0.1‰. The $^{18}\text{O}/^{16}\text{O}$ fractionation factor listed as 0.979 in Table 2 of Juranek and Quay (2010) is incorrect because their calculations actually used a value of 0.980, which is identical to the value of

$^{18}\varepsilon_R = -20\text{‰}$ I attributed to the paper. The corrected $^{17}\varepsilon_R$ value and the resulting γ_R value of 0.5205 are shown in italics in Table 3 below. The resulting changes in g are reflected by the updated version of Fig. 3 below. The second half of the sentence “A better agreement with the base case is found for the iterative calculations “Hendricks et al. (2004)”, “Reuer et al. (2007)” and “Juranek and Quay (2010)”, with the latter calculation method giving the best agreement, mainly because the chosen γ_R and λ values of 0.518 are closest to the base case value 0.5179” on p. 1807 no longer applies.

None of these changes affect the conclusions of the paper.

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Table 2. Input parameters used as base case in the calculation of g (Sect. 6.1) and their uncertainties (Sect. 5). All δ values are relative to Air-O₂. The $^{17}\Delta$ values are defined as $^{17}\Delta = ^{17}\delta - 0.5179\ ^{18}\delta$ (cf. Eq. 8) and expressed relative to Air-O₂. However, they are not needed for the calculation according to Eq. (48) and are listed for reference only. All values have been adjusted to the same decimal for clarity, irrespective of their actual uncertainty.

Quantity	Symbol	Value	Unit	Uncertainty	Reference
triple isotope fractionation ratio, respiration ^a	γ_R	0.5179	1	0.0006	Luz and Barkan (2005)
¹⁸ O/ ¹⁶ O fractionation, respiration	$^{18}\epsilon_R$	-20.000	‰	4	Kiddon et al. (1993)
¹⁷ O/ ¹⁶ O fractionation, respiration	$^{17}\epsilon_R$	-10.358	‰		calculated from $^{18}\epsilon_R$ and γ_R
isotope delta ¹⁸ O/ ¹⁶ O, photosynthetic O ₂	$^{18}\delta_P$	-22.835	‰	0.50	see Sect. 5.2
isotope delta ¹⁷ O/ ¹⁶ O, photosynthetic O ₂	$^{17}\delta_P$	-11.646	‰		calculated from $^{18}\delta_P$ and $^{17}\Delta_P$
¹⁷ O excess, ¹⁷ O/ ¹⁶ O, photosynthetic O ₂	$^{17}\Delta_P$	180	ppm	15	Luz and Barkan (2000), recalculated
isotope delta ¹⁸ O/ ¹⁶ O, O ₂ at saturation	$^{18}\delta_{\text{sat}}$	0.707	‰	0.017	Benson and Krause (1984)
isotope delta ¹⁷ O/ ¹⁶ O, O ₂ at saturation	$^{17}\delta_{\text{sat}}$	0.382	‰		calculated from $^{18}\delta_{\text{sat}}$ and $^{17}\Delta_{\text{sat}}$
¹⁷ O excess, O ₂ at saturation	$^{17}\Delta_{\text{sat}}$	16	ppm	2	Luz and Barkan (2009)
triple isotope fractionation coefficient, O ₂ invasion ^b	θ	0.516	1	0.015	estimated
¹⁸ O/ ¹⁶ O fractionation, O ₂ invasion	$^{18}\epsilon_I$	-2.095	‰		calculated from $^{18}\epsilon_E$ and $^{18}\delta_{\text{sat}}$
¹⁷ O/ ¹⁶ O fractionation, O ₂ invasion	$^{17}\epsilon_I$	-1.082	‰		calculated from $^{18}\epsilon_I$ and θ
¹⁸ O/ ¹⁶ O fractionation, O ₂ evasion	$^{18}\epsilon_E$	-2.800	‰	0.2	Knox et al. (1992)
¹⁷ O/ ¹⁶ O fractionation, O ₂ evasion	$^{17}\epsilon_E$	-1.463	‰		calculated from $^{17}\epsilon_I$ and $^{17}\delta_{\text{sat}}$

^a $\gamma_R = ^{17}\epsilon_R / ^{18}\epsilon_R$

^b $\theta = \ln(1 + ^{17}\epsilon_I) / \ln(1 + ^{18}\epsilon_I)$

Table 3. Comparison between different calculation methods for g . A dash (–) or values in brackets mean that the corresponding parameters are not used in the calculation. The “used” ^{17}O excess values are used by the different calculation methods. The “implied” ^{17}O excess values are calculated using the definitions adopted by the different calculation methods, based on the listed $^{17}\delta_{\text{P}}$, $^{18}\delta_{\text{P}}$, $^{17}\delta_{\text{sat}}$ and $^{18}\delta_{\text{sat}}$ values. Where the calculation method does not require these δ values, the values for the “best case” in Table 2 have been used for the “implied” ^{17}O excess.

Parameter	Unit	1	2	3	4	5	6	7	8
		Luz and Barkan (2000)	Juranek and Quay (2005)	Sarma et al. (2005)	Hendricks et al. (2004)	Reuer et al. (2007)	Juranek and Quay (2010)	base case, this paper	approx., this paper
g calculation		Eq. (1)	Eq. (1)	Eq. (1)	iterative	iterative	iterative	Eq. (48)	Eq. (1)
Definition		$^{17}\Delta$ (Eq. 4)	$^{17}\Delta^{\#}$ (Eq. 7)	$^{17}\Delta^{\#}$ (Eq. 7)	$^{17}\Delta^{\#}$ (Eq. 7)	$^{17}\Delta^{\#}$ (Eq. 7)	$^{17}\Delta^{\#}$ (Eq. 7)	$^{17}\Delta$ (Eq. 4)	$^{17}\Delta$ (Eq. 4)
λ	1	–	0.516	0.518	0.516	0.516	0.518	–	–
κ	1	0.521	–	–	–	–	–	0.5179	0.5179
γ_{R}	1	–	–	–	0.5183	0.5185	0.5205	0.5179	–
$^{18}\varepsilon_{\text{R}}$	‰	–	–	–	–18.000	–20.000	–20.000	–20.000	–
$^{17}\varepsilon_{\text{R}}$	‰	–	–	–	–9.329	–10.370	–10.410	–10.358	–
$^{18}\delta_{\text{P}}$	‰	(–22.835)	(–22.835)	(–22.835)	–22.960	–22.960	–23.247	–22.835	(–22.835)
$^{17}\delta_{\text{P}}$	‰	(–11.646)	(–11.646)	(–11.646)	–11.668	–11.668	–11.864	–11.646	(–11.646)
$^{18}\varepsilon_{\text{I}}$	‰	–	–	–	0.707	0.707	0.707	–2.095	–
$^{17}\varepsilon_{\text{I}}$	‰	–	–	–	0.381	0.373	0.382	–1.082	–
θ	1	–	–	–	0.539	0.527	0.541	0.516	–
$^{18}\delta_{\text{sat}}$	‰	(0.707)	(0.707)	(0.707)	0.707	0.707	0.707	0.707	(0.707)
$^{17}\delta_{\text{sat}}$	‰	(0.382)	(0.382)	(0.382)	0.381	0.373	0.382	0.382	(0.382)
$^{17}\Delta_{\text{P, used}}$	ppm	249	–	–	–	–	–	180	180
$^{17}\Delta_{\text{sat, used}}$	ppm	16	–	–	–	–	–	16	16
$^{17}\Delta_{\text{P,}^{\#}\text{, used}}$	ppm	–	249	249	249	249	249	–	–
$^{17}\Delta_{\text{sat,}^{\#}\text{, used}}$	ppm	–	16	16	16	8	16	–	–
$^{17}\Delta_{\text{P, implied}}$	ppm	251	137	182	179	179	178	180	180
$^{17}\Delta_{\text{sat, implied}}$	ppm	14	17	16	16	8	16	16	16
$^{17}\Delta_{\text{P,}^{\#}\text{, implied}}$	ppm	321	205	251	249	249	249	249	249
$^{17}\Delta_{\text{sat,}^{\#}\text{, implied}}$	ppm	14	17	16	16	8	16	16	16

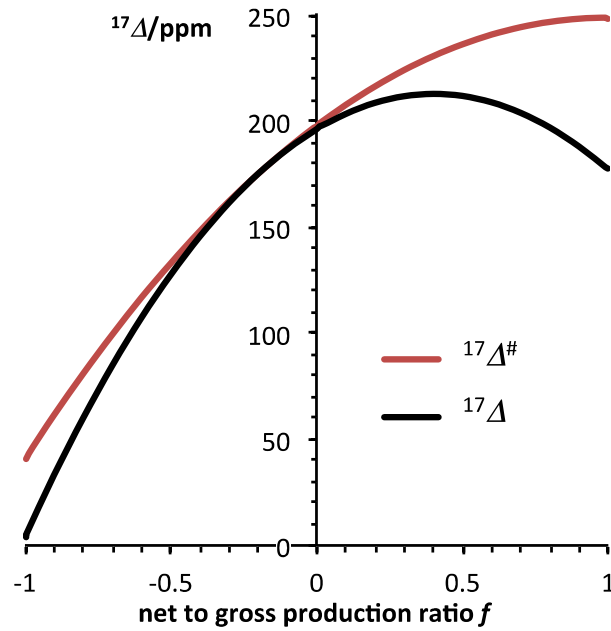


Fig. 1. Effect of the net to gross production ratio f on the steady-state ^{17}O excess defined by Eq. (7), i.e. $^{17}\Delta^\#$, and Eq. (4) i.e. $^{17}\Delta$, with $\lambda = \kappa = \gamma_R = ^{17}\varepsilon_R / ^{18}\varepsilon_R = 0.5179$, $^{18}\varepsilon_R = -20\text{‰}$, $^{18}\delta_P = -23.323\text{‰}$ and $^{17}\delta_P = -11.902\text{‰}$. The steady-state δ values used to calculate the steady-state ^{17}O excess have been calculated according to Eq. (31).

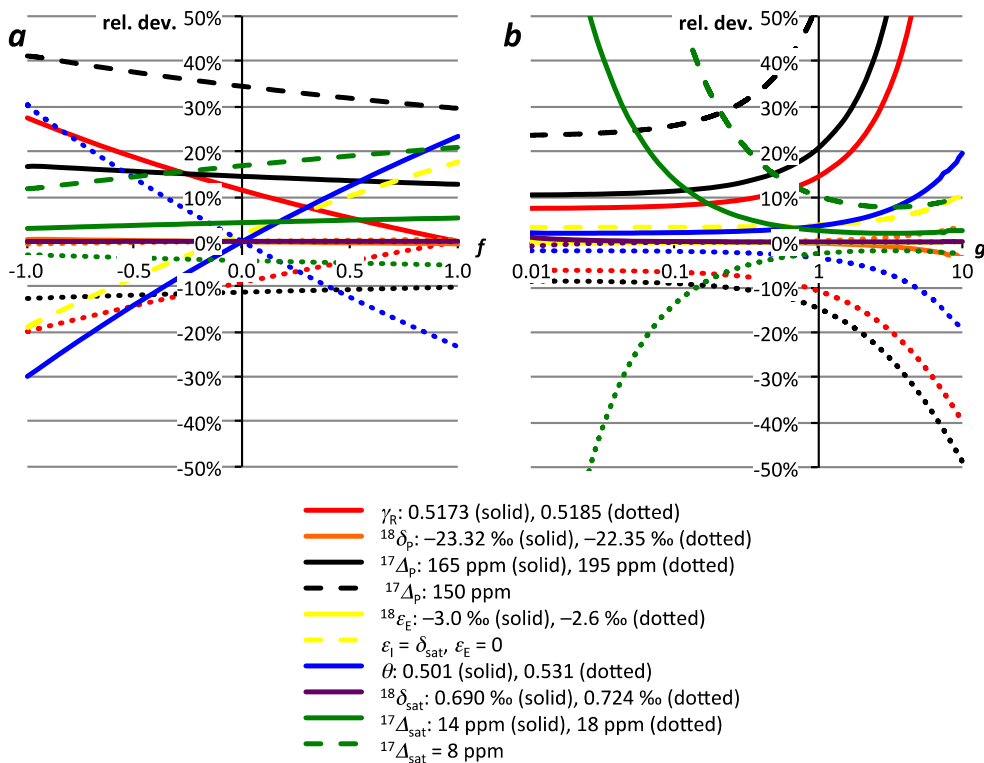


Fig. 2. Relative deviation of g from the base case (see Table 2) for different parameters in Eq. (7). Panel (a) corresponds to $g = 0.4$ and a range of f from -1.0 to $+1.0$ (negative values correspond to net heterotrophy, positive value to net autotrophy). Panel (b) corresponds to $f = 0.1$ and range of g from 0.01 to 10 (logarithmic axis).

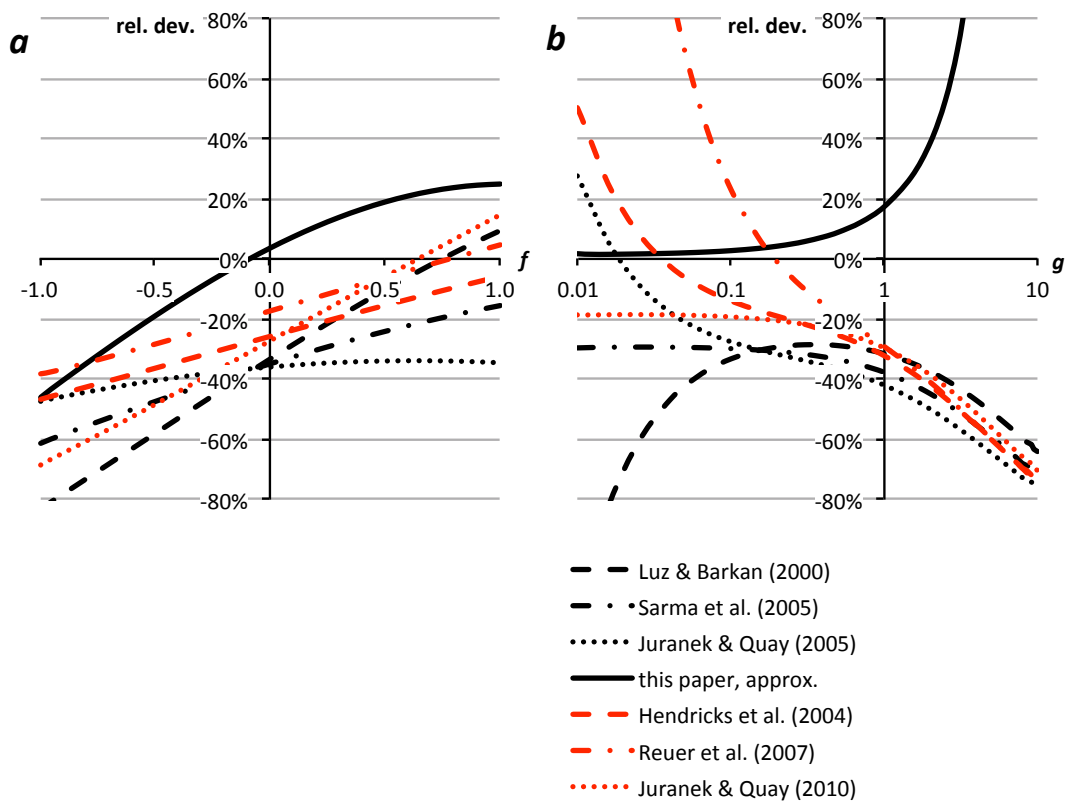


Fig. 3. Relative deviation of g for different calculation methods (Table 3). Panel (a) corresponds to $g = 0.4$ and a range of f from -1.0 to $+1.0$ (negative values correspond to net heterotrophy, positive value to net autotrophy). Panel (b) corresponds to $f = 0.1$ and range of g from 0.01 to 10 (logarithmic axis). Black curves correspond to calculation methods based on Eq. (1). Red curves correspond to iterative methods.