

Climate Change workshop #3

Estimate the ocean's age from its salinity

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Assume the ocean accumulates salt from influx due to rivers.
Neglect salt dilution and removal processes.

(Discuss these assumptions before proceeding...)

In steady-state, $\text{Burden} = F_{\text{in}} * T = F_{\text{out}} * T$ where $T = \text{lifetime}$

$B = \text{salt in oceans now} = 5 \times 10^{22} \text{ g}$

Flux in from rivers: $F_{\text{in}} = 4 \times 10^{15} \text{ g salt/year}$

How long has the ocean been accumulating salt from rivers?

$$T = B / F_{\text{in}} = 5 \times 10^{22} \text{ g} / 4 \times 10^{15} \text{ g salt/year} \sim 10^7 \text{ year} = 10 \text{ million years}$$

Wait a minute – the oceans are much older than this. What's wrong with our assumptions?

- each year 3 feet of ocean evaporates
- and 3 feet of rain falls (Seattle rainfall is about average)
- plus salt deposits on the ocean floor are probably subducted...

Other salt loss mechanisms?