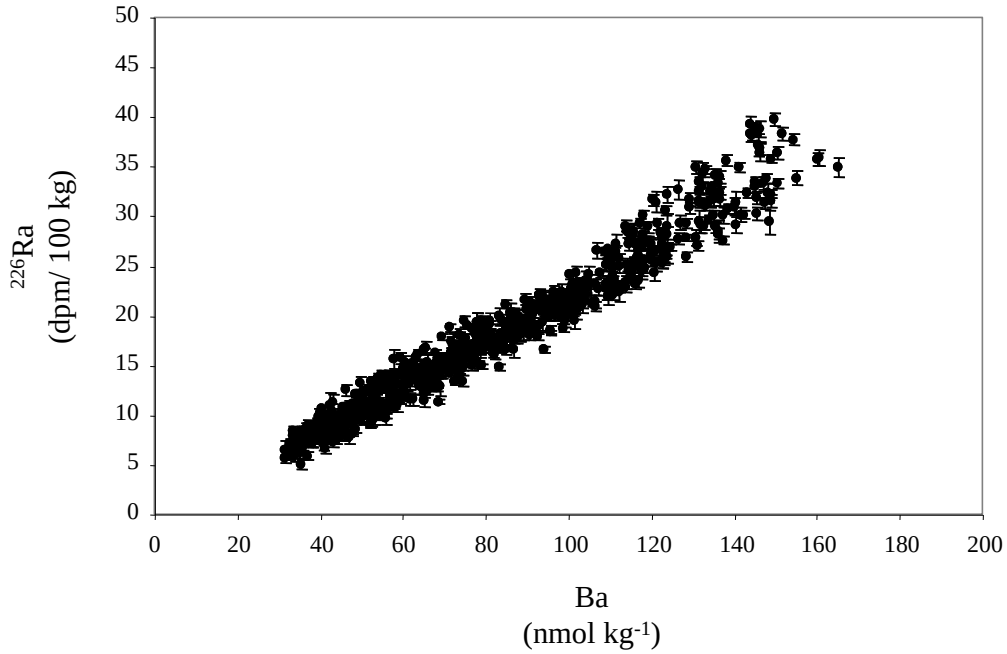
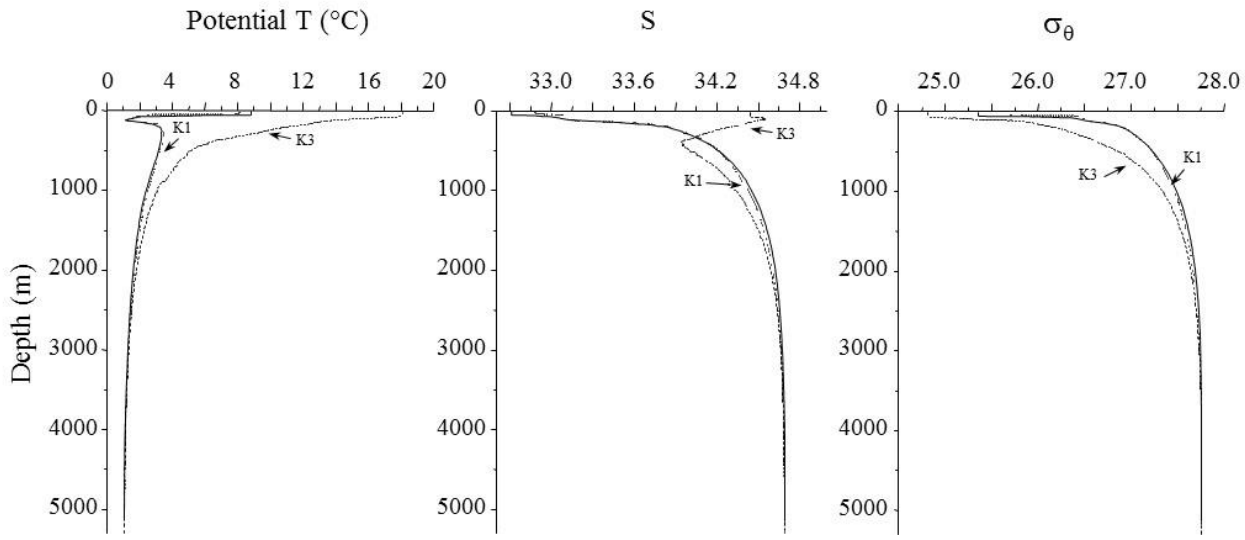


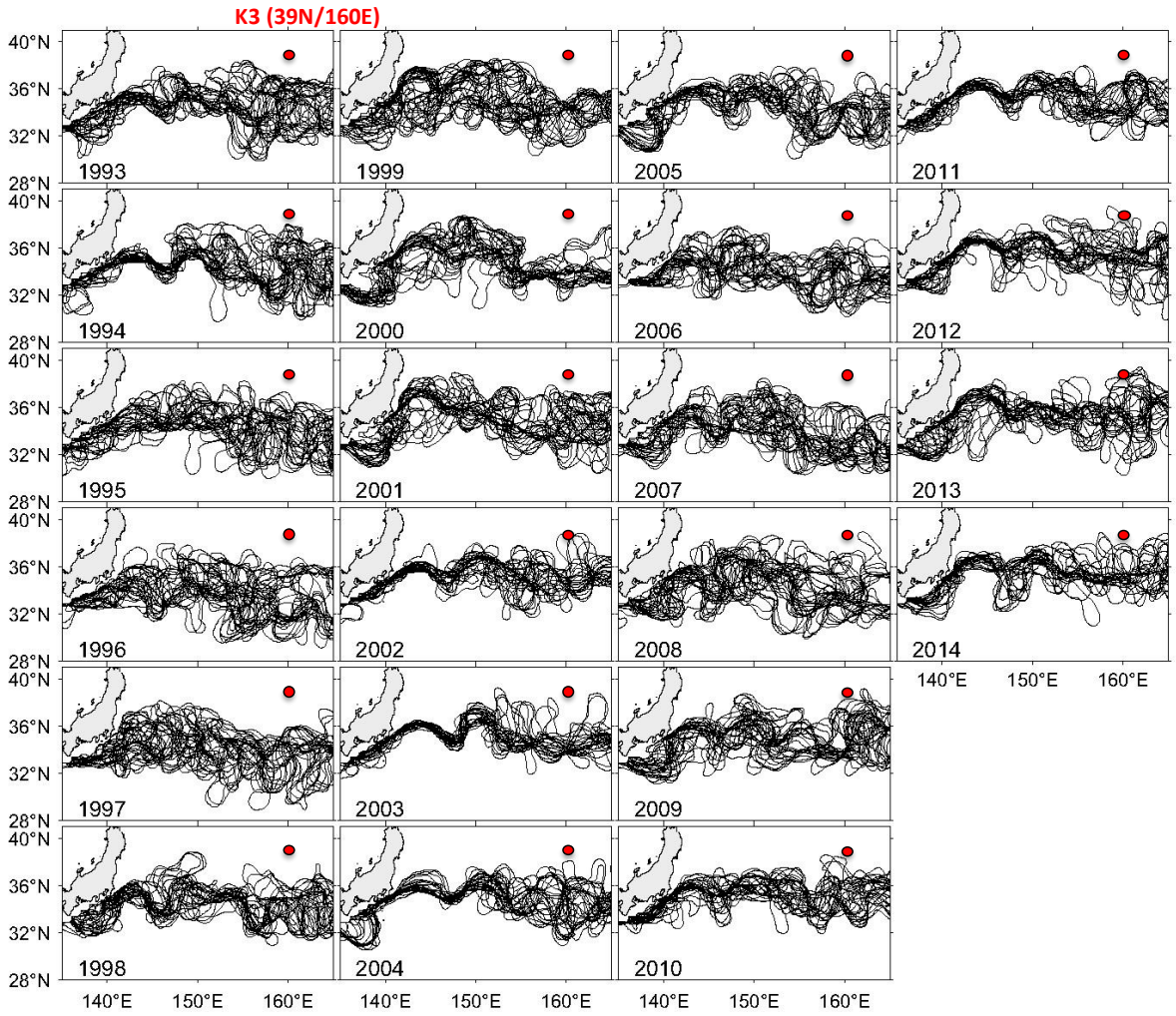
Supplementary Material, Figure 1

Figure 1 of Supplementary Material: Relationship between Ba and ^{226}Ra as observed during the GEOSECS program in the Atlantic, Pacific and Indian Oceans (GEOSECS World Atlas; Chan et al., 1976).



Supplementary Material, Figure 2

Figure 2 of Supplementary Material: Vertical profiles of potential temperature, salinity and σ_θ at stations K1 and K3 in the North Pacific.



Supplementary Material, Figure 3

Figure 3 of Supplementary Material: Yearly paths of the Kuroshio and Kuroshio Extension (modified from Oka et al. 2015 based on Qiu et al. 2014). The location of station K3 investigated in year 2002 in the present study is reported (closed red circle).

Table 1 of Supplementary Material: Ba concentrations and ^{226}Ra activities determined in seawater at old station Hale Aloha, off Hawaii. The ^{226}Ra/Ba ratios are also reported. The volume refers to the volume collected for the Ra analysis.

Station	Depth (m)	Volume (kg)	^{226}Ra (dpm/ 100 kg)	Ba (nmol kg^{-1}) ± 2%	^{226}Ra/Ba (dpm μmol^{-1})
Old Hale Aloha	30	35.1	6.5 ± 0.2	36.1	1.80 ± 0.07
RV KOK	100			36.0	
June 2002	100			41.0	
	100			37.0	
	100			37.7	
	Mean 100	38.1	6.5 ± 0.2	37.9	1.71 ± 0.06
	200	46.3	6.2 ± 0.2	37.0	1.68 ± 0.06
	300	52.1	7.4 ± 0.1	39.7	1.87 ± 0.05
	400			47.6	
	500	54.1	12.1 ± 0.3	55.0	2.20 ± 0.07
	1500	55.8	24.6 ± 0.2	118.3	2.08 ± 0.04
	2800	54.4	31.4 ± 0.4	145.7	2.16 ± 0.05
	4000	54.5	33.8 ± 0.2	144.7	2.34 ± 0.05
	4600			142.9	
	4600			141.8	
	4600			142.9	
	Mean 4600			142.5	
Old Hale Aloha	5			34.1	
RV WECOMA	20			33.5	
August 2002	20			34.9	
	20			42.8	
	40			34.9	
	50			35.0	
	60			34.6	
	80			33.4	
	100			33.9	
	100			34.4	
	150			33.2	
	150			34.8	
	200			34.4	
	200			37.9	
	250			33.2	
	300			37.4	
	300			39.6	
	400			44.0	
	500			57.1	
	650			70.7	
	800			83.8	
	1150			102.4	
	1500			114.2	
	1900			126.3	
	1900			124.6	
	1900			127.0	
	2300			131.5	
	2700			136.8	
	3100			134.9	
	3100			139.5	
	3100			148.6	
	3500			140.1	
	3900			140.0	
	4300			139.6	
	4700			140.0	
	4700			138.8	
	4700			137.7	
	4700			139.7	

Table 2 of Supplementary Material: Ba concentrations and ^{226}Ra activities determined in seawater at station K1. The ^{226}Ra/Ba ratios are also reported. The volume refers to the volume collected for the Ra analysis.

Station	Depth (m)	Volume (kg)	^{226}Ra (dpm/ 100 kg)			Ba (nmol kg^{-1}) ± 2%	^{226}Ra/Ba (dpm µmol^{-1})		
K1	5					50.6			
	10					52.1			
	30	74.0	12.6	±	0.07	53.6	2.35	±	0.13
	50					51.5			
	60					49.6			
	75					57.6			
	80	87.5	11.2	±	0.22		1.94*	±	0.10
	100					51.9			
	120	88.9	12.1		0.26		2.14$	±	0.13
	150					61.4			
	200					69.5			
	230	99.2	17.7	±	0.13	70.9	2.50	±	0.13
	250					72.3			
	300					70.7			
	400					88.4			
	500	99.7	18.5		0.31	85.1	2.17	±	0.13
	600					86.8			
	700					92.6			
	900					101.8			
	1000	99.0	24.7	±	0.20	108.5	2.28	±	0.12
	1500					123.8			
	2000	112.1	30.6	±	0.53	130.8	2.34	±	0.12
	3000					139.8			
	3500	114.3	31.6	±	0.16		2.26$	±	0.12
	4500					125.8			
	4800	110.0	34.7	±	0.34		2.54$	±	0.12
	5000					136.8			
	5126	112.0	33.2	±	0.33		2.45$	±	0.12
	5200					134.3			

$, * : When the Ba concentration was not available at the same depth as for the ^{226}Ra sample, we use the mean Ba concentration (samples collected above and below the Ra sample) to determine the ^{226}Ra/Ba ratio ($) or we use the Ba concentration determined in the nearest sample (*).

Table 3 of Supplementary Material: Ba concentrations and ^{226}Ra activities determined in seawater at station K3. The ^{226}Ra/Ba ratios are also reported. The volume refers to the volume collected for the Ra analysis.

Station	Depth (m)	Volume (kg)	^{226}Ra (dpm/ 100 kg)			Ba (nmol kg^{-1}) ± 2%	^{226}Ra/Ba (dpm µmol^{-1})		
K3	5		6.6	±	0.06	36.6	1.81	±	0.09
	10					35.1			
	25					46.2			
	30					41.2			
	40	75.8	7.0	±	0.10		1.80$^{\$}$	±	0.09
	50					36.7			
	60					47.8			
	75					34.4			
	100					36.6			
	110	89.6	7.7	±	0.09		1.94$^{\$}$	±	0.10
	125					42.9			
	150					41.2			
	175					40.9			
	200					38.5			
	225					45.6			
	250	87.1	9.0	±	0.18	44.7	2.00	±	0.11
	300					45.2			
	350					57.9			
	400	98.2	12.0	±	0.13		1.78$^{\$}$	±	0.09
	450					77.0			
	500					73.6			
	600					78.4			
	750					83.6			
	800	101.4	19.4	±	0.15		2.32*	±	0.12
	1000					90.5			
	1500					114.0			
	2000	102.9	28.6	±	0.14	119.9	2.39	±	0.12
	2500					133.9			
	3000					131.7			
	3500	128.5	31.0	±	0.19	141.2	2.19	±	0.11
	4000					159.2			
	5000	128.8	33.8	±	0.14	148.5	2.28	±	0.11
	5200	97.5	32.8	±	0.21	165.2	1.99	±	0.10

$^{\$, *}$: When the Ba concentration was not available at the same depth as for the ^{226}Ra sample, we use the mean Ba concentration (samples collected above and below the Ra sample) to determine the ^{226}Ra/Ba ratio ($) or we use the Ba concentration determined in the nearest sample (*).

Table 4 of Supplementary Material: Results of the analyses conducted in the suspended particles collected at stations K1, K3 and old Hale Aloha in the North Pacific. Excess Ba and ^{226}Ra (denoted Ba_{ex} and $^{226}Ra_{ex}$, respectively) refer to the Ba and ^{226}Ra contents corrected for the lithogenic component.

Station	depth	Volume	^{226}Ra			$^{226}Ra_{ex}$			Ba			Ba_{ex}			$^{226}Ra_{ex}/Ba_{ex}$			Sr			Sr/Ba		
	m	L	dpm/ 100 kg			dpm/ 100 kg			pmol kg^{-1}			pmol kg^{-1}			dpm µmol^{-1}			pmol kg^{-1}			mol/ mol		
K1	30	171.1	0.011	±	0.002	0.008	±	0.001	76.9	±	4.0	27.0	±	4.4	2.99	±	0.73	1182	±	42	43.7	±	7.3
"	80	430.7	0.094	±	0.003	0.093	±	0.005	428.5	±	12.4	410.0	±	12.4	2.26	±	0.13	609	±	23	1.5	±	0.07
"	110	481.5	0.089	±	0.002	0.088	±	0.005	303.0	±	8.2	289.0	±	8.2	3.04	±	0.20	380	±	14	1.3	±	0.06
"	150	523.8	0.076	±	0.002	0.076	±	0.004	352.7	±	10.2	342.5	±	10.2	2.21	±	0.13	385	±	15	1.1	±	0.06
"	230	595.0	0.116	±	0.003	0.116	±	0.005	525.9	±	18.4	512.5	±	18.4	2.26	±	0.13	511	±	24	1.0	±	0.06
"	400	626.0	0.072	±	0.002	0.070	±	0.003	420.3	±	13.9	375.8	±	14.0	1.87	±	0.11	429	±	19	1.1	±	0.07
"	600	616.6	0.059	±	0.002	0.057	±	0.002	384.5	±	13.1	356.8	±	13.1	1.61	±	0.09	366	±	17	1.0	±	0.06
"	1000	799.0	0.038	±	0.002	0.037	±	0.002	284.8	±	9.1	259.0	±	9.2	1.43	±	0.11	204	±	9	0.8	±	0.04
"	2000	1267.6	0.041	±	0.001	0.041	±	0.002	385.8	±	13.1	379.3	±	13.1	1.08	±	0.07	141	±	7	0.4	±	0.02
K3	10	221.4	0.433	±	0.013																		
"	40	197.2	0.018	±	0.003																		
"	110	302.8	0.124	±	0.007																		
"	250	448.5	0.102	±	0.004	0.102	±	0.007	318.6	±	13.7	314.3	±	13.7	3.24	±	0.27	258	±	14	0.8	±	0.06
"	400	408.8	0.114	±	0.005	0.114	±	0.008	400.2	±	18.0	393.5	±	18.0	2.90	±	0.24	256	±	13	0.7	±	0.05
"	800	440.6	0.059	±	0.004	0.059	±	0.005	271.7	±	9.2	265.8	±	9.2	2.21	±	0.20	221	±	10	0.8	±	0.05
"	1500	446.3	0.042	±	0.003	0.042	±	0.004	386.4	±	16.6	379.8	±	16.6	1.10	±	0.12	157	±	8	0.4	±	0.03
Old Hale Aloha (KOK, June 2002)	150	320.6	0.036	±	0.005																		
"	200	594.2	0.055	±	0.007																		
"	250	1181.7	0.067	±	0.002																		
"	300	1009.0	0.044	±	0.002																		
"	400	1143.4	0.043	±	0.002																		
"	500	980.3	0.037	±	0.03																		
"	800	1106.7	0.034	±	0.003																		
"	1500	1843.3	0.027	±	0.001																		
"	2800	1570.0	0.022	±	0.001																		
"	4000	1803.0	0.019	±	0.001																		
Old Hale Aloha (WECOMA, Aug. 2002)	175	1487.0	0.058	±	0.002																		
"	250	2101.0	0.062	±	0.002																		
"	450	2957.0	0.050	±	0.002																		
"	2810	1593.0	0.020	±	0.001																		
"	4010	1851.0	0.019	±	0.001																		

Table 5 of Supplementary Material: ^{226}Ra, ^{226}Ra activities and $^{228}Ra/^{226}Ra$ ratios determined in seawater at stations K1 and K3.

Station	Depth	Volume	^{226}Ra			^{228}Ra			$^{228}Ra/^{226}Ra$		
	m	kg	dpm/ 100 kg			dpm/ 100 kg					
K1	30	74.0	12.6	±	0.07	0.61	±	0.04	0.048	±	0.003
	80	87.5	11.2	±	0.22	0.44	±	0.15	0.039	±	0.013
	230	99.2	17.7	±	0.13	0.27	±	0.07	0.015	±	0.004
	1000	99.0	24.7	±	0.20	0.10	±	0.080	0.004	±	0.003
	2000	112.1	30.6	±	0.53	< 0.07					
	3500	114.3	31.5	±	0.16	0.072	±	0.062	0.002	±	0.002
	4800	110.0	34.7	±	0.34	0.28	±	0.146	0.008	±	0.004
	5126	112.0	33.2	±	0.33	0.29	±	0.15	0.009	±	0.005
K3	6		6.6	±	0.06	1.46	±	0.05	0.221	±	0.008
	40	75.8	7.0	±	0.10	1.40	±	0.10	0.199	±	0.014
	110	89.6	7.7	±	0.09	1.03	±	0.07	0.133	±	0.009
	250	87.1	9.0	±	0.18	1.31	±	0.16	0.147	±	0.018
	400	98.2	12.0	±	0.13	1.04	±	0.09	0.087	±	0.008
	800	101.4	19.4	±	0.15	0.09	±	0.06	0.005	±	0.003
	2000	102.9	28.6	±	0.14	0.13	±	0.05	0.005	±	0.002
	3500	128.5	31.0	±	0.19	< 0.06					
	5000	128.8	33.8	±	0.14	0.25	±	0.05	0.007	±	0.002
	5200	97.5	32.8	±	0.21	0.32	±	0.09	0.010	±	0.003

Table 6 of Supplementary Material: ^{226}Ra, ^{228}Ra, excess ^{226}Ra and excess ^{228}Ra activities, $^{228}Ra_{ex}/^{226}Ra_{ex}$ ratios determined in suspended particles at stations K1 and K3.

Station	depth	^{226}Ra			^{228}Ra			$^{226}Ra_{ex}$			$^{228}Ra_{ex}$			$^{228}Ra_{ex}/^{226}Ra_{ex}$		
	m	dpm/ 100kg			dpm/ 100kg			dpm/ 100kg			dpm/ 100kg					
K1	30	0.011	±	0.002	0.0064	±	0.002	0.008	±	0.001	0.0032	±	0.001	0.40	±	0.160
	80	0.094	±	0.003	0.0061	±	0.002	0.093	±	0.005	0.0050	±	0.001	0.05	±	0.014
	110	0.089	±	0.002	0.0069	±	0.001	0.088	±	0.005	0.0060	±	0.001	0.07	±	0.013
	150	0.076	±	0.002	0.0037	±	0.001	0.076	±	0.004	0.0031	±	0.001	0.04	±	0.011
	230	0.116	±	0.003	0.0031	±	0.001	0.116	±	0.005	0.0023	±	0.001	0.02	±	0.007
	400	0.072	±	0.002	0.0036	±	0.001	0.070	±	0.003	0.0007	±	0.0002	0.01	±	0.003
	600	0.059	±	0.002	0.0037	±	0.001	0.057	±	0.002	0.0019	±	0.001	0.03	±	0.011
	1000	0.038	±	0.002		_		0.037	±	0.002						
	2000	0.041	±	0.001		_		0.041	±	0.002						
K3	250	0.102	±	0.004	0.0287	±	0.004	0.102	±	0.007	0.0285	±	0.005	0.28	±	0.049
	400	0.114	±	0.005	0.0187	±	0.004	0.114	±	0.008	0.0183	±	0.004	0.16	±	0.033
	800	0.059	±	0.004	0.0077	±	0.002	0.059	±	0.005	0.0073	±	0.002	0.12	±	0.041
	1500	0.042	±	0.003	0.0075	±	0.003	0.042	±	0.004	0.0071	±	0.002	0.17	±	0.060