LETTER

Reply to Taboada and Anadón: Critique of sea-level rise study invalid

In their letter, Taboada and Anadón (1) use an integral form of the sea-level formula that we have proposed (2), obtained simply by integrating our equation over time (Eq. **1**):

$$H(t) = H_0 + a\sum_i (T(t_i) - T_0) + b(T(t) - T(t_0)) \qquad [1]$$

Because Eq. **1** is equivalent to our equation, these authors, not surprisingly, obtain the same result as we do, with parameter values differing only insignificantly from ours as we verified using (Eq. **2**)

$$\sum_0^{120} T(t_i) = -6.3\text{K}, T(t_{120}) - T(t_0) = 0.9\text{K} \qquad [2]$$

and $t_{120} - t_0 = 120$ years (Table 1).

However, the authors' discussion of the parameter fit relating to their figures 1 and 2 is simply wrong (1). In figure 1, they show a regression of sea level H vs. the integral over temperature T only—relative to an arbitrary reference level, which is the mean over 1951–1980—when the equation contains the integral over the difference $(T - T_0)$; i.e., the second term in our Eq. (1) above. It is only the latter expression, with T_0 designating preindustrial equilibrium sea level, that is nonarbitrary and makes physical sense.

Regressing the full sea-level H against T in figure 2 is similarly wrong (1). In Eq. **1**, the b coefficient indeed expresses a proportionality between temperature and sea level, but in figure 2, this dependence is drowned out by the much larger contribution of the terms in a, which our equation models as a dependence between temperature and the rate of sea-level rise (dH/dt).

Table 1. Parameters of fit computed by the methods of ref. 1 and ref. 2, respectively.

Parameter	Unit	Estimate from ref. 2	Estimate from ref. 1
a	cm/K per year	0.56 ± 0.05	0.58
T_0	K	−0.41 ± 0.03	−0.41
b	cm/K	−4.9 ± 1.0	−4.5

Only the sum of contributions as modeled by our equation correlates well with sea level; partial regressions like this do not work. Hence, neither of the graphs presented makes sense.

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1. Taboada FG, Anadón R (2010) Critique of the methods used to project global sea-level rise from global temperature. *Proc Natl Acad Sci USA* 107:E116–E117.
2. Vermeer M, Rahmstorf S (2009) Global sea level linked to global temperature. *Proc Natl Acad Sci USA* 106:21527–21532.

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