The author proposes a new factor called sensitivity given by
$$S = \Delta DIC / \Delta CO2$$
to measure of the ocean's carbonate buffer system efficiency to absorb CO_2 from the atmosphere. The S factor is a simplification of the Revelle factor by removing the DIC/CO_2 term.

This simplification does not allow to correctly apprehend the buffer capacity of seawater, as detailed below by two examples.

The efficiency of the ocean to absorb CO_2 from the atmosphere depends on the equilibrium in seawater of dissolved CO_2 and HCO_3^- and CO_3^{2-}. This equilibrium depends on the actual concentrations of HCO_3^- and CO_3^{2-} and CO_2.

The higher the concentrations of HCO_3^- and CO_3^{2-}, the "more" CO_2 can be dissolved (at equilibrium following Henry's law). This has been coined the ocean buffer capacity and was formalized by Revelle in his famous factor.

A quick example is given in Table 1.
For very different Total alkalinity (TA) values (300, 1300 and 2300), and for an increase of 1 µM of DIC the corresponding increase of CO2 is much higher in low buffered waters (low TA) than in the high buffered waters (high TA).

The proposed S factor, thus, is extremely variable as a function of TA variations in the surface of the ocean.

The higher the concentration of CO_2 already dissolved, the "less" CO_2 can be dissolved (at equilibrium following Henry's law). This is the other facet of ocean buffer capacity, as formalized by Revelle, and it was on this basis that he predicted that the capacity of the ocean to absorb CO_2 would slowly decrease in time.

This is illustrated by another quick example given in Table2. In this case the TA alkalinity is constant but the CO_2 concentration is variable.

The proposed S factor, thus, is extremely variable as a function of initial CO_2 concentrations in the surface of the ocean.

These two examples show that the proposed S factor is not useful because it does not account for the variations in HCO_3^- (as given by TA for a constant initial pCO_2) and by the variations of CO_2 (as given by a constant TA for a variable initial pCO_2). On the contrary, this is accounted by the DIC/CO_2 term in Revelle's factor, and it does not make sense to simply the Revelle factor by removing this term.

Table 1

Salinity (psu)	Temperature (°C)	TA (µmol/kg-SW)	DIC (µmol/kg-SW)	pH	pCO2 (µatm)	CO2 (µmol/kg-SW)	ΔCO2:ΔDIC (µmol:µmol)
35	15	2300	2080.9	8.045	400.0	14.93	
35	15	2300	2081.9	8.043	402.2	15.01	0.08
35	15	1300	1210.0	7.821	400.0	14.93	
35	15	1300	1211.0	7.817	404.1	15.08	0.15
35	15	300	298.6	7.212	400.0	14.93	
35	15	300	299.6	7.199	413.6	15.44	0.51

Table 2

Salinity (psu)	Temperature (°C)	TA (µmol/kg-SW)	DIC (µmol/kg-SW)	pH	pCO2 (µatm)	CO2 (µmol/kg-SW)	ΔCO2:ΔDIC (µmol:µmol)
35	15	2300	2242.2	8.884	200.0	7.46	
35	15	2300	2243.2	8.877	203.1	7.58	0.11
35	15	2300	2280.5	8.594	400.0	14.93	
35	15	2300	2281.5	8.586	408.5	15.25	0.32
35	15	2300	2299.0	8.423	600.0	22.39	
35	15	2300	2300.0	8.413	613.5	22.90	0.50

Computations were made with CO2sys implemented in Excel using the carbonic acid dissociations constants of Mehrbach et al. on the pH Total scale.