



Relic Water in the Deep Arctic Ocean

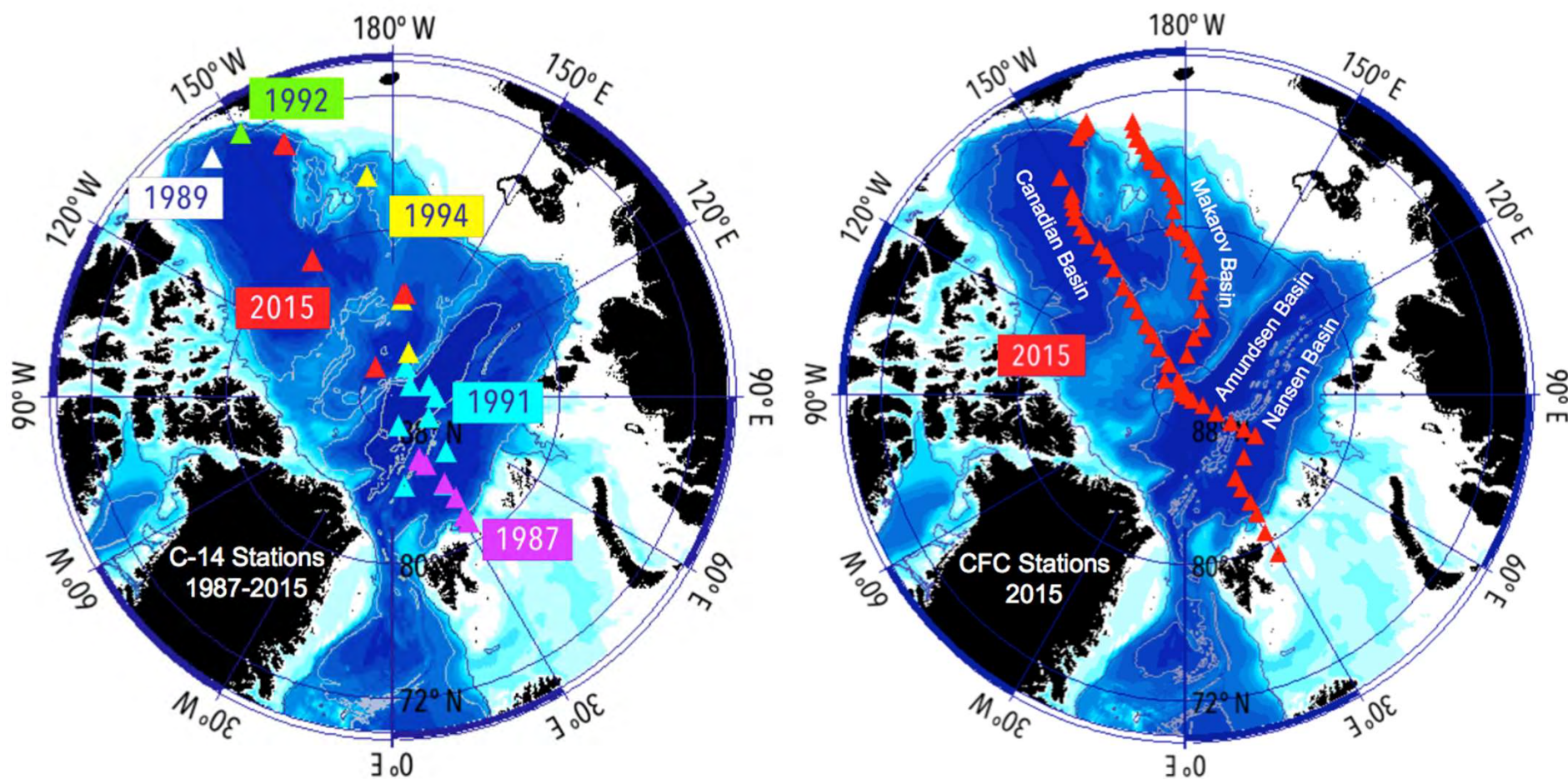
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Peter Schlosser^{2,3,1} & Angelica Pasqualini³

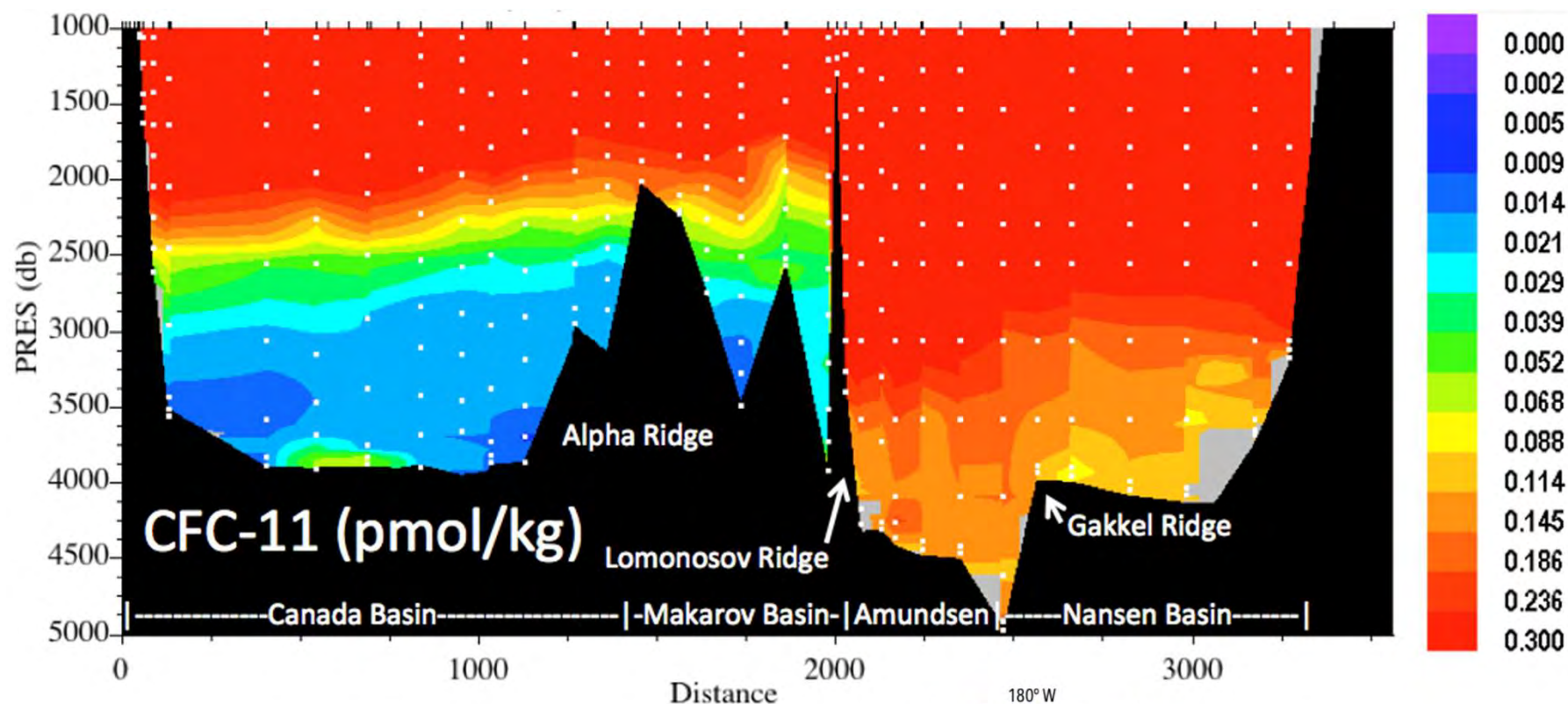
¹ Lamont-Doherty Earth Observatory of Columbia University

² Arizona State University

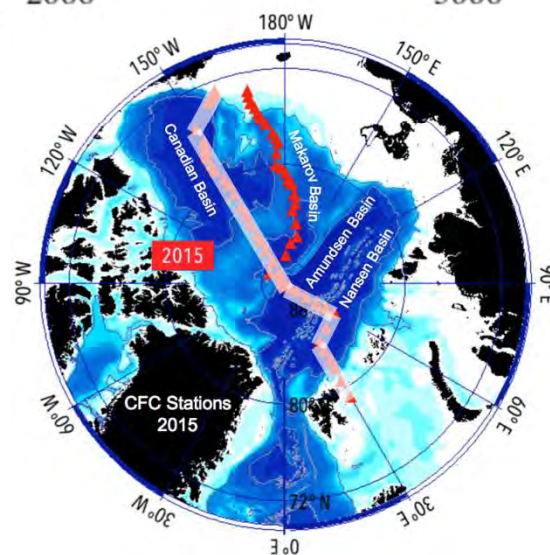
³ Columbia University, Dept. Earth and Environmental Engineering

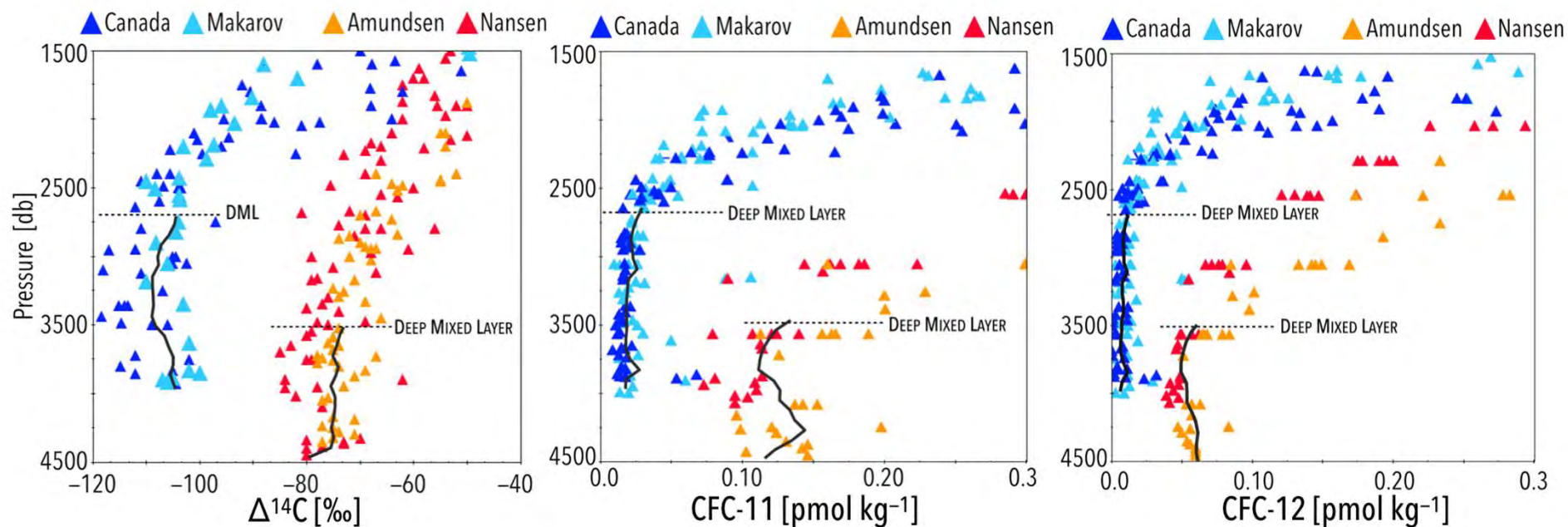
Locations for ^{14}C stations (left panel) and CFC stations (right panel) taken on various cruises in the 1980s and 1990s and on the US and German GEOTRACES cruises in 2015.



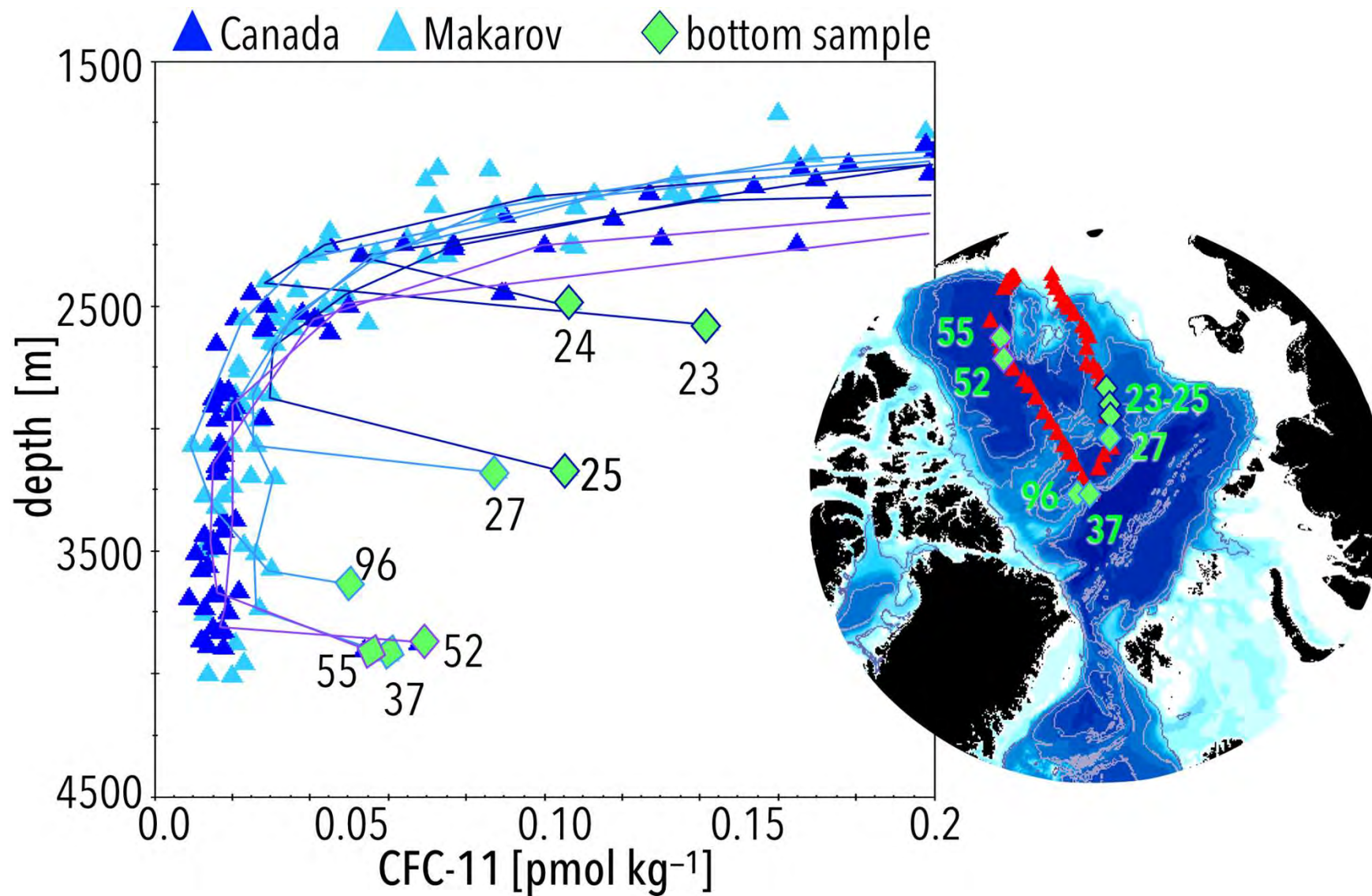


Vertical section of CFC-11 extending across the entire Arctic Ocean along roughly 150°W and 30°E. The color concentration scale is non-linear and expanded for lower concentrations.



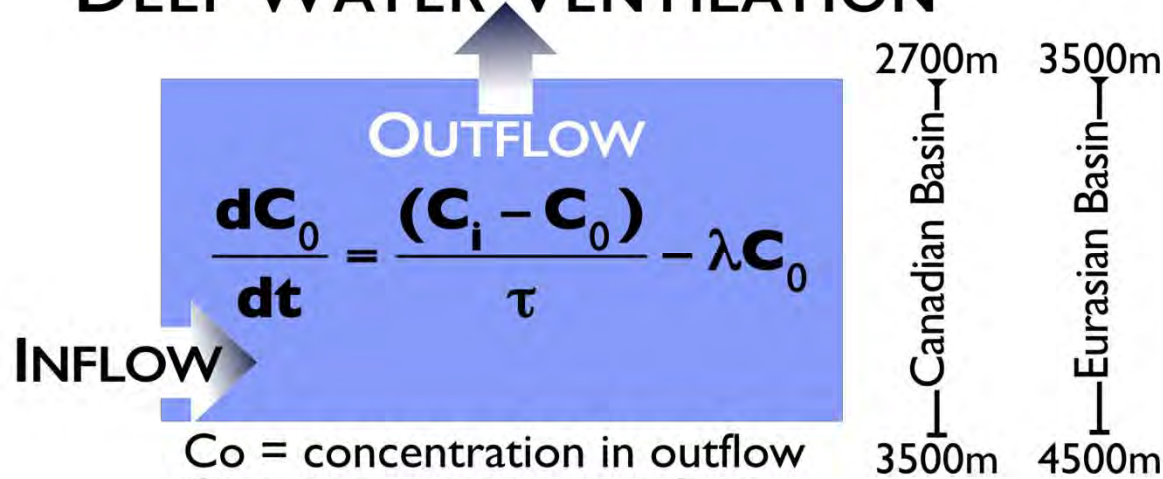


Vertical profiles of $\Delta^{14}\text{C}$ (left panel), CFC-11 (middle panel) and CFC-12 (right panel). Depths of the top of the bottom mixed layer are shown and the mean vertical profiles for the deep layers are plotted (black line).



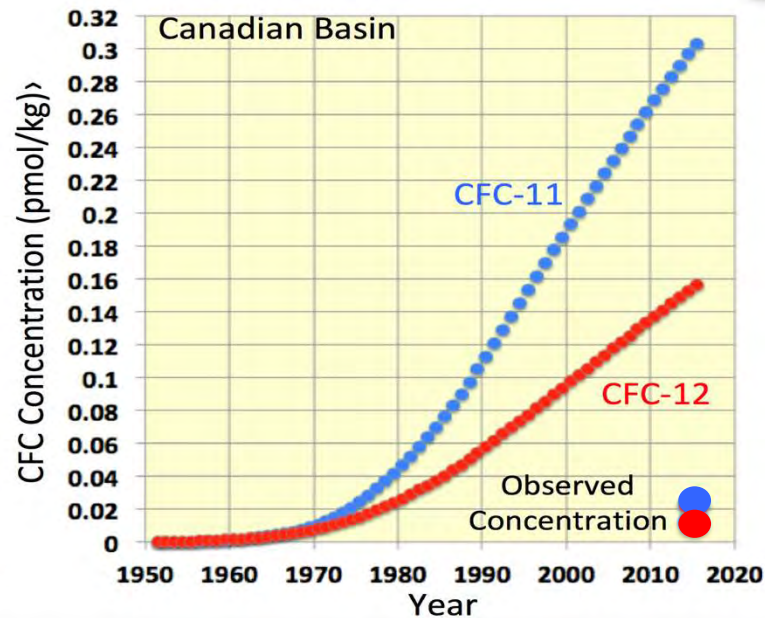
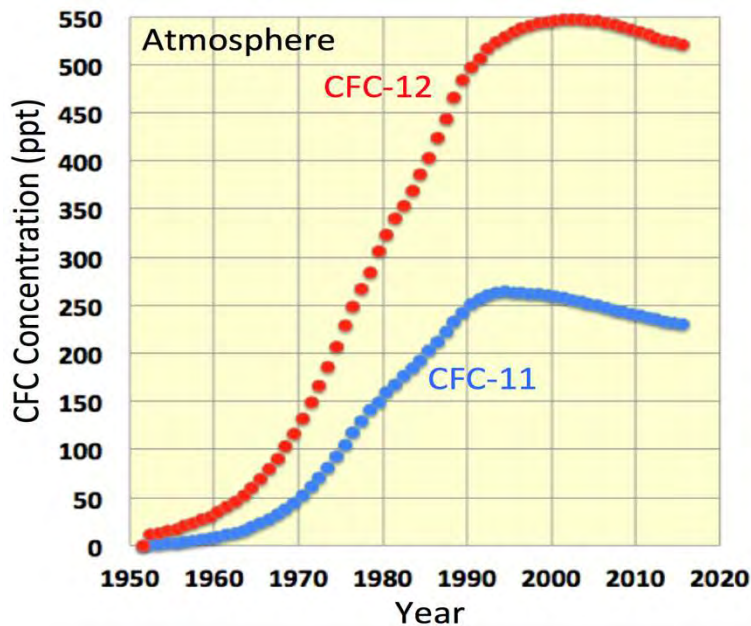
Vertical profiles of the CFC-11 data for the deep Canadian Basin highlighting stations with maximum concentrations at the bottom.

I-BOX MODEL OF DEEP WATER VENTILATION



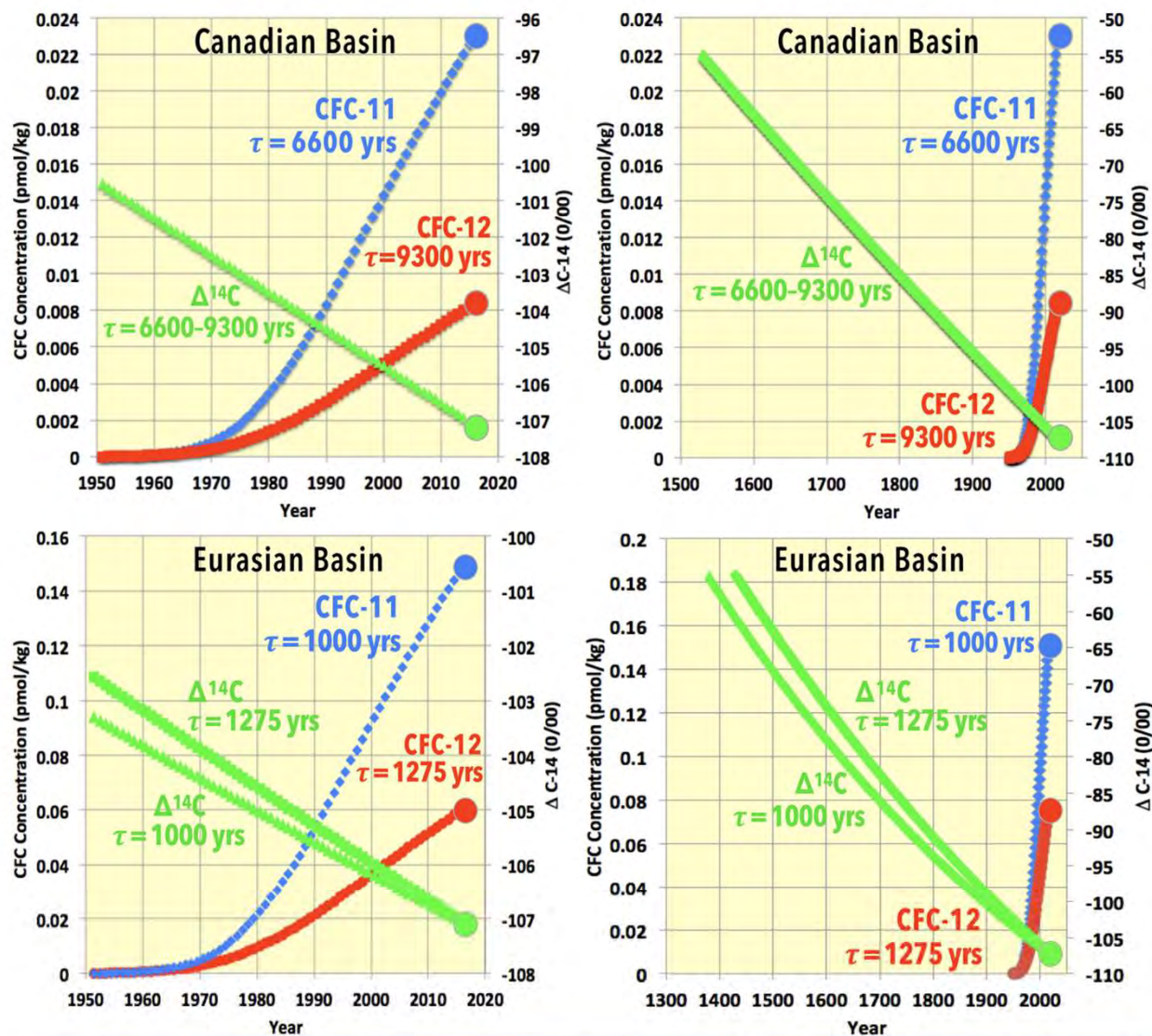
Schematic diagram of the box model used to calculate residence times for the deep Arctic Ocean

C_0 = concentration in outflow
 C_i = concentration in inflow
 τ = residence time
 λ = radioactive decay constant



Concentration of CFC-11 and CFC-12 in the northern hemisphere (left panel) and in the deep Canadian Basin (right panel) versus time.

Box model results for the deep Canadian Basin (top) and deep Eurasian Basin (bottom)



Basin	Deep Water Bottom Layer Depth Range [m]	Mean $\Delta^{14}\text{C}$ 1987-2015 [‰]	Mean C-14 Age [years]	Mean CFC-11 2015 [pmol/kg ⁻¹]	Mean CFC-12 2015 [pmol/kg ⁻¹]	Residence Time CFC-11 [years]	Residence Time CFC-12 [years]
Eurasian	3500-4500	-75.4	181	0.148	0.059	1000	1275
Canadian	2700-3500	-107.0	483	0.0227	0.0082	6600	9300