Table S1. Narrowband signals identified by MTM spectral analysis[a]

Variable	n[b]	Frequency (y^{-1})	Period (y)	Period (d)	ALOHA Confidence (%)[c]	Kahe Confidence (%)
Temperature	240	1.045	0.957	350	99	99
		2.051	0.488	178	90	99
		3.164	0.316	115	nd	90
Salinity	240	**0.083**	**12.000**	**4383**	**90**	**90**
		1.035	0.966	353	99	nd
		1.045	0.957	350	nd	99
		1.387	0.721	263	90	nd
		1.807	0.554	202	90	nd
		2.383	0.420	153	95	nd
		2.832	0.353	129	90	nd
		2.910	0.344	126	nd	90
		3.047	0.328	120	95	nd
		3.145	0.318	116	nd	95
		3.359	0.298	109	99	nd
		4.404	0.227	83	nd	90
		4.814	0.208	76	95	nd
pCO_2	217	**0.092**	**10.850**	**3693**	**95**	**95**
		1.054	0.948	346	99	99
		2.109	0.474	173	95	nd

		4.707	0.212	78	nd	90
pCO_2	240	**0.083**	**12.000**	**4383**	**95**	
		1.045	0.957	350	99	
		2.051	0.488	178	99	
		2.227	0.449	164	90	
		3.037	0.329	120	90	
$[H^+]$	217	**0.092**	**10.850**	**3693**	**95**	**95**
		1.055	0.948	346	99	99
		2.109	0.474	173	95	nd
$[H^+]$	240	**0.083**	**12.000**	**4383**	**95**	
		1.045	0.957	350	99	
		2.051	0.488	178	99	
		2.227	0.449	164	90	
Ω_{arag}	217	**0.092**	**10.850**	**3693**	**90**	**90**
		0.947	1.056	386	nd	99
		1.045	0.957	350	99	nd
		2.090	0.479	175	99	nd
		2.988	0.335	122	95	nd
		3.174	0.315	115	nd	95
		3.926	0.255	93	nd	95
		4.805	0.208	76	nd	95
Ω_{arag}	240	**0.083**	**12.000**	**4383**	**95**	
		1.045	0.957	350	99	

		2.070	0.483	176	95	
		3.047	0.328	120	95	
nDIC	217	**0.092**	**10.850**	**3693**	**99**	**95**
		0.938	1.067	390	nd	99
		1.045	0.957	350	99	nd
		1.602	0.624	228	nd	90
		2.139	0.468	171	90	nd
		2.891	0.346	126	95	nd
		3.438	0.291	106	nd	90
		3.613	0.277	101	90	nd
		4.355	0.230	84	95	nd
nDIC	240	**0.083**	**12.000**	**4383**	**99**	
		1.045	0.957	350	99	
		2.129	0.470	172	95	
		2.881	0.347	127	95	
		3.623	0.276	101	90	
		4.404	0.227	83	95	
nTA	217	**0.092**	**10.850**	**3693**	**99**	**90**
		1.582	0.632	231	nd	95
		1.816	0.551	201	99	nd
		2.100	0.476	174	90	nd
		2.500	0.400	146	95	nd
		3.145	0.318	116	95	nd

		3.232	0.309	113	nd	90
		4.033	0.248	91	90	nd
		4.102	0.244	89	nd	95
		4.600	0.217	79	95	nd
		4.814	0.208	76	nd	90
		4.990	0.200	73	99	nd
nTA	240	**0.083**	**12.000**	**4383**	**99**	
		1.055	0.948	346	90	
		1.816	0.551	201	99	
		2.500	0.400	146	95	
		3.154	0.317	116	99	
		3.623	0.276	101	90	
		4.033	0.248	91	95	
		4.590	0.218	80	90	
		4.999	0.200	73	95	
Chl *a*	217	1.006	0.994	363	99	nd
		1.055	0.948	346	nd	99
		1.514	0.661	241	95	nd
		1.729	0.579	211	nd	95
		1.963	0.509	186	nd	99
		2.061	0.485	177	99	nd
		2.676	0.374	137	90	nd
		3.115	0.321	117	95	nd

		3.545	0.282	103	nd	90
		4.033	0.248	91	nd	95
		4.619	0.216	79	90	nd
Chl *a*	240	1.006	0.994	363	99	
		1.514	0.661	241	95	
		2.051	0.488	178	95	
		2.676	0.374	137	95	
		3.115	0.321	117	95	
		4.688	0.213	78	90	
MLD	240	1.045	0.957	350	99	99
		1.641	0.610	223	nd	99
		2.012	0.497	182	99	90
		2.949	0.339	124	nd	90
		3.135	0.319	117	90	nd
		3.584	0.279	102	nd	90
		3.780	0.265	97	nd	90
		4.033	0.248	91	99	nd
		4.072	0.246	90	nd	90
		4.971	0.201	73	99	95
pCO_{2atm}[d]	240	**0.083**	**12.000**	**4383**	**99**	
		1.045	0.957	350	99	
		2.051	0.488	178	99	

a) Bold font indicates secular trends

b) n = length of data vector over period of observation: 217 points (Mar 1991 – Oct 2012), 230 points (Nov 1989 – Oct 2012) or 240 points (Nov 1988 – Oct 2012)

c) Confidence level that detected signal exceeds robust red noise background; nd = not detected at the 90% confidence level

d) Atmospheric CO_2 mole fractions from MLO converted to partial pressures at ALOHA sea surface conditions (see Methods).