

R/V Shinsei-maru Cruise Report  
KS-19-6

Development of autonomous turbulence measurements:  
seasonal and frontal mixing variability

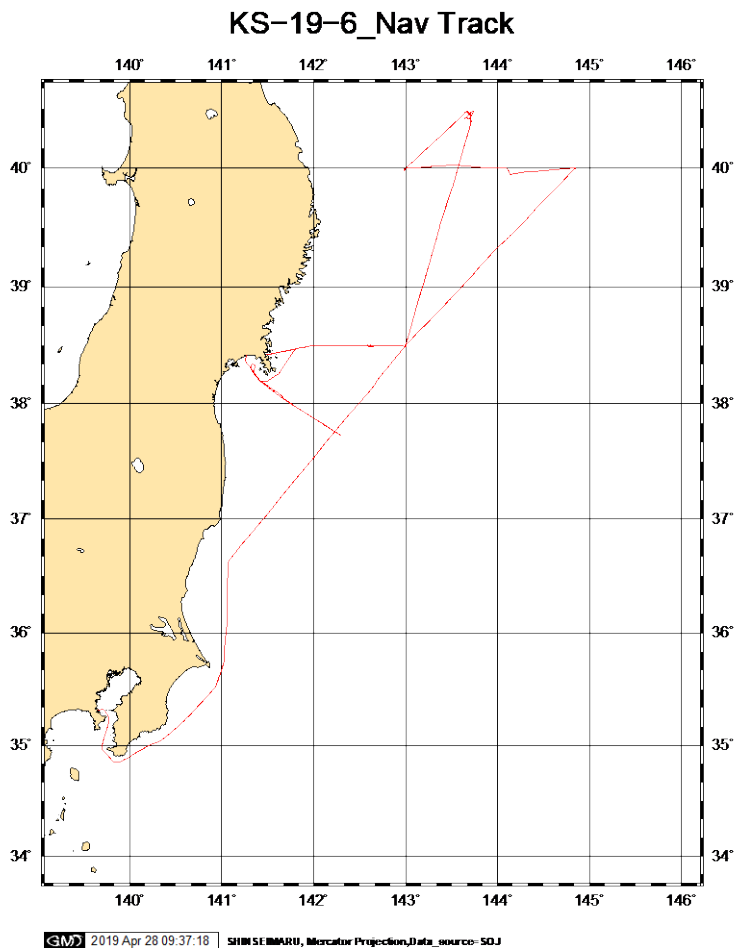
AreaOff Sanriku

Apr. 19 - 28, 2019

Joint Usage/Research Center for Atmosphere and Ocean  
Science (JURCAOS)  
Japan Agency for Marine-Earth Science and Technology  
(JAMSTEC)

## 1. Cruise Information

- Cruise ID KS-19-6
- Name of vessel R/V Shinsei-maru
- Title of project
- Title of cruise Development of autonomous turbulence measurements: seasonal and frontal mixing variability
- Chief Scientist [Affiliation] Ichiro Yasuda [Atmosphere and Ocean Research Institute, The University of Tokyo]
- Cruise period April 19-28, 2019
- Ports of departure / arrival Yokosuka / Ishinomaki
- Research area Off Sanriku
- Research map



## 2. Research Proposal and Science Party

- Title of proposal:

Overall: Development of autonomous turbulence measurements: seasonal and frontal mixing variability

- Representative of Science Party [Affiliation] Ichiro Yasuda [Atmosphere and Ocean Research Institute (AORI), The University of Tokyo]

- Science Party (List) [Affiliation, assignment etc.]

Ichiro Yasuda [AORI]: Overall

Shinzo Fujio [AORI]: VMP5500, Deep mixing

Sachihiko Itoh [AORI]: U-CTD, U-VMP Front Observations

Daigo Yanagimoto [AORI]: Deep circulation, LADCP, Water sampling, oxygen

Koenjong Lee [AORI]: SeaExplorer and Slocum observations, U-VMP

Mamoru Tanaka [AORI]: VMP observations

Shuo Zhai [AORI]: Float-VMP observations

Yusuke Sasaki [AORI]: SeaExplorer Observations

Masaki Hamamoto [AORI]: CTD operation, U-VMP operation

Dasuke Hasegawa [Fisheries Research Agency: FRA] SeaGlider observations, VMP observations

Takahiro Tanaka [FRA] Slocum and SeaGlider observations, SONAR observation

Ken Yamaki [AORI]: Float-VMP observation

Shinsuke Toyoda [MWJ] CTD observations

## 3. Research/Development Activities

### 1. CTD/LADCP/AFP07/Water sampling for the analysis of deep water circulation and water-mass

Shinzo Fujio, Ichiro Yasuda, Daigo Yanagimoto and all scientists

CTD:

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)
C01	20190420	1301	38	30.107	142	59.7
FL1	20190421	854	40	27.5502	143	42.3093
FL2	20190421	1955	40	27.803	143	40.729
C02	20190422	513	39	59.27	142	59.29
C03	20190422	1250	39	59.861	144	6.092
C04	20190423	2209	39	59.969	144	50.388

Water sampling:

Stn	Date	Time	Lat(deg)	Lat(min)	Lon(deg)	Lon(min)	Bottom Depth
C01	20190420	1301	38	30.107	142	59.7	1767
C02	20190422	513	39	59.27	142	59.29	1290
C03	20190422	1250	39	59.861	144	6.092	5064
C04	20190423	2209	39	59.969	144	50.388	5838

### 2. Development of Float-VMP observations:

Ichiro Yasuda, Zhuo Zhai, Ken Yamaki and KoengJong Lee

### Recovery of the float

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)	
FL	190421	1433	190421	1433	143	41.2925	recover

### 3. Development of glider observations with VMP and ADCP:

KoengJong Lee, Yusuke Sasaki, Takahiro Tanaka and Ichiro Yasuda

#### SeaExplorer

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)	
C01	20190420	1146	38	30.0084	142	59.9613	deploy
C01	20190423	2349	38	30.0261	142	41.9109	recover

#### Slocum

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)	
FL	190421	1126	40	27.5657	143	42.2568	deploy
FL	190421	2335	40	27.7697	143	38.6088	recover

### 4. Deep mixing observations with VMP5500

Shinzo Fujio, Ichiro Yasuda and Daigo Yanagimoto

Stn	Date	Time	Lat(deg)N	Lat(min)E	Lon(deg)	Lon(min)
FL2	20190421	1931	40	27.9751	143	40.5484
C04	20190422	2138	39	59.5576	144	50.7215

### 5. Underway-VMP observations across the frontal regions

Sachihiko Itoh, Ichiro Yasuda, KoengJong Lee, Mamoru Tanaka

Stn	Date	Time	Lat(deg)	Lat(min)	Lon(deg)	Lon(min)
1	20190423	1641	38	29.7013	142	59.7837
2	20190423	1730	38	29.9341	142	58.1438
3	20190423	1755	38	29.9377	142	56.4571
4	20190423	1819	38	29.9452	142	54.8669
5	20190423	1842	38	29.9465	142	53.304
6	20190423	1909	38	29.9657	142	51.3009
7	20190423	1933	38	30.0066	142	49.5382
8	20190423	1959	38	30.005	142	47.5592
9	20190423	2026	38	30.005	142	45.6908
10	20190423	2050	38	30.005	142	43.8407
11	20190424	31	38	30.024	142	41.8108
12	20190424	54	38	29.9895	142	40.3267
13	20190424	117	38	29.9991	142	38.756
14	20190424	141	38	30.0028	142	37.2414
15	20190424	204	38	30.0025	142	35.6673
16	20190424	228	38	29.9995	142	34.1276

Stn	Date	Time	Lat(deg)	Lat(min)	Lon(deg)	Lon(min)
1	20190427	448	37	45.03	142	14.88
2	20190427	509	37	45.66	142	13.65
3	20190427	532	37	46.2897	142	12.39
4	20190427	553	37	46.92	142	11.15
5	20190427	616	37	47.58	142	9.83
6	20190427	637	37	48.18	142	8.59

Stn	Date	Time	Lat(deg)	Lat(min)	Lon(deg)	Lon(min)
7	20190427	744	37	48.9364	142	7.1052
8	20190427	806	37	49.59	142	5.8
9	20190427	828	37	50.2984	142	4.4333
10	20190427	853	37	51.0463	142	2.92
11	20190427	917	37	51.7898	142	1.5027
12	20190427	942	37	52.5036	142	0
13	20190427	1006	37	53.2078	141	58.5882
14	20190427	1031	37	53.928	141	57.143
15	20190427	1052	37	54.5709	141	55.847
16	20190427	1115	37	55.2085	141	54.5627
17	20190427	1138	37	55.8305	141	53.3092
18	20190427	1200	37	56.4722	141	52.0475
19	20190427	1216	37	56.914	141	51.1806
20	20190427	1231	37	57.3419	141	50.3281
21	20190427	1245	37	57.7199	141	49.5516
22	20190427	1259	37	58.1146	141	48.7535
23	20190427	1314	37	58.5514	141	47.9184
24	20190427	1329	37	58.9493	141	47.1107
25	20190427	1343	37	59.349	141	46.2672

## 6. SeaGlider observation: deploy two Seagliders

Daisuke Hasegawa and Takahiro Tanaka

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)	
C01	190420	1139	38	29.9971	143	0.0233	deploy

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)	
FL	190421	807	40	27.3769	143	42.2937	deploy

## 7. Sonar Observations across fronts:

Takahiro Tanaka and Daisuke Hasegawa

Sonar observation

Date(JST)	hh(JST)	Log
2019/4/22	1:57:30	雑音測定発信・収録開始（ファイル名：KS1906-Noise）。電磁ログ使用のため、ADCP 含め音響装置の使用なし
2019/4/22	2:00:00	停船。推進機、スラスタ回転数0。本船にクラッチなし
2019/4/22	2:05:20	回転開始。観測時の状態にしよう
2019/4/22	2:09:19	停船。推進機 42rpm。スラスタは回転数までは分ならず。

(8%?)

2019/4/22	2:14:45	船速増速開始
2019/4/22	2:19:05	対水3ノット。行き。推進機 63rpm (02:29:30 終了)
2019/4/22	2:36:20	対水3ノット。帰り。推進機 58rpm (02:46:30 終了)
2019/4/22	2:56:15	対水8ノット。行き。推進機 136rpm (03:06:30 終了)
2019/4/22	2:11:15	対水8ノット。帰り。推進機 137rpm (03:21:30 終了)
2019/4/22	2:28:50	対水10ノット。行き。推進機 168rpm (03:39:00 終了)
2019/4/22	3:43:10	対水10ノット。帰り。推進機 168rpm (03:53:30 終了)

Date(JST)	hh(JST)	Log
2019/4/23	23:30:25	魚探観測テストスタート (ファイル名 : KS1906_test)
2019/4/24	0:48:30	テスト収録終了
2019/4/24	0:51:00	収録スタート (ファイル名 : KS1906)。
2019/4/24	6:14:00 頃	U-VMP 観測終了。グライダー回収へ。他の音響装置 ON にする。
2019/4/24	7:30:00 頃	グライダー回収。U-VMP 測線へ。
2019/4/24	9:19:00 頃	ドップラーソナー停止
2019/4/24	11:55:00 頃	ドップラーソナーON。しばらくして収録停止

Date(JST)	hh(JST)	Log
2019/4/26		同期装置の設定を行った。 (魚探) インターバル : 1.5sec.、Delay : 0sec. (ADCP) インターバル : 1.5sec.、Delay : 700msec. (PDR) インターバル : 10sec.、Delay : ? パルス幅は全て 100msec.。ADCP はブロードバンド、層厚 8 m、100層に設定。
2019/4/27	8:13:05	収録開始 (ファイル名 : KS1906_2)
2019/4/27	12:00:00 頃	船のドップラー有。XCTD を打ちながら 37°45'N、142°15'E へ測線折り返し。船のドップラー切。
2019/4/27	13:48:10	U-VMP 開始したが、ウインチ不調 etc.のため、一時中断
2019/4/27	22:55:00 頃	U-VMP 開始。石巻湾へ。
2019/4/27	23:13:55	16時~16時半まで停船し、ノルパック観測。船のドップラー入れた。
		U-VMP 揚収
		収録終了

#### NORPAC net sampling

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)
C01	20190423	2349	38	30.0261	142	41.9109
UVMP2	190427	707	37	48.8618	142	7.0858

#### 8. FRRF observation for ecosystem analysis

KoengJong Lee and Ichiro Yasuda

Stn	Date	Time	Lat(deg)	Lat(min)	Lon(deg)	Lon(min)	Bottom Depth
C01	20190420	1301	38	30.107	142	59.7	1767
C02	20190422	513	39	59.27	142	59.29	1290

#### 9. Fast-response thermistor observations and calibration of time constants with VMP500

Ichiro Yasuda, KoengJong Lee, Mamoru Tanaka

Stn	Date	Time	Lat(deg)N	Lat(min)	Lon(deg)E	Lon(min)
C01	20190420	1538	38	30.1937	142	59.7915
FL1	20190421	1200	40	27.6932	143	42.128
FL2	20190421	1334	40	27.7057	143	42.1587
FL3	20190421	1502	40	27.702	143	42.1038
C02	20190422	349	39	59.7419	142	59.8523
C03	20190422	1123	39	59.9527	144	6.0067
C04	20190423	418	39	59.96	144	50.96
K1_1	20190425	736	38	28.0032	141	479,382
K1_2	20190425	745	38	27.9532	141	48

#### 10. XCTD observations for front descriptions

Ichiro Yasuda, Koengjong Lee

Stn	Date	Time	Lat (deg)N	Lat (min)	Lon (deg) E	Lon (min)
X1	20190427	83923	37	59.9912	141	45.0012
X2	20190427	85454	37	58.4994	141	48.0001
X3	20190427	91055	37	56.9725	141	51.0316
X4	20190427	92557	37	55.51	141	54.0034
X5	20190427	94128	37	54.0041	141	56.993
X6	20190427	95707	37	52.5062	142	0.0032
X7	20190427	101238	37	51.0087	142	2.9992
X8	20190427	102809	37	49.5034	142	6.0105
X9	20190427	104308	37	47.9919	142	9.0048
X10	20190427	105819	37	46.5006	142	11.9972
X11	20190427	111338	37	45.0061	142	15.0001

#### •Event Log during the cruise

Date	Time(JST)		Lat			Lg			Depth	Stn	Comments
190419	1630	+9:00	35	0.3734	N	139	42.0574	E	0		
190420	2039	+9:00	38	29.9971	N	143	0.0233	E	1782.9	C01	RELEASED GLIDER
190420	2046	+9:00	38	30.0084	N	142	59.9613	E	1780.5	C01	RELEASED GLIDER
190420	2154	+9:00	38	30.1373	N	142	59.6742	E	1764.9	C01	STARTED CTD
190420	2240	+9:00	38	29.9027	N	142	59.9268	E	1784	C01	CTD DEEPEST

190421	6	+9:00	38	29.4569	N	143	0.271	E	1816.6	C01	FINISHED CTD
190421	35	+9:00	38	30.1986	N	142	59.7347	E	1765.9	C01	STARTED VMP500
190421	132	+9:00	38	30.0317	N	143	0.0411	E	1782.6	C01	FINISHED VMP500
190421	1433	+9:00	40	26.5131	N	143	41.2925	E	2796.5	FL	Recovered Float
190421	1549	+9:00	40	27.5358	N	143	42.3259	E	2953.9	FL	Started VMP6000 test
190421	1600	+9:00	40	27.5812	N	143	42.2809	E	2954.7	FL	Finished VMP6000 test
190421	1626	+9:00	40	27.5482	N	143	42.3309	E	2956	FL	Started VMP6000 test
190421	1653	+9:00	40	27.404	N	143	42.3046	E	2941	FL	Finished VMP6000 test
190421	1707	+9:00	40	27.3769	N	143	42.2937	E	2938.4	FL	RELEASED GLIDER(T-GL)
190421	1745	+9:00	40	27.5695	N	143	42.3197	E	2956.9	FL	STARTED CTD
190421	1854	+9:00	40	27.4558	N	143	42.1546	E	2930.9	FL	CTD DEEPEST
190421	1959	+9:00	40	27.4438	N	143	41.8052	E	2915	FL	FINISHED CTD
190421	2026	+9:00	40	27.5657	N	143	42.2568	E	2950.5	FL	RELEASED GLIDER
190421	2056	+9:00	40	27.6826	N	143	42.1558	E	2959.5	FL	STARTED VMP500
190421	2148	+9:00	40	27.781	N	143	41.7611	E	2893.8	FL	FINISHED VMP500
190421	2230	+9:00	40	27.7029	N	143	42.2125	E	2964.8	FL	STARTED VMP500
190421	2323	+9:00	40	27.7953	N	143	41.8316	E	2900.3	FL	FINISHED VMP500
190422	0	+9:00	40	27.6861	N	143	42.1475	E	2959.2	FL	STARTED VMP500
190422	101	+9:00	40	28.3801	N	143	40.6256	E	2741.3	FL	FINISHED VMP500
190422	200	+9:00	40	28.402	N	143	40.4147	E	0	FL	Started FishFinder noise test
190422	356	+9:00	40	28.1831	N	143	40.112	E	2696.9	FL	FinishedFishFinder noise test
190422	430	+9:00	40	27.9884	N	143	40.5342	E	2748.1	FL	Released VMP5500
190422	445	+9:00	40	27.7878	N	143	40.7163	E	2780.7	FL	STARTED CTD
190422	548	+9:00	40	27.9603	N	143	40.7366	E	2772.1	FL	CTD DEEPEST
190422	659	+9:00	40	28.3768	N	143	40.6276	E	2740.8	FL	FINISHED CTD
190422	725	+9:00	40	28.1837	N	143	39.9629	E	2681.2	FL	Recovered VMP5500
190422	835	+9:00	40	27.7697	N	143	38.6088	E	2560.8	FL	RECOVERED GLIDER(A-GL)
190422	1238	+9:00	39	59.8586	N	142	59.89	E	1285.1	C02	STARTED VMP500
190422	1345	+9:00	39	58.9128	N	142	59.3617	E	1295.7	C02	FINISHED VMP500
190422	1407	+9:00	39	59.2203	N	142	59.3435	E	1293.5	C02	STARTED CTD
190422	1445	+9:00	39	59.5304	N	142	59.0919	E	1290.8	C02	CTD DEEPEST
190422	1521	+9:00	39	59.7799	N	142	59.0098	E	1289.6	C02	FINISHED CTD

190422	2024	+9:00	39	59.9448	N	144	6.0139	E	5076.2	C03	STARTED VMP500
190422	2111	+9:00	39	58.8113	N	144	7.2185	E	5246.8	C03	FINISHED VMP500
190422	2144	+9:00	39	59.9596	N	144	6.0097	E	5065.6	C03	STARTED CTD
190423	19	+9:00	39	58.6457	N	144	7.0441	E	5213	C03	CTD DEEPEST
190423	244	+9:00	39	57.3245	N	144	8.034	E	5515.4	C03	FINISHED CTD
190423	638	+9:00	39	59.5594	N	144	50.7213	E	5830.7	C04	LET GO VMP5500
190423	658	+9:00	39	59.9644	N	144	50.3905	E	5838.9	C04	STARTED CTD
190423	928	+9:00	39	59.7527	N	144	50.4689	E	5835	C04	CTD DEEPEST
190423	1242	+9:00	39	59.913	N	144	50.8021	E	5822.5	C04	FINISHED CTD
190423	1300	+9:00	40	0.0103	N	144	50.9118	E	5816.8	C04	RECOVERED VMP5500
190423	1315	+9:00	39	59.9804	N	144	51.0033	E	5811.8	C04	STARTED VMP500
190423	1409	+9:00	39	59.8951	N	144	50.5973	E	5831.4	C04	FINISHED VMP500
190424	229	+9:00	38	29.9376	N	142	58.2153	E	0	C01	Started U-VMP
190424	620	+9:00	38	30.0309	N	142	41.8454	E	0	C01	Finished U-VMP
190424	756	+9:00	38	29.4407	N	142	35.8501	E	0	C01	Finished U-VMP
190424	849	+9:00	38	30.0261	N	142	41.9109	E	0	C01	STARTED TWIN NORPAC NET
190424	903	+9:00	38	30.0083	N	142	41.918	E	0	C01	FINISHED TWIN NORPAC NET
190424	931	+9:00	38	30.0231	N	142	41.845	E	0	C01	Started U-VMP
190424	1154	+9:00	38	30.0138	N	142	32.7774	E	0	C01	Finished U-VMP
190425	1633	+9:00	38	28.0196	N	141	47.9789	E	0	K1_1	STARTED VMP500
190425	1645	+9:00	38	27.9538	N	141	47.8173	E	172.35	K1_1	FINISHED VMP500
190425	1645	+9:00	38	27.9519	N	141	47.8131	E	172.54	K1_2	STARTED VMP500
190425	1650	+9:00	38	27.9142	N	141	47.7495	E	171.85	K1_2	FINISHED VMP500
190427	839	+9:00	37	59.9834	N	141	45.0273	E	175.26	X1	LET GO XCTD
190427	855	+9:00	37	58.4823	N	141	48.0357	E	256.89	X2	LET GO XCTD
190427	911	+9:00	37	56.9384	N	141	51.0998	E	302.41	X3	LET GO XCTD
190427	926	+9:00	37	55.5037	N	141	54.0163	E	370.35	X4	LET GO XCTD
190427	941	+9:00	37	54.0007	N	141	56.9993	E	477.75	X5	LET GO XCTD
190427	957	+9:00	37	52.5076	N	141	59.9999	E	510.61	X6	LET GO XCTD
190427	1012	+9:00	37	51.0055	N	142	3.0057	E	556.65	X7	LET GO XCTD
190427	1028	+9:00	37	49.4967	N	142	6.0238	E	598.13	X8	LET GO XCTD
190427	1043	+9:00	37	47.9969	N	142	8.9949	E	654.63	X9	LET GO XCTD

190427	1058	+9:00	37	46.4926	N	142	12.0138	E	724.04	X10	LET GO XCTD
190427	1113	+9:00	37	45.0033	N	142	15.0068	E	0	X11	LET GO XCTD
190427	1346	+9:00	37	44.98	N	142	14.9811	E	788.43	UVMP2	Started U-VMP & FishFinder Obs.
190427	1607	+9:00	37	48.8618	N	142	7.0858	E	614.25	UVMP2	STARTED TWIN NORPAC NET
190427	1626	+9:00	37	48.8195	N	142	6.7355	E	607.03	UVMP2	FINISHED TWIN NORPAC NET
190427	2255	+9:00	37	59.6877	N	141	45.5892	E	196.5	UVMP2	FINISHED UVMP

## ● 5. Notice on Using

All the data need careful treatment for calibrations, analysis and publish before public opening.

For data usage, inquire chief scientist for details

This cruise report is a preliminary documentation as of the end of cruise.  
This report is not necessarily corrected even if there is any inaccurate description (i.e. taxonomic classifications). This report is subject to be revised without notice. Some data on this report may be raw or unprocessed. If you are going to use or refer the data on this report, it is recommended to ask the Chief Scientist for latest status.  
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