

TABLE 6.2
 Normal Atmospheric Equilibrium
 Concentrations of Various Gases in Surface
 Ocean Water

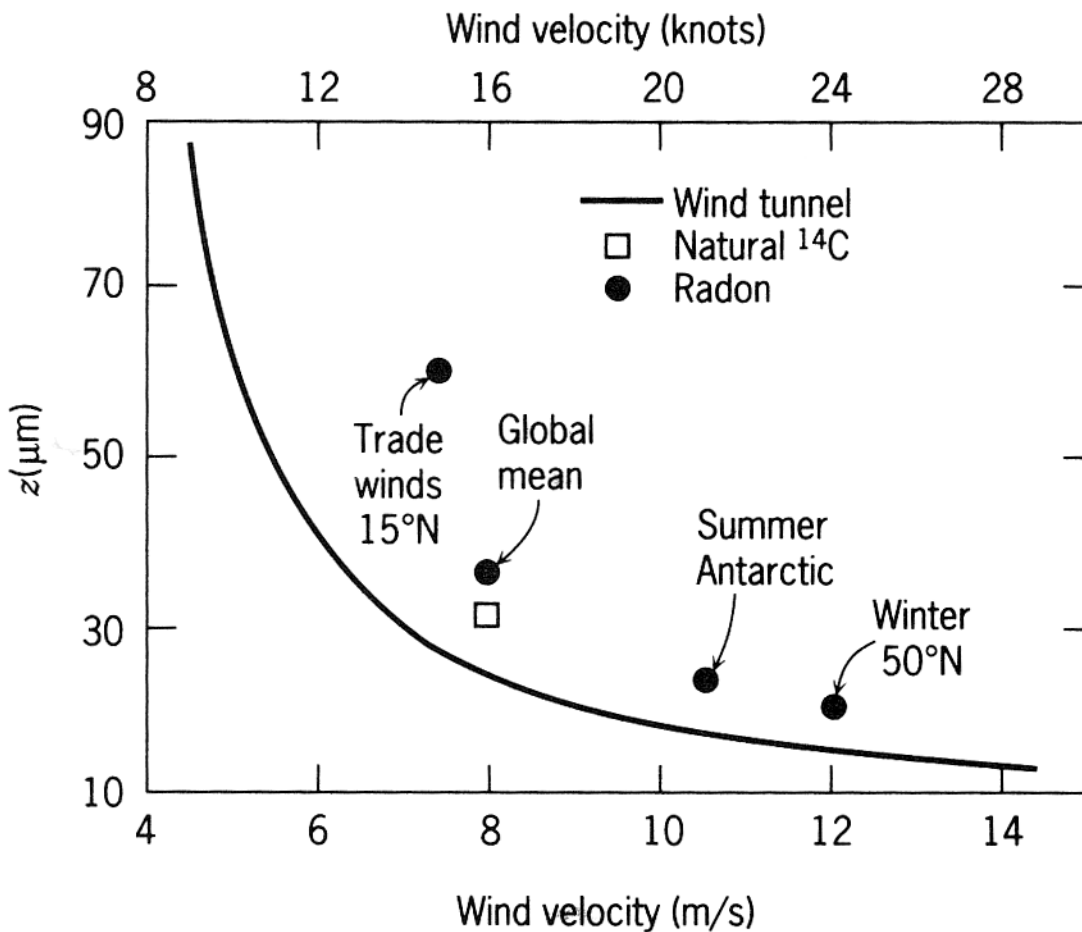
<i>Gas</i>	<i>Partial Pressure in Dry Air (atm)</i>	<i>Equilibrium Concentration in Surface Seawater (ml/L)^a</i>	
		<i>0°C</i>	<i>24°C</i>
H ₂	5×10^{-7}		
He	5.2×10^{-6}	4.1×10^{-5}	3.4×10^{-5}
Ne	1.8×10^{-5}	1.7×10^{-4}	1.5×10^{-4}
N ₂	.781	14	9
O ₂	.209	8.8	5.5
Ar	9.3×10^{-3}	.36	.22
CO ₂	3.2×10^{-4}	.47	.23
Kr	1.1×10^{-6}	8.1×10^{-5}	4.9×10^{-5}
Xe	8.6×10^{-8}	1.2×10^{-5}	$.6 \times 10^{-5}$

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^aSalinity of the seawater is assumed to be 35‰.

Molecular Diffusivity Coefficients of Various Gases in Seawater

Gas	Molecular Weight, (g/mol)	Diffusion Coefficient ($\times 10^{-5} \text{ cm}^2/\text{s}$)	
		0°C	24°C
H ₂	2	2.0	4.9
He	4	3.0	5.8
Ne	20	1.4	2.8
N ₂	28	1.1	2.1
O ₂	32	1.2	2.3
Ar	40	.8	1.5
CO ₂	44	1.0	1.9
Rn	222	.7	1.4



Net Global Gas Fluxes Across the Air–Sea Interface

Element	Compound	Controlling Resistance	Net Global Air–Sea Flux		Present Atmospheric Level (1987) ^e	Global Man ^c % Human Impact	Marine Flux as % of Global Cycle ^d
			Direction ^a	Magnitude ^b			
H	H ₂	r_w	+	10 ¹²			
C	HCHO	$r_a \sim r_w$	–	10 ¹³			
	CH ₄	r_w	+	~10 ¹³	1.66 ppmv	~240	~2 ↑
	C ₂ H ₆	r_w	+	10 ¹²	~ppbv	?	?
	C ₃ H ₈	r_w	+	10 ¹²	~ppbv	?	?
	C ₂ H ₄	r_w	+	10 ¹²	~0.1 ppbv	?	?
	C ₃ H ₆	r_w	+	10 ¹⁴	~0.1 ppbv	?	?
	CO ₂	r_w	–	8 × 10 ¹⁵	348 ppmv	25	~50 ↓
N	N ₂ O	r_w	+	6 × 10 ¹²	~310 ppb	7	10–30 ↑
	NO	r_w	+(?)		10–100 pptv	>50	↓ as NO _x ?
	NO ₂	?	+(?)		10–100 pptv	>50	↓ as NO _x ?
	NH ₃	r_a	+(?)	?	?10–20 pptv	?	↓ ?
O	O ₃	r_w	–	6 × 10 ¹⁴	?~30–50 ppbv	>50%?	↓ ?
S	Total volatile S		+	34–170 × 10 ¹² (as S)			
	H ₂ S	r_w	+	15 × 10 ¹²			
	(CH ₃) ₂ S	r_w	+	30–80 × 10 ¹²	~100 pptv	~100	30 ↑
	CS ₂	r_w	+	0.3 × 10 ¹²			
	COS	r_w	+	0.8 × 10 ¹²	500 pptv	?<5	Dominant natural marine ↑
							↓
Cl	SO ₂	r_a	–	5 × 10 ¹²	?10–100 pptv	?~100	↓
	CH ₃ Cl	r_w	+	3–8 × 10 ¹²	600 pptv	?<5	Major natural marine
	CCl ₄	r_w	–	~10 ¹⁰	~150 pptv	?large	??
	CCl ₃ F	r_w	–	3 × 10 ⁹	~220 pptv	totally manmade	(Trace <1) ↓
	CCl ₂ F ₂	r_w	–	2 × 10 ⁹	~335 pptv	totally manmade	(Trace <1) ↓
I	CH ₃ I	r_w	+	3–13 × 10 ¹¹	1–20 pptv	?	Major natural marine source

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^a+, sea→air; –, air→sea.

^bUnits are g (of the compound)/y.

^cObserved – pre-industrial = $\frac{\text{Atmospheric perturbation}}{\text{Natural level}} \times 10^2$.

^dOceanic source, ↑; oceanic sink, ↓.

^eGas concentrations are given in terms of volume, e.g., 1 ppmv = 1 L of gas in 10⁶ L of air.