Physical data report by station

Station n°143

LMD / UMR 8539 / Paris / France
LPO / UMR 6523 / Brest / France
IBENS / INSERM 1024 stations/ CNRS 8197 / Paris / France

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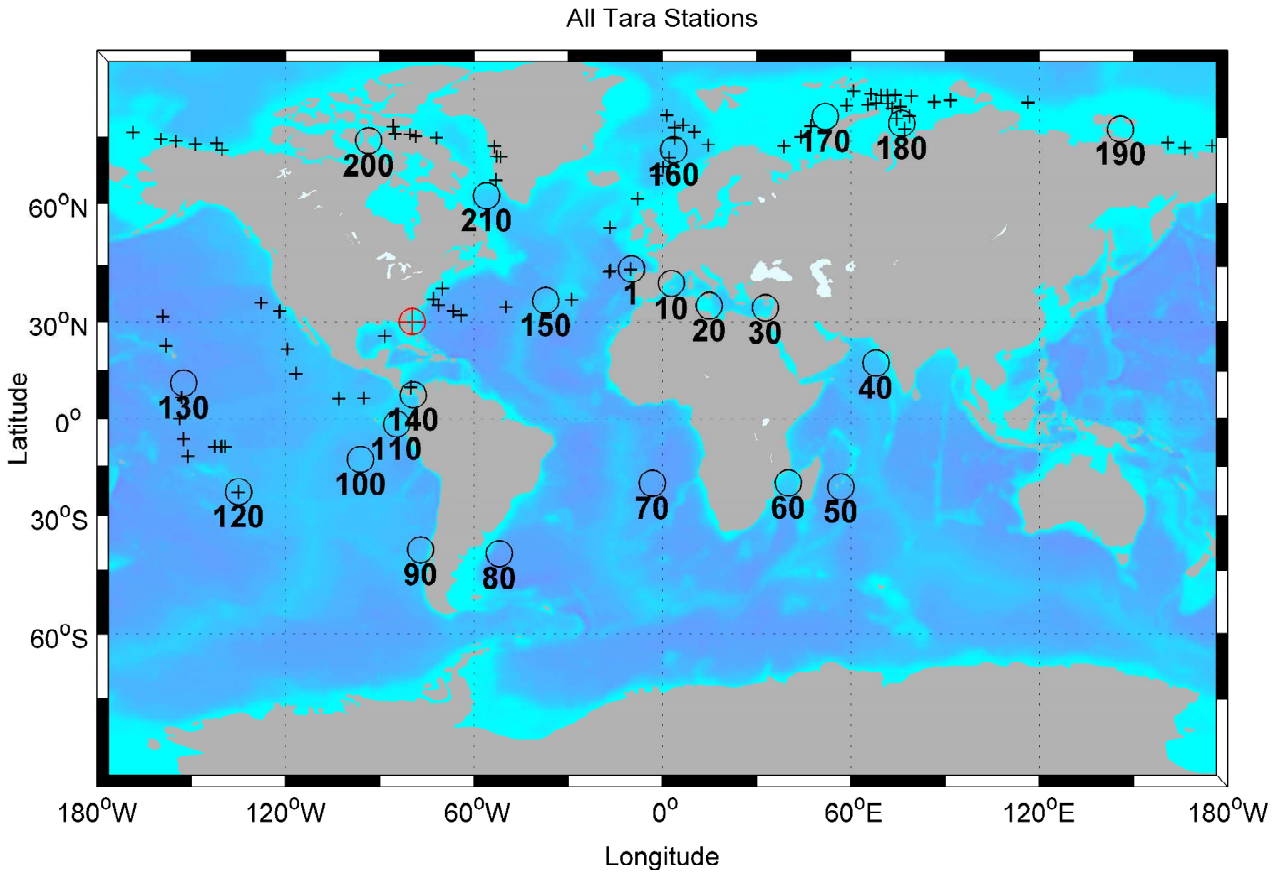

Contents

Station overview

We present here the geographical situation of the station and a quick overview of the physical data available. For more information please see the next sections. About availability in the table below, 1 means "available" and 0 "not available".

Station n°	143
Location	North Pacific Ocean
Date	16/1/2012
Mean Longitude	-79.7981°
Mean Latitude	30.3437°
CTDs profiles	10

Availability:	
UV Satellite fields	1
SST Satellite fields	1
SSS Satellite fields	1
SSH Satellite fields	1
CHL1 Satellite fields	1
Argo floats	1

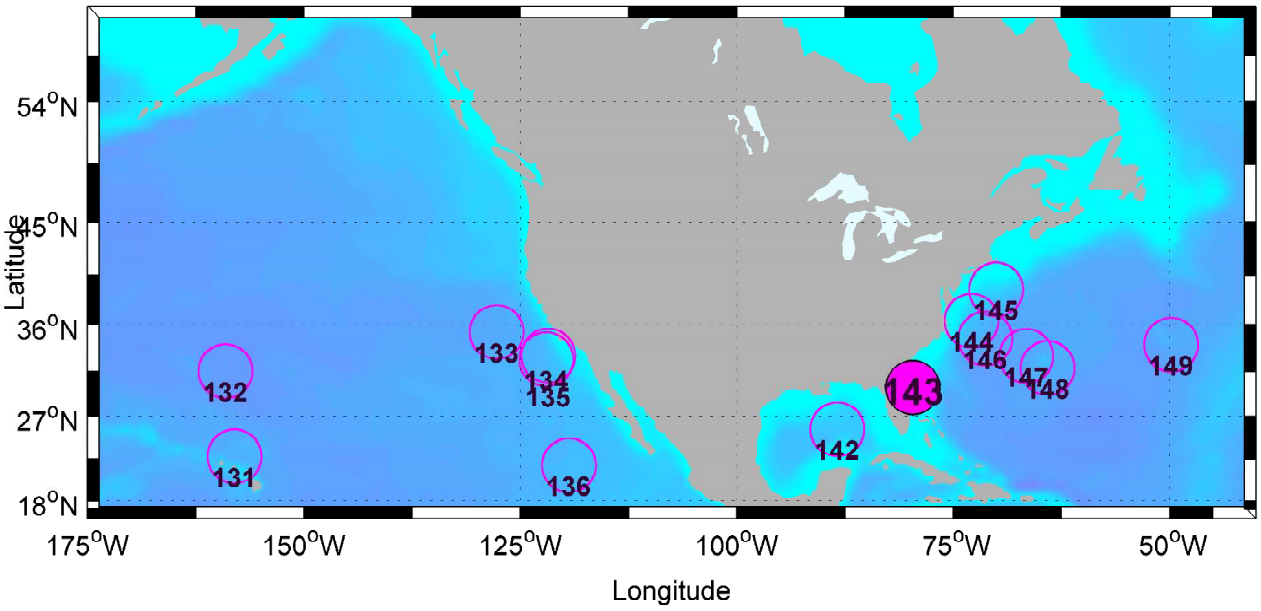

Figure 1: Filled magenta black circle indicate the station of this study.

1 Sea surface temperature, height and chlorophyll

1.1 Introduction

We present here several sea surface properties at the station position using satellite data (SSH $[m]$ in Fig.2 and Fig.3, the SST $[°C]$ in Fig.4 and Fig.5 and the CHL1 $[mg/m^3]$ in Fig.6 and Fig.7). We give definitions and information about these quantities below:

- Sea Surface Height (SSH): Maps of Absolute Dynamic Topography (MADT) from the global 1/4° (approx. $27km$) Daily Delayed Time Archiving Validation and Interpretation of Satellite Data in Oceanography (AVISO) field (Rio and Hernandez, 2004; Capet et al., 2014). The altimeter products were produced by Ssalto/Duacs and distributed by Aviso, with support from Cnes (`http://www.aviso.oceanobs.com/duacs/`).
- Sea Surface Temperature (SST): OSTIA uses satellite data provided by the GHRSST project, together with in-situ observations to determine the sea surface temperature. The analysis is performed using a variant of optimal interpolation (OI) described by Martin et al. (2007). The National Centre for Ocean Forecasting produces the analysis at a resolution of 1/20° (approx. $5km$). OSTIA data is provided in GHRSST netCDF format every day.
- Chlorophyll (CHL1): Weekly 1/10°Chlorophyll maps processed and distributed by ACRI-ST GlobColour service, supported by EU FP7 MyOcean & ESA GlobColour Projects, using ESA ENVISAT MERIS data, NASA MODIS and SeaWiFS data.

Legend In order to relieve figures we describe here their general legend:

- ● indicate the casts of Tara stations identified by their respective numbers.
- ○ are used to locate other Tara's stations around.
- □ refer to CTD profiles. When filled, each colour corresponds to a reference used in profiles plots (see CTD section) to make distinction between them.
- We indicate bathymetry by grey contours, horizontal geostrophic surface velocity field by dark arrows proportional to the current intensity, and SSH field by white contours.
- The ▼ is the nearest coast point (zlevel=0) of each ctd profile from etopo2 database
- When shown, ▽ represent Argo's data available around the mean longitude and latitude position of CTDs. We defined a box around the mean position with $\Delta X \pm 4°$ $lat - lon$ and $\Delta t \pm 15$ $julian\ days$. Argo's numbers are only an index.
- Date refers to the day when SST, SSH or Chlorophyll maps are available.

1.2 SSH maps

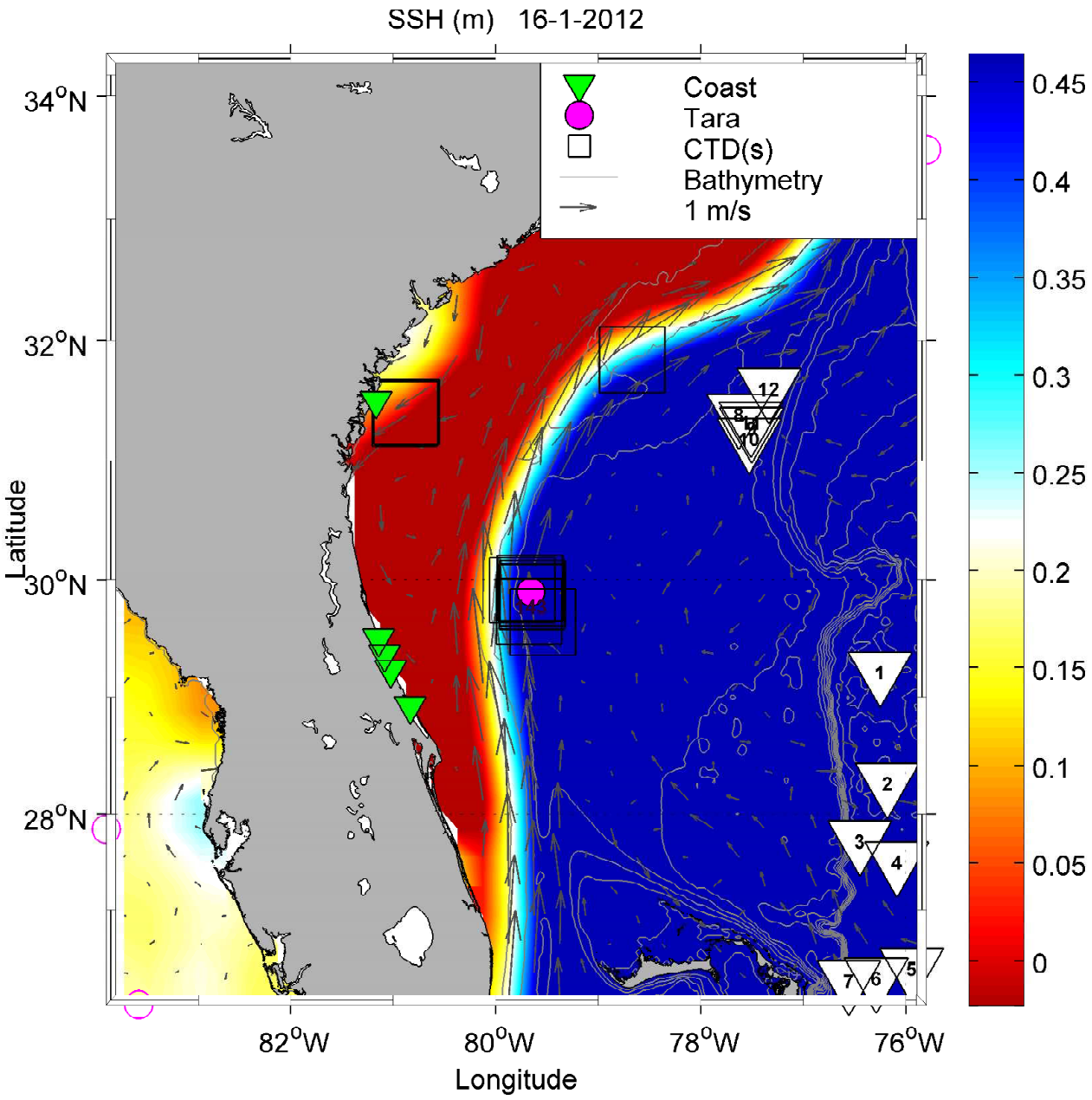

Figure 2: Description: see legend p. 14

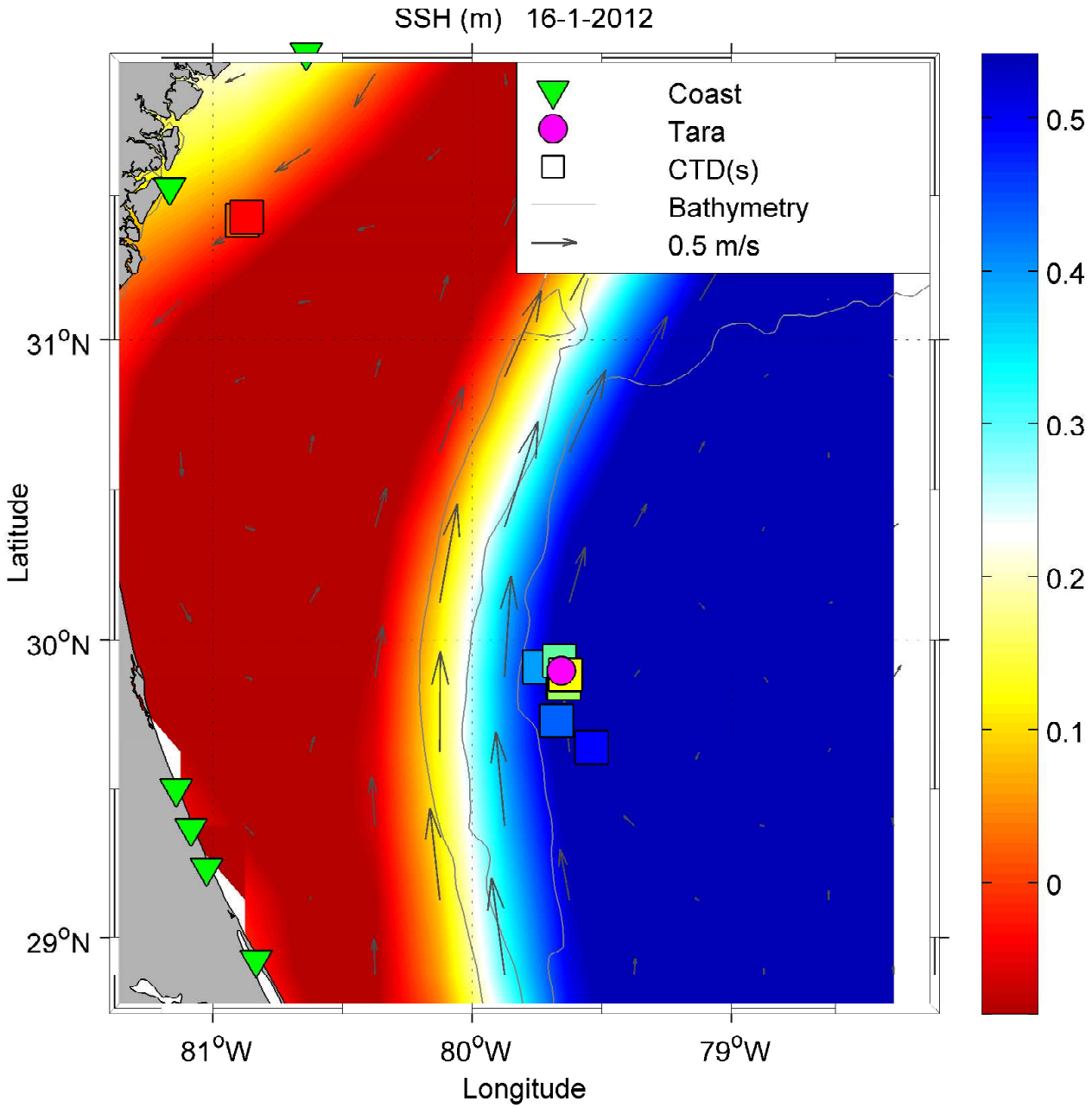

Figure 3: Description: see legend p. 14

1.3 SST maps

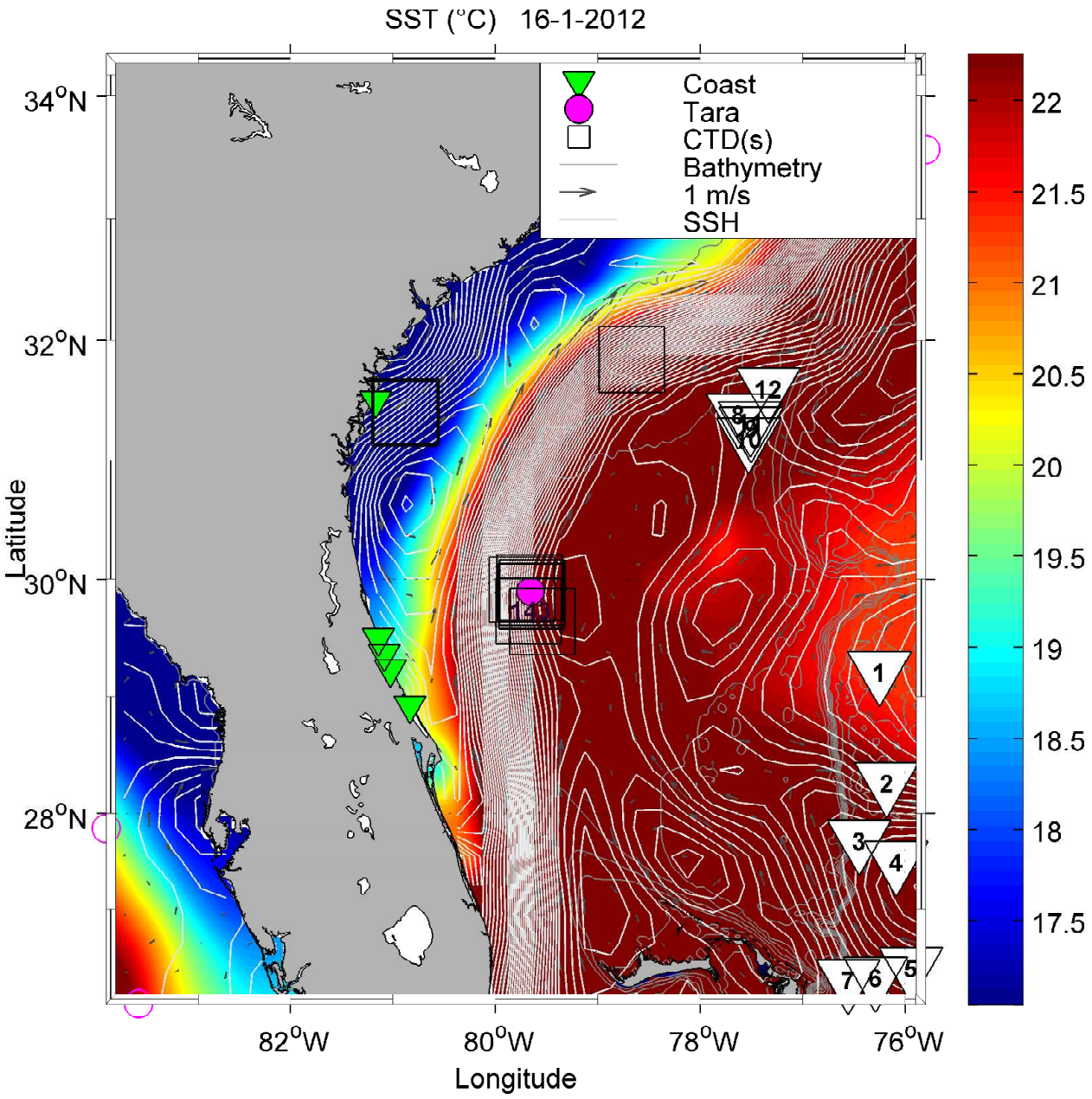

Figure 4: Description: see legend p. 14

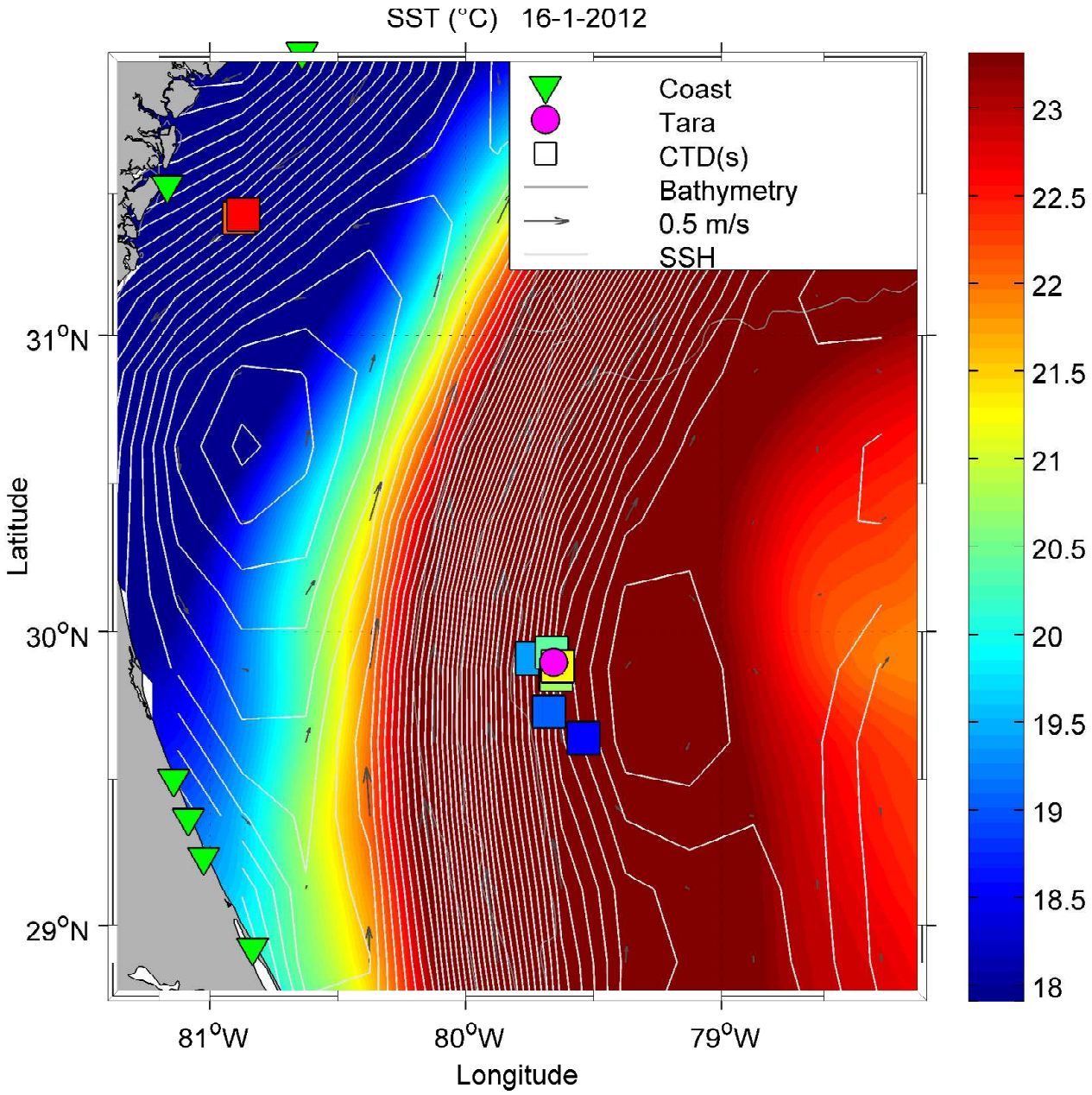

Figure 5: Description: see legend p. 14

1.4 Chlorophyl maps

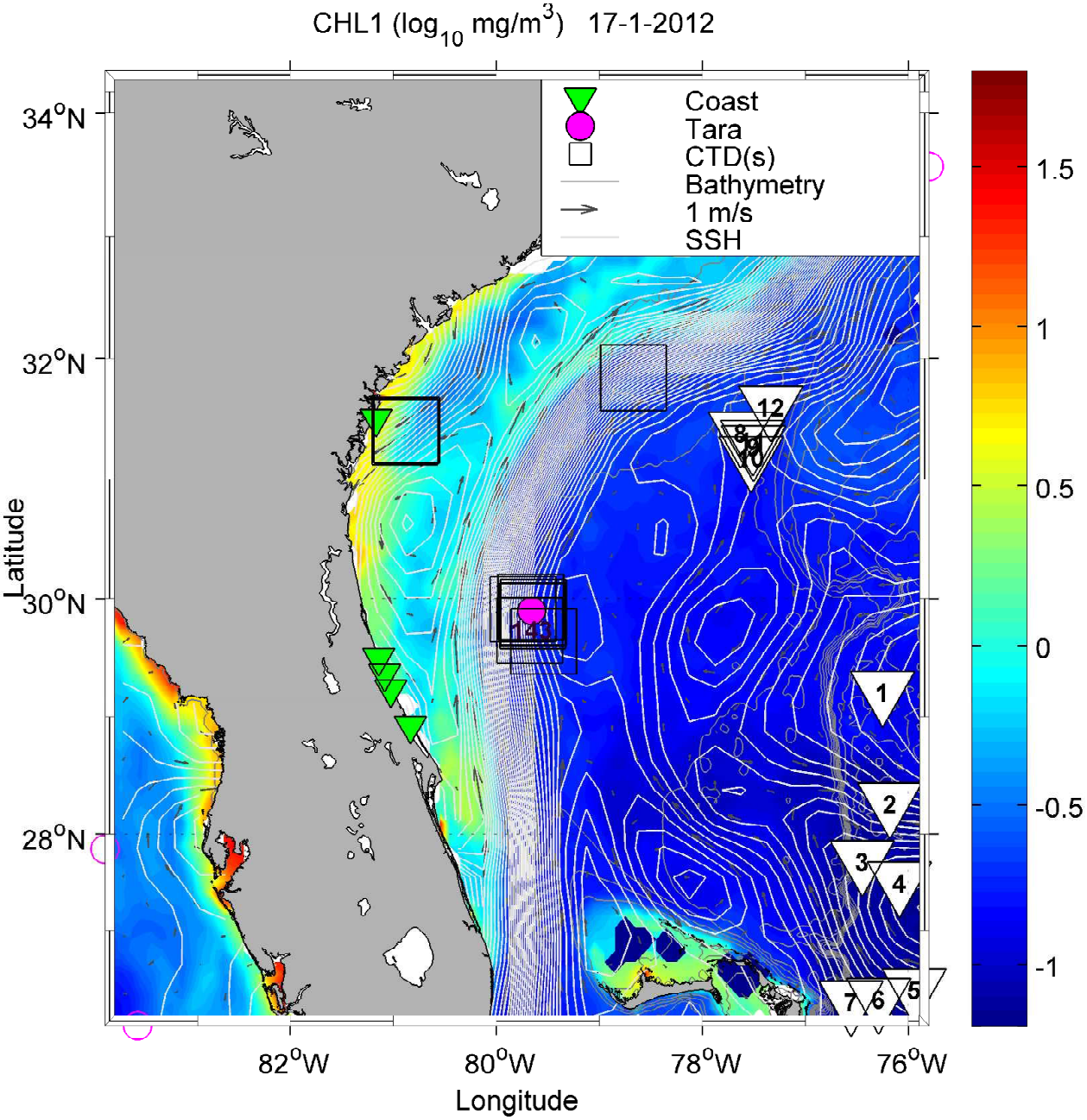

Figure 6: Description: see legend p. 14

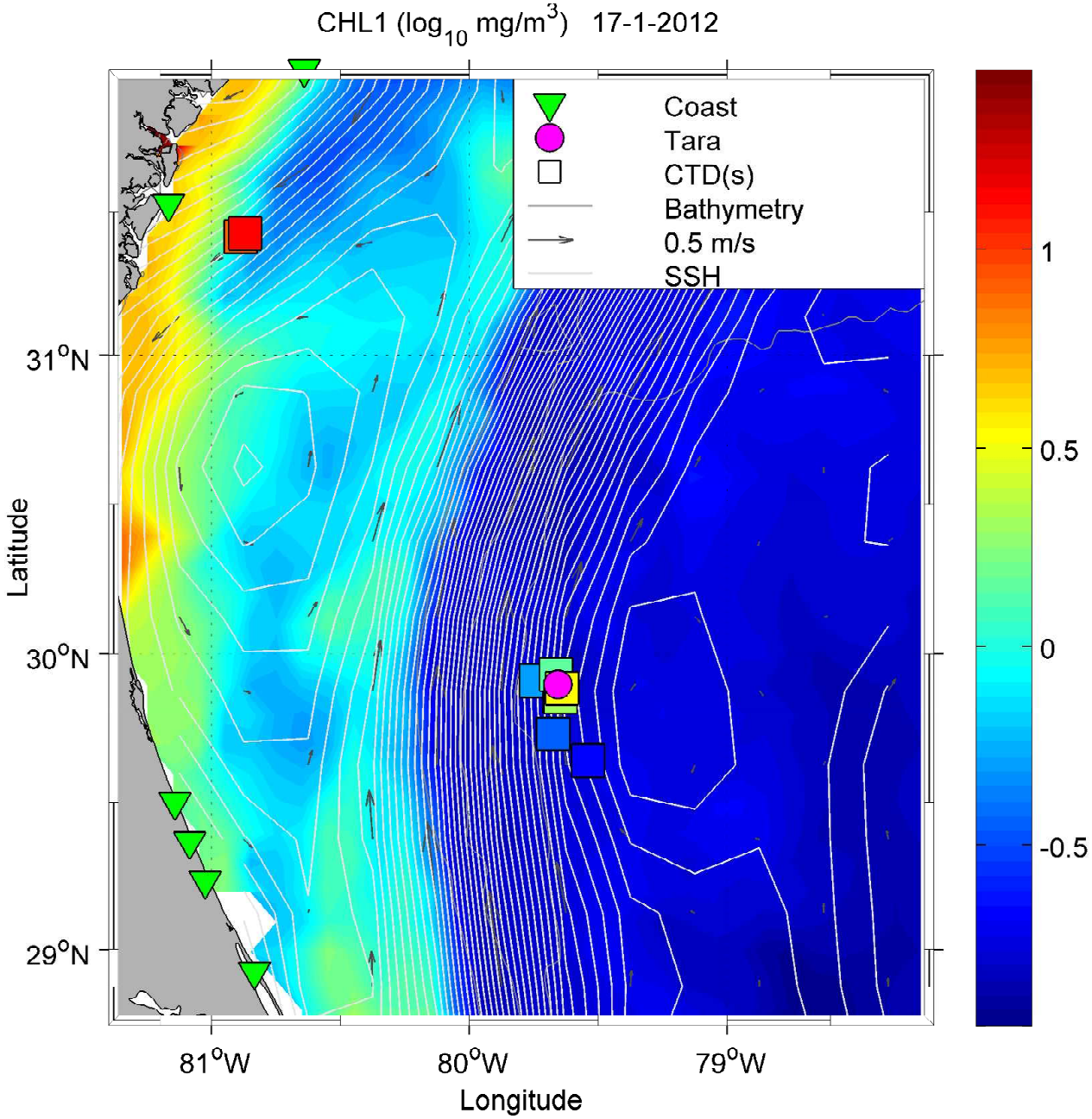

Figure 7: Description: see legend p. 14

2 TSG

2.1 Introduction

To complete the hydrological surface study, we use ThermoSalinoGraph (TSG) data measured by the Tara around the stations. Thermosalinographs are used to collect information about the sea surface, typically in flow-through systems operating continuously throughout a cruise.

We looked for the nearest TSG data available at $\Delta t \pm 15$ *julian days* around Tara stations. TSG data from the TARA OCEAN project (station 1 to 151) are validated but this is not the case of TSG data recorded during the TARA Porlar Cicle project that might present errors.32387 records satisfy these conditions. It is important to emphasize that TSG data are measure along the boat path whereas satellite data are snapshots.

TSG surface temperature is plotted over the Sea Surface Temperature measured by satellite and provided by OSTIA in figure 8.

TSG absolute salinity is plotted over the weekly Sea Surface Salinity data measured by Soil Moisture and Ocean Salinity (SMOS) mission in figure 9. The L3 SMOS data are available on the LOCEAN website (via a request form) but they still experience large biases and noise on various time and space scales. Nicolas KOLODZIEJCZYK work with a team at the LOCEAN to reduce these errors (see Hernandez et al. (2014), Kolodziejczyk et al. (2015b) and Kolodziejczyk et al. (2015a) for more information). These products are not perfect and large biases still exist but they are very promising. He gracefully gave us two types of corrected data for the context of this study:

- The most accurate set of data is composed of weekly map over the Atlantic (between 42N and 42S) with a resolution of 75 km for the period spanning from 2011 to 2013. Corrections are applied to reduce costal, large scale and seasonal orbit biases. An Optimal Interpolation using ISAS Argo interpolated products is performed.
- The other product is the 1/4 2days L3 SMOS data spanning from 30-Jun-2010 to 30-Aug-2014 on which a monthly filter and a systematic coastal bias correction are applied.

The Optimal interpolation product is not available for this station so the L3 band + coastal biais correction is ploted.

2.2 TSG Temperature maps

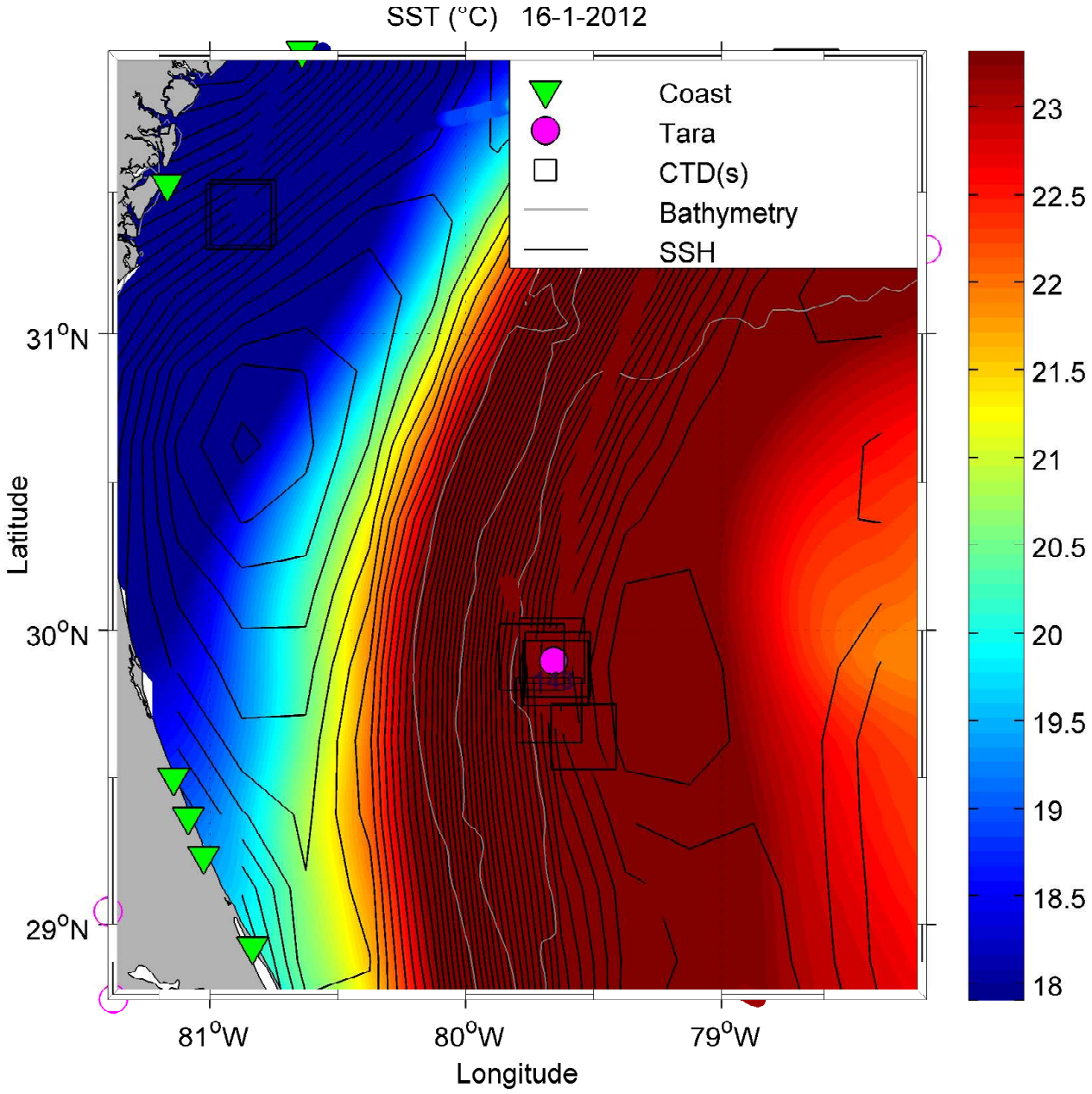

Figure 8: Description: see legend p. 14

2.3 TSG Salinity maps

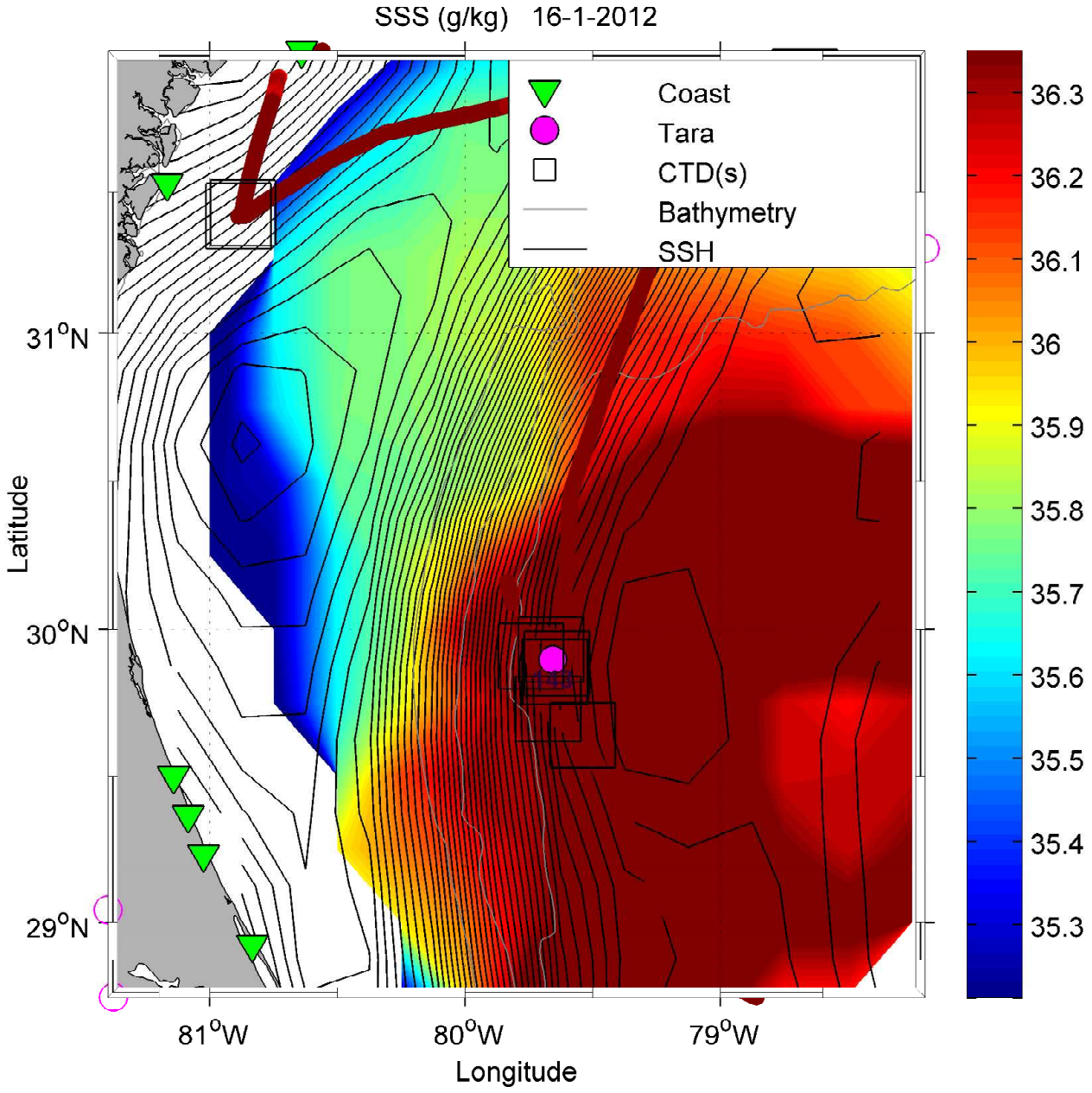

Figure 9: Description: see legend p. 14

3 Conductivity, Temperature and Depth (CTD) measurements

3.1 Introduction

In this study, CTD's measurements have been realized by a `Seabird vertical profiler`. The CTD profiles shown here are provided by the Villefranche Oceanographic Laboratory (LOV), Villefranche-Sur-Mer, France (http://www.obs-vlfr.fr/LOV/ZooPart/Portal/). Moreover, vertical profiles of Nitrate and Oxygen are provided. Additional quantities like salinity or density are then inferred using the Gibbs SeaWater (GSW) Oceanographic Toolbox (`http://www.teos-10.org/pubs/gsw/html/gsw_contents.html`).

For the Tara station n143, 10 CTD profiles are available. We calculate the potential density σ_0 referred to surface and the Brunt-Vaisala frequency (N^2). This one is a pulsation known as the "Brunt-Vaisala frequency" (s^{-2}), and given by:

$$N^2(z) = -\frac{g}{\rho_*}\frac{d\sigma}{dz} \tag{1}$$

where g is the vertical component of gravity, ρ_* a constant density value, d/dz the vertical derivative operator and σ the potential density (we use here σ_0). For more information please refer to Gerkema and Zimmerman (2008) (Eq. 3.18, p. 48 in the book). For each profile, $N^2(z)$ is calculated with a finite differences numerical scheme using $dz = 1m$. When calculated, $N^2(z)$ is averaged with a running median window on $30dbar$ (± 5 $dbar$, centred) to filter noise at small vertical scales (~ 1 m).

We calculate the depth of mixed layer using two definitions given by De Boyer Montégut et al. (2004) to determine the MLD (m). Given a potential temperature profile $\theta(z)$ or a potential density profile $\sigma(z)$, we calculate z for which:

$$|\theta(z) - \theta(10m)| \leq 0.2\ ^\circ C \tag{2}$$

$$|\sigma(z) - \sigma(10m)| \leq 0.03\ kg/m^3 \tag{3}$$

Profiles and $\theta - S$ diagrams are presented on Fig. 10 and 11. Colors are used to distinct each CTD profile (dark blue for the first to red for the last one, "jet colorbar-like": dark blue, blue, light blue, cyan, green, yellow, orange, dark orange, red, dark red). Filled circles represent the bottle depths. We give bottles depths, and we calculate the N^2 and fluorescence maximum depths. We give the values of N^2 at all these different depths. Results are given in the Tab. 1

Several indices were computed to describe the context of CTD sampling. A season flag and a position in the season are given for each ctd sample. 4 "submesoscale" structures indices were computed at each ctd location from Satellite data. The intensity of the STT gradient and the intensity of the geostrophic currents are directly understandable. Strain rate is linked to the derivative of geostrophic current [see Waugh et al. (2006)] and Lyapunov exponent (computed by F.D'Ovidio [see d'Ovidio et al. (2004)])is a measure of the presence of a transport front where values in excess of 0.1 day-1 are typically fronts.

Legend In order to relieve figures we describe here their general legend:

- For each CTD we give the Tara's cast's number, CTD number, the bottom depth inferred from `eTopo2` bathymetry product, the distance, azimuth and position of nearest coast point (also inferred from etopo).
- Time information are then presented by giving the date in classic and julian format. Two season indices are presented: the season and the position in this season
- We give the fluo value at Max_{Fluo} depth, and a simple sum of fluo along vertical profile (from 1 to 200m, when possible).
- "Submesoscale" indices computed from satellite data are then presented.

- Ctd properties are then computed at precise depths: MLD_θ, MLD_σ, Max_{Fluo}, Max_{N^2} and each bottle depth.

3.2 CTD profiles

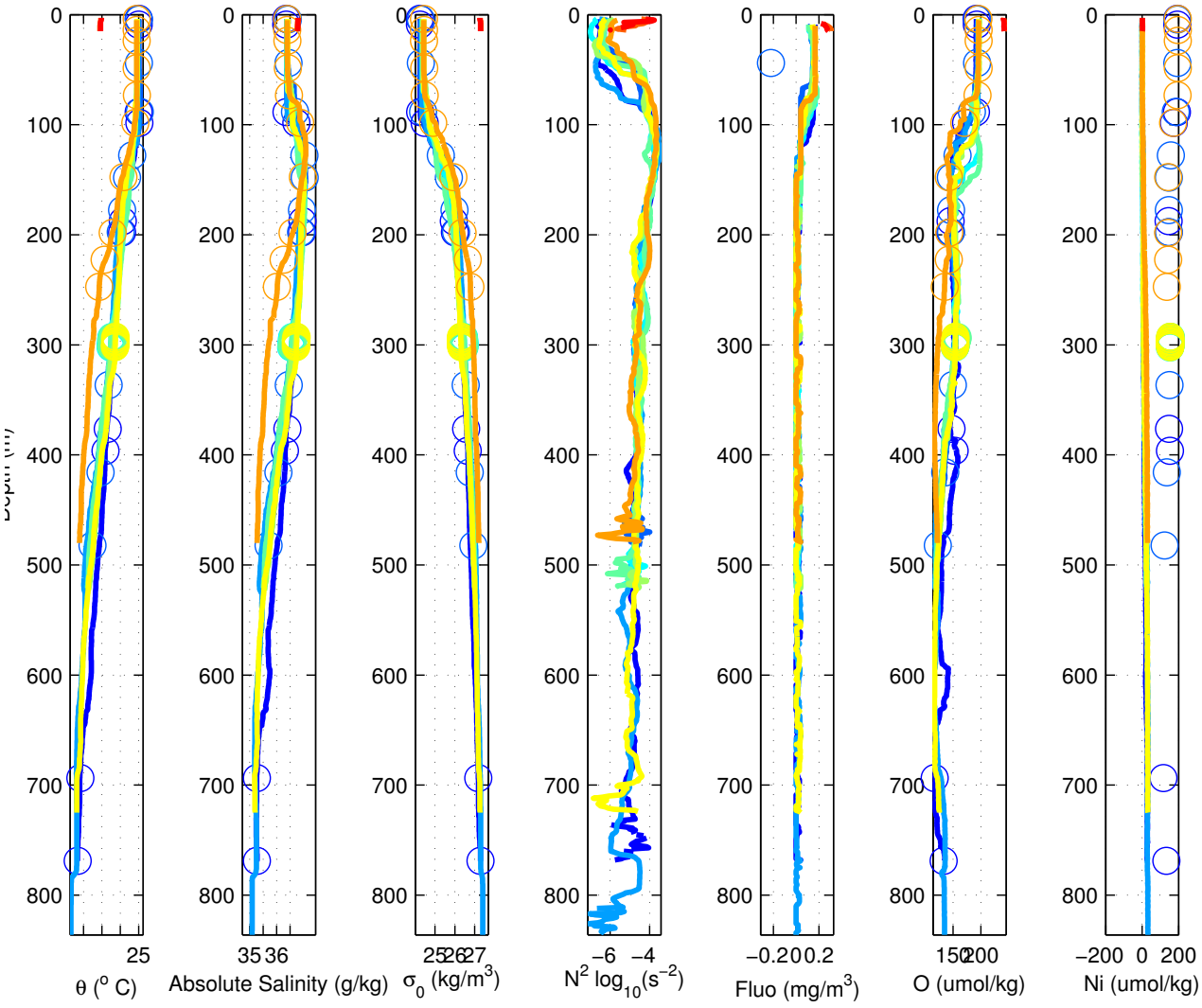

Figure 10: Description: see paragraph p. 14

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3.3 CTD $\theta - S$ diagrams

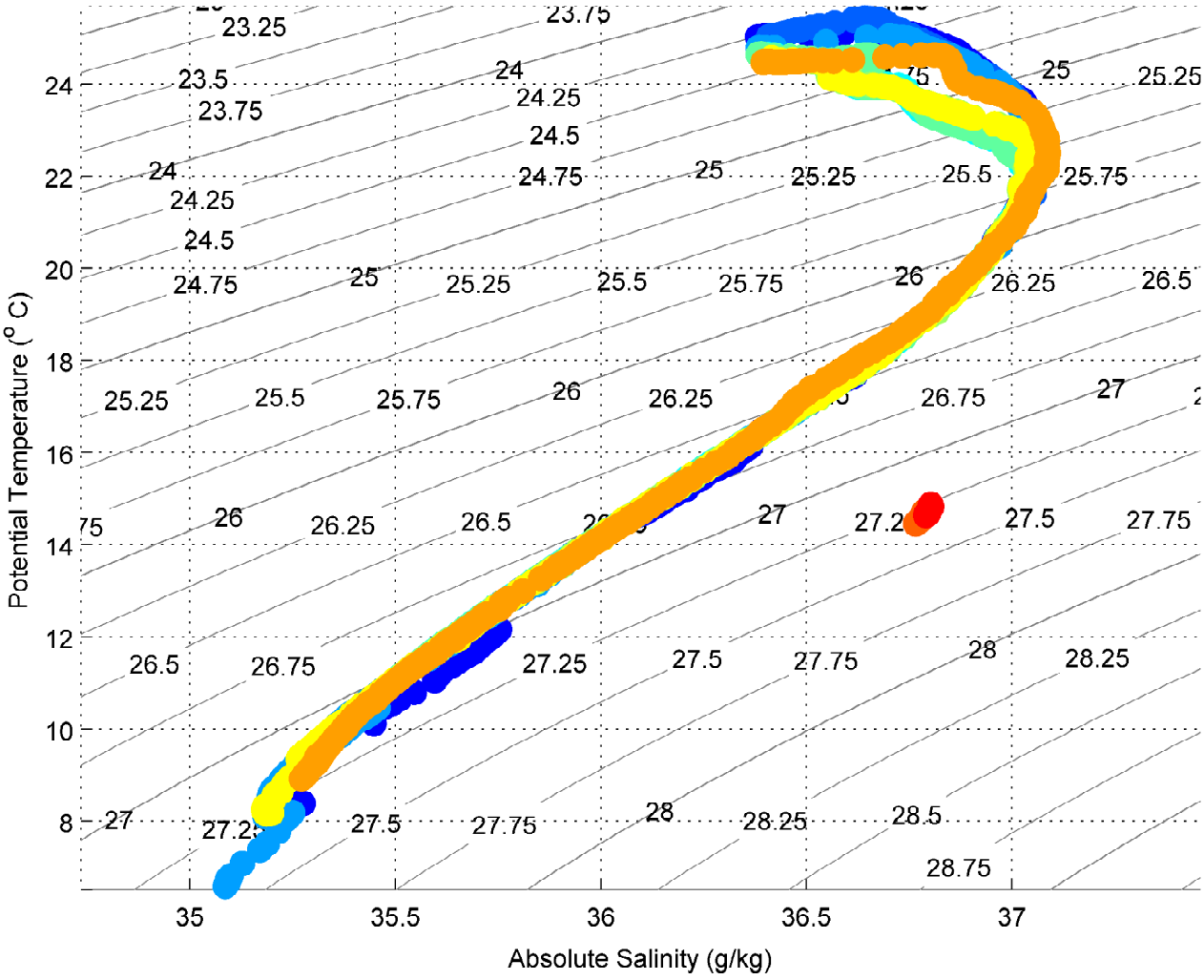

Figure 11: Description: see paragraph p. 14

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3.4 Water column characterization from CTD measurements

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	1	-79.5395	29.6394	769	-801	149/238	-80.8333	28.925

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
16	1	2012	2455943	1	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.16578	14	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
1.6336	0.53225	0.00045414	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	24.9927	36.3841	24.2633	3.1121e-07	0.16578	191.6912	-0.99583
Max	769	8.4525	35.2685	27.2999	NaN	0.00086291	133.9344	26.8039
MLD_σ	94	25.0553	36.4184	24.2757	0.00010086	0.14889	180.7219	0.98318
MLD_θ	109	24.839	36.8381	24.6585	0.00030958	0.11119	159.3378	1.0114
Max_{N2}	127	23.912	36.9818	25.0474	0.0001015	0.040949	155.2072	2.3856
Max_{Fluo}	14	25.0094	36.3832	24.2578	NaN	0.16578	191.9686	-0.15797
Max_O	16	25.0123	36.3828	24.2568	1.2608e-07	0.16359	191.648	0.79082
Min_O	656	9.818	35.339	27.1334	2.2368e-06	0.004804	115.3425	28.6762
$Depth\ Nitro$	639	10.6181	35.4908	27.1134	6.7367e-06	0.011278	125.2344	23.6134
B i1	776	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i2	700	9.0767	35.2589	27.1934	1.8085e-06	0.024776	118.1555	30.5752
B i3	400	15.9133	36.3218	26.6721	NaN	0	157.0258	11.8193
B i4	380	16.2839	36.3522	26.6093	2.7177e-05	0	145.8525	12.2726
B i5	200	20.4447	36.9527	26.0139	9.0906e-05	0.010357	147.1412	6.4559
B i6	190	20.6496	36.9585	25.9623	9.4833e-06	0.0096653	145.5214	6.4521
B i7	100	25.12	36.732	24.4921	0.00021672	0.1299	169.5135	2.8072
B i8	90	25.0559	36.4078	24.2671	1.5776e-05	0.14757	189.2891	1.2506
B i9	10	24.9927	36.3841	24.2633	3.1121e-07	0.16578	191.6912	-0.99583
B i10	5	25.0028	36.3835	24.2594	3.527e-07	NaN	191.901	1.2816

Table 1:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	2	-79.6747	29.7305	482	-801	142/247	-81.0242	29.2333

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
16	1	2012	2455943	1	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.15748	43	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
0.83966	0.884	0.00081156	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	25.0253	36.4099	24.2727	1.484e-06	0.12681	193.8214	0.80341
Max	482	12.4557	35.7082	26.9364	NaN	0.022239	122.9188	21.2955
MLD_σ	62	25.3307	36.569	24.302	8.9301e-05	0.13472	190.0158	1.3684
MLD_θ	106	24.8564	36.804	24.6273	0.00019874	0.040949	168.7617	2.5144
Max_{N2}	111	24.5774	36.8607	24.7552	0.00012342	0.040949	162.9692	2.6124
Max_{Fluo}	43	25.048	36.4174	24.2737	3.1338e-06	0.15748	193.1118	0.73723
Max_O	15	25.0238	36.4101	24.2737	3.0473e-07	0.12761	193.7278	-0.15791
Min_O	480	12.5474	35.719	26.9267	1.9041e-05	0.020205	122.5843	20.9386
$Depth\ Nitro$	109	24.6807	36.8405	24.7085	0.00035319	0.040949	167.5374	1.8426
B i1	487	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i2	420	14.6174	36.0665	26.7655	1.679e-05	0.0037299	135.3366	16.1582
B i3	340	16.8207	36.4492	26.5559	4.1244e-05	0.010167	147.9842	10.3515
B i4	200	20.2372	36.9311	26.0533	4.3439e-05	0	146.1595	5.934
B i5	180	20.6343	36.962	25.9686	3.6269e-05	0	146.0211	5.138
B i6	150	22.3246	37.0707	25.5789	0.00023365	0	145.1696	3.758
B i7	130	23.2795	37.0438	25.2812	0.00024148	0.040949	155.1581	1.1908
B i8	90	25.3027	36.6955	24.4078	1.8882e-05	0.040949	183.7118	1.265
B i9	45	25.0505	36.4192	24.2744	4.3811e-06	0.15314	193.0493	0.99824
B i10	5	25.0267	36.4108	24.2727	NaN	NaN	193.8774	0.020303

Table 2:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	3	-79.7414	29.9097	836	-802	143/252	-81.1417	29.5

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
16	1	2012	2455943	1	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.14757	14	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
0.37842	1.0944	0.00065927	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	24.7898	36.3852	24.3261	5.9974e-07	0.14757	195.0339	0.71614
Max	836	6.6645	35.0866	27.415	NaN	0	134.7501	32.5246
MLD_σ	94	24.8079	36.4222	24.354	0.00035316	0.11119	179.5949	0.75894
MLD_θ	112	24.6261	36.8487	24.7315	0.00010744	0.040949	170.4356	2.6827
Max_{N2}	126	23.3055	37.039	25.2697	0.0007605	0.035196	154.2199	3.7814
Max_{Fluo}	14	24.7861	36.3839	24.3265	4.8082e-08	0.14757	195.2092	1.1273
Max_O	14	24.7861	36.3839	24.3265	4.8082e-08	0.14757	195.2092	1.1273
Min_O	612	9.3365	35.2678	27.1567	4.7409e-05	0	115.2027	29.9669
$Depth$ $Nitro$	449	11.9053	35.6337	26.9839	NaN	0.032832	120.5233	24.3221
B i1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i3	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i4	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i5	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i6	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i7	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i8	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i9	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i10	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

Table 3:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	4	-79.6493	29.8556	520	-801	149/249	-81.0844	29.3667

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
17	1	2012	2455944	1	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.15804	72	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
1.2297	0.818	0.00077485	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	24.6212	36.3925	24.3828	1.9123e-07	0.11119	195.8603	-1.1963
Max	520	11.5644	35.5636	26.9955	NaN	0.0081898	120.2248	23.9231
MLD_σ	70	24.6258	36.4247	24.4096	0.00043537	0.15065	192.6599	-1.0154
MLD_θ	81	24.4423	36.5488	24.5592	3.6568e-05	0.16578	192.1833	-0.91175
Max_{N2}	138	22.98	36.9099	25.268	0.00035525	0.040949	177.135	0.11796
Max_{Fluo}	72	24.498	36.5379	24.5336	0.00030909	0.15804	192.5963	-0.83987
Max_O	31	24.6287	36.3921	24.3816	1.314e-07	0.14484	196.0574	0.030082
Min_O	518	11.5761	35.5652	26.9945	4.5272e-06	0.040949	120.0937	23.4682
$Depth$ $Nitro$	165	21.6883	37.0333	25.7313	2.9468e-05	0.0032113	154.6058	2.1222
B i1	305	17.4677	36.5586	26.4825	6.1492e-06	0	153.5974	8.8523
B i2	304	17.4789	36.5606	26.4813	8.5115e-06	0	153.4987	6.1936
B i3	303	17.4855	36.5621	26.4808	1.5865e-05	0	153.553	8.8066
B i4	302	17.5106	36.5666	26.4781	1.7456e-05	0.00011824	153.2209	9.5524
B i5	301	17.5174	36.5677	26.4772	5.3538e-06	0.00058618	153.9078	6.9539
B i6	300	17.5181	36.5676	26.477	1.5995e-06	0.0023795	154.0501	8.6553
B i7	299	17.5192	36.5679	26.4769	4.0329e-06	0.0023795	154.1235	9.6381
B i8	298	17.5273	36.5696	26.4762	6.7181e-06	0.0023795	154.3515	8.4675
B i9	297	17.5395	36.5728	26.4755	2.9465e-05	0.00072514	153.752	7.8732
B i10	296	17.5838	36.5799	26.4701	2.9665e-05	0.0023795	153.8223	9.4559

Table 4:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	5	-79.6635	29.9295	521	-803	151/252	-81.1417	29.5

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
17	1	2012	2455944	1	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.17277	66	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
1.1016	0.87553	0.00073215	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	24.6349	36.3831	24.3716	1.1689e-06	0.11119	196.509	0.61271
Max	521	11.1917	35.5087	27.0216	NaN	0.030187	119.0102	27.0459
MLD_σ	62	24.6401	36.3981	24.3847	0.00011933	0.15957	195.252	2.0022
MLD_θ	87	24.5089	36.6721	24.6323	0.00010831	0.11946	186.4836	1.2977
Max_{N2}	146	23.1323	36.8626	25.1884	0.00015762	0.040949	189.8033	0.97732
Max_{Fluo}	66	24.5618	36.5112	24.4938	0.00024596	0.17277	192.9625	-0.0029196
Max_O	122	23.4018	36.793	25.0556	3.4226e-05	0.040949	198.7156	1.1485
Min_O	518	11.2092	35.5121	27.021	7.0427e-06	0	118.8256	26.0837
$Depth\ Nitro$	517	11.2222	35.5132	27.0195	7.4302e-06	0	118.8536	24.8841
B i1	305	17.3682	36.545	26.4963	3.8439e-05	0	151.8193	9.8892
B i2	304	17.4146	36.5527	26.491	2.6235e-05	0	151.6685	9.3884
B i3	303	17.4213	36.5541	26.4904	9.6809e-06	0	152.991	9.5619
B i4	302	17.4264	36.5584	26.4923	1.5836e-05	0	153.8653	9.5619
B i5	301	17.4492	36.5597	26.4877	1.9921e-05	0	154.0841	10.0169
B i6	300	17.4609	36.5616	26.4863	8.2945e-06	0	153.8722	10.4274
B i7	299	17.4649	36.5626	26.486	2.3976e-06	0	154.1914	8.8847
B i8	298	17.4699	36.5639	26.4858	7.6104e-06	0	154.2224	9.5632
B i9	297	17.483	36.5664	26.4845	1.3991e-05	0	154.4369	9.5997
B i10	296	17.4906	36.5669	26.4829	7.9859e-06	0	154.6166	9.844

Table 5:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	6	-79.6463	29.8545	523	-801	149/249	-81.0844	29.3667

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
17	1	2012	2455944	1	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.14842	24	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
1.2534	0.80925	0.00077612	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	24.5211	36.4155	24.4304	3.442e-07	0.14757	196.8816	1.8749
Max	523	11.4693	35.5494	27.0023	NaN	0.038537	120.9468	24.8278
MLD_σ	56	24.525	36.4439	24.4536	0.00015125	0.14322	193.592	0.34894
MLD_θ	82	24.3895	36.6	24.6137	8.836e-05	0.11957	191.9305	1.4351
Max_{N2}	115	23.5397	36.8156	25.0317	0.00013729	0.040949	185.673	3.3982
Max_{Fluo}	24	24.5197	36.4137	24.4304	4.216e-08	0.14842	197.1807	2.5128
Max_O	14	24.5261	36.4163	24.4298	3.8345e-08	0.14883	196.9904	1.9634
Min_O	518	11.6344	35.5766	26.9925	9.0555e-06	0.040949	120.3655	24.7689
$Depth\ Nitro$	303	18.1807	36.6804	26.3996	9.5707e-05	0	153.0731	8.5669
B i1	305	17.996	36.6507	26.423	0.00026879	0	151.9173	10.3006
B i2	304	18.1997	36.673	26.3893	0.00016515	0	151.8987	10.1578
B i3	303	18.1807	36.6804	26.3996	9.5707e-05	0	153.0731	8.5669
B i4	302	18.3046	36.6955	26.3801	8.9631e-05	0	153.8581	8.8886
B i5	301	18.3506	36.6987	26.371	8.5381e-05	0	154.9126	8.9006
B i6	300	18.4012	36.7045	26.3627	6.8698e-05	0	154.5844	8.9783
B i7	299	18.426	36.7054	26.357	3.2102e-05	0	153.4557	7.4748
B i8	298	18.4309	36.7059	26.3561	6.3539e-06	0	153.8712	8.0146
B i9	297	18.4339	36.7064	26.3557	5.565e-06	0.0051303	154.2371	8.9787
B i10	296	18.4377	36.7068	26.355	5.3172e-06	0.024474	154.2822	8.2786

Table 6:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	7	-79.6405	29.8836	725	-801	151/248	-81.0844	29.3667

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
17	1	2012	2455944	1	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.164	16	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
1.3064	0.79777	0.00074964	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	24.5638	36.4156	24.4175	4.8607e-07	0.14316	196.9533	1.4588
Max	725	8.2548	35.1991	27.2751	NaN	0.040949	125.361	31.7152
MLD_σ	70	24.5363	36.4338	24.4435	0.00017696	0.15782	194.2876	2.1208
MLD_θ	78	24.4276	36.6016	24.6032	8.3148e-05	0.082123	191.5053	1.0229
Max_{N2}	130	22.938	37.0267	25.3679	0.00024206	0.040949	156.5172	4.4455
Max_{Fluo}	16	24.5642	36.4157	24.4179	8.9477e-08	0.164	196.8323	1.4803
Max_O	14	24.5643	36.4157	24.4177	1.2319e-07	0.164	197.0069	1.1997
Min_O	629	9.4356	35.2653	27.139	5.4662e-06	0	116.6655	30.6621
$Depth\ Nitro$	128	23.0411	36.9952	25.3141	8.7961e-05	0.040949	158.0799	2.3002
B i1	305	18.652	36.7376	26.3247	2.7501e-06	0	154.2165	8.2034
B i2	304	18.6568	36.7377	26.3235	4.2842e-06	0	154.3669	8.3173
B i3	303	18.6592	36.7392	26.324	1.3065e-05	0	154.437	8.2828
B i4	302	18.6785	36.7406	26.3201	1.1753e-05	0	154.2142	8.0095
B i5	301	18.6772	36.7415	26.3211	5.929e-06	0	154.3904	7.6793
B i6	300	18.686	36.7448	26.3213	2.6951e-05	0	154.3861	7.318
B i7	299	18.7199	36.7486	26.3156	3.3055e-05	0	154.1102	6.9751
B i8	298	18.7357	36.7489	26.3117	1.9135e-05	0	154.4207	7.5432
B i9	297	18.7368	36.7515	26.3134	1.6599e-05	0	154.503	7.5619
B i10	296	18.7547	36.7517	26.3089	1.3649e-05	0	154.2797	8.3921

Table 7:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	8	-78.6694	31.8394	480	-511	147/334	-79.3667	33.0167

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
18	1	2012	2455945	0	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.16585	62	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
3.2082	1.226	0.00033622	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	24.4626	36.3956	24.4331	6.3618e-07	0.16578	196.0185	0.8642
Max	480	8.975	35.2718	27.2157	NaN	0.025926	121.8655	29.2432
MLD_σ	57	24.4744	36.4273	24.4565	5.7918e-05	0.16923	194.7528	0.86582
MLD_θ	91	24.2819	36.861	24.8433	6.0279e-05	0.040949	169.3232	2.2663
Max_{N2}	104	23.7825	36.9747	25.0791	0.00017014	0.040949	159.6034	2.913
Max_{Fluo}	62	24.4821	36.4578	24.4774	2.2627e-05	0.16585	194.5446	0.74949
Max_O	15	24.4578	36.3956	24.4349	6.2355e-07	0.16578	195.7568	-1.2912
Min_O	384	10.7226	35.4572	27.063	7.1324e-05	0.014723	116.3211	26.0001
$Depth\ Nitro$	477	9.0577	35.2807	27.2093	1.754e-05	0	121.5238	29.3188
B i1	250	14.3172	36.0242	26.792	1.8465e-05	0	134.6998	17.4425
B i2	225	15.6352	36.2478	26.6722	0.00015158	0.019949	138.0834	13.921
B i3	200	17.7947	36.5802	26.4145	0.00010109	0.013005	138.129	10.6491
B i4	150	20.3247	36.9363	26.0312	0.00017622	0.0049885	145.5367	7.2029
B i5	100	23.8279	36.9539	25.0497	0.00013613	0.040949	163.2725	3.702
B i6	75	24.532	36.5136	24.5053	0.00015492	0.13546	190.9006	1.6862
B i7	50	24.4824	36.4065	24.4379	1.1414e-05	0.16578	195.6421	1.4582
B i8	25	24.4691	36.3954	24.432	4.1524e-06	0.17088	196.0832	0.66283
B i9	15	24.4578	36.3956	24.4349	6.2355e-07	0.16578	195.7568	-1.2912
B i10	5	24.4632	36.3948	24.432	NaN	NaN	196.436	-0.79858

Table 8:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	9	-80.8872	31.3924	15	-19	29/294	-81.1667	31.5

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
19	1	2012	2455946	0	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.31035	14	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
2.2007	0.52993	NaN	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	14.477	36.7679	27.3214	1.934e-05	0.27196	242.892	0.65661
Max	15	14.4564	36.7659	27.3244	NaN	0.31035	242.5732	0.35583
MLD_σ	15	14.4564	36.7659	27.3244	NaN	0.31035	242.5732	0.35583
MLD_θ	15	14.4564	36.7659	27.3244	NaN	0.31035	242.5732	0.35583
Max_{N2}	5	14.6849	36.7875	27.2908	0.00010291	NaN	241.7696	0.65108
Max_{Fluo}	14	14.468	36.7675	27.3232	6.5209e-06	0.31035	242.8624	0.25207
Max_O	11	14.4696	36.7668	27.3222	6.5694e-06	0.28327	243.154	1.7123
Min_O	4	14.7208	36.7875	27.2829	3.8455e-05	NaN	241.4192	0.1704
$Depth\ Nitro$	10	14.477	36.7679	27.3214	1.934e-05	0.27196	242.892	0.65661
B i1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i3	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i4	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i5	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i6	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i7	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i8	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i9	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i10	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

Table 9:

$Profil$	CTD	Lon	Lat	CTD Depth max (m)	Bathy (m)	Dist[km]/azimuth[°] coast	Lon coast	Lat coast
143	10	-80.8696	31.4028	15	-20	30/291	-81.1667	31.5

Day	Month	Year	Julian day	Core biology Flag	Season	Season part (early-middle-late)
19	1	2012	2455946	0	Winter	Early

$Max_{Fluo}(mg/m^3)$	Depth (m)	Sum $Fluo$ $1-200m(mg/m^3)$
0.28075	15	57.841

Intensity SST Gradient $(°/100km)$	Intensity Geostrophic current (m/s)	Strain $rate$ (s^{-2})	Lyapunov exponent $(1/days)$
2.5117	0.533	NaN	0.37774

	Depth (m)	T $(°C)$	AS (g/kg)	σ_0 (kg/m^3)	N^2 (s^{-2})	$Fluo$ (mg/m^3)	O $(\mu mol/kg)$	Ni $(\mu mol/kg)$
$10m$	10	14.6426	36.7916	27.3034	8.6728e-06	0.25646	241.8485	1.9713
Max	15	14.636	36.7904	27.3041	NaN	0.28075	242.0558	1.2987
MLD_σ	15	14.636	36.7904	27.3041	NaN	0.28075	242.0558	1.2987
MLD_θ	15	14.636	36.7904	27.3041	NaN	0.28075	242.0558	1.2987
Max_{N2}	5	14.8173	36.8046	27.2748	0.00017353	NaN	241.0673	0.90851
Max_{Fluo}	15	14.636	36.7904	27.3041	NaN	0.28075	242.0558	1.2987
Max_O	13	14.6357	36.7906	27.3042	NaN	0.27006	242.5307	2.0782
Min_O	3	14.8623	36.8018	27.2626	NaN	NaN	240.6443	1.1229
$Depth\ Nitro$	9	14.6691	36.7923	27.2981	1.453e-05	0.24942	241.7152	1.0178
B i1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i3	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i4	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i5	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i6	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i7	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i8	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i9	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
B i10	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

Table 10:

4 ARGO

4.1 Introduction

To complete the CTD study, we use ARGO data available around Tara's stations. ARGO is a global array of autonomous profiling floats that observe pressure, temperature and salinity in the upper $2000m$ of the ocean. These data were collected and made freely available by the International Argo Program and the national programs that contribute to it (http://www.argo.ucsd.edu, http://argo.jcommops.org).

The Argo Program is part of the Global Ocean Observing System. The ARGO profiles were downloaded on the Aviso ftp web site where only pressure (P), temperature (T), and salinity (S) data. However, some of these profiles were still suspicious so applied another analysis in the same way that Chaigneau et al. (2011) using the following conditions:

- Data flagged as good and probably good (Argo quality flag 1 and 2)
- The shallowest data above 15 dbar and the deepest data below 300m
- A difference of pressure level inferior than 25 dbar between 0-100dbar and inferior than 50 dbar between 100-300dbar

We looked for the nearest ARGO floats available in box defined by $\Delta X \pm 4°$ $lat - lon$ and $\Delta t \pm 15$ $julian\ days$ around Tara stations. For each CTD profile we search for the best matching ARGO profile. We computed distance dx, delay time dt, and radius $r = \sqrt{dx^2 + dt^2}$ between each ARGO and CTD profiles. We add correlations calculations between CTD-ARGO salinity and temperature. Correlations are calculated using the `corrcoef` function in `Matlab`. To make correlations calculation possible we interpolate ARGO profiles (defined on the 152 levels vertical grid) on a CTD-compatible 1 decibar vertical grid. We present the results in Tab. 12 with the ARGO profiles we kept after tests. We show the CTD and **all** ARGO profiles on Fig. 12, and a $\theta - S$ diagram on Fig. 13.

4.2 Correlations with CTD profiles

CTD	Argo	*Radius*	*dt* (*jul*)	*dx* (*km*)	θ correl.	S correl.	Lon Argo	Lat Argo
1	1	322.5029	14	322.1989	0.97196	0.92559	-76.25	29.227
1	2	360.6595	4	360.6373	0.98581	0.94512	-76.18	28.277
1	3	366.1963	13	365.9654	0.98918	0.96045	-76.448	27.78
1	4	406.8366	9	406.737	0.98556	0.92915	-76.087	27.598
1	5	483.0874	-3	483.0781	0.98897	0.93719	-75.944	26.675
1	6	465.8448	-7	465.7922	0.9898	0.9413	-76.289	26.591
1	7	450.1719	-11	450.0375	0.9873	0.93594	-76.556	26.57
1	8	268.3808	10	268.1944	0.99115	0.96148	-77.629	31.399
1	9	267.9781	6	267.9109	0.97786	0.89532	-77.503	31.286
1	10	259.444	2	259.4363	0.98418	0.9313	-77.528	31.196
1	11	270.9308	-2	270.9234	0.98911	0.97343	-77.51	31.332
1	12	305.1159	-14	304.7945	0.99034	0.90462	-77.335	31.614
2	1	336.858	14	336.5669	0.94925	0.85335	-76.25	29.227
2	2	376.7466	4	376.7254	0.9845	0.92254	-76.18	28.277
2	3	382.6879	13	382.467	0.97299	0.93389	-76.448	27.78
2	4	423.3221	9	423.2264	0.97533	0.86877	-76.087	27.598
2	5	499.5823	-3	499.5733	0.97743	0.89217	-75.944	26.675
2	6	482.2234	-7	482.1726	0.97583	0.87974	-76.289	26.591
2	7	466.4235	-11	466.2938	0.97506	0.85521	-76.556	26.57
2	8	270.2655	10	270.0804	0.97758	0.69502	-77.629	31.399
2	9	270.9194	6	270.8529	0.95753	0.27618	-77.503	31.286
2	10	262.7601	2	262.7525	0.96052	0.80592	-77.528	31.196
2	11	273.6148	-2	273.6075	0.97932	0.89289	-77.51	31.332
2	12	307.1368	-14	306.8175	0.97793	0.46826	-77.335	31.614
3	1	346.7502	14	346.4674	0.92417	0.8407	-76.25	29.227
3	2	391.2047	4	391.1843	0.93936	0.8682	-76.18	28.277
3	3	399.3402	13	399.1286	0.95782	0.87573	-76.448	27.78
3	4	439.8376	9	439.7455	0.94289	0.83605	-76.087	27.598
3	5	517.8259	-3	517.8172	0.94879	0.84546	-75.944	26.675
3	6	501.0752	-7	501.0263	0.95067	0.86202	-76.289	26.591
3	7	485.6631	-11	485.5386	0.94506	0.8531	-76.556	26.57
3	8	261.7289	10	261.5378	0.9678	0.87348	-77.629	31.399
3	9	263.6405	6	263.5722	0.93059	0.78092	-77.503	31.286
3	10	255.9793	2	255.9715	0.94041	0.82297	-77.528	31.196
3	11	266.0082	-2	266.0007	0.96233	0.90685	-77.51	31.332
3	12	298.6099	-14	298.2815	0.94294	0.77277	-77.335	31.614
4	1	336.8919	15	336.5578	0.92357	0.84625	-76.25	29.227
4	2	380.5686	5	380.5358	0.97627	0.91937	-76.18	28.277
4	3	388.6466	14	388.3943	0.95229	0.91556	-76.448	27.78
4	4	429.125	10	429.0085	0.95416	0.86216	-76.087	27.598
4	5	507.2187	-2	507.2147	0.96989	0.91966	-75.944	26.675
4	6	490.5871	-6	490.5504	0.96752	0.90752	-76.289	26.591
4	7	475.2836	-10	475.1784	0.96788	0.88801	-76.556	26.57
4	8	259.0149	11	258.7813	0.98545	0.84942	-77.629	31.399
4	9	260.2286	7	260.1345	0.97853	0.51492	-77.503	31.286
4	10	252.2847	3	252.2668	0.96871	0.91172	-77.528	31.196
4	11	262.7397	-1	262.7378	0.9947	0.96773	-77.51	31.332
4	12	295.8278	-13	295.542	0.97475	0.56741	-77.335	31.614
5	1	339.9118	15	339.5806	0.90242	0.85072	-76.25	29.227
5	2	385.5393	5	385.5069	0.96421	0.92477	-76.18	28.277
5	3	394.6002	14	394.3518	0.93643	0.90592	-76.448	27.78
5	4	435.0021	10	434.8872	0.93938	0.86363	-76.087	27.598
5	5	513.8874	-2	513.8835	0.96197	0.92424	-75.944	26.675
5	6	497.5569	-6	497.5207	0.95654	0.91352	-76.289	26.591
5	7	482.4515	-10	482.3479	0.95761	0.89618	-76.556	26.57
5	8	254.6122	11	254.3744	0.98253	0.82248	-77.629	31.399
5	9	256.309	7	256.2134	0.98316	0.50652	-77.503	31.286
5	10	248.561	3	248.5429	0.96762	0.91732	-77.528	31.196
5	11	258.6917	-1	258.6898	0.99819	0.97094	-77.51	31.332
5	12	291.419	-13	291.1289	0.97074	0.5155	-77.335	31.614

Table 11: Description: see paragraph p. 22

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CTD	Argo	*Radius*	*dt* (*jul*)	*dx* (*km*)	θ correl.	S correl.	Lon Argo	Lat Argo
6	1	336.5788	15	336.2444	0.93302	0.86908	-76.25	29.227
6	2	380.2508	5	380.2179	0.97628	0.92676	-76.18	28.277
6	3	388.3371	14	388.0846	0.95426	0.92566	-76.448	27.78
6	4	428.8144	10	428.6978	0.95379	0.87303	-76.087	27.598
6	5	506.9219	-2	506.918	0.96249	0.90993	-75.944	26.675
6	6	490.2984	-6	490.2617	0.96273	0.90126	-76.289	26.591
6	7	475.0013	-10	474.8961	0.96214	0.88035	-76.556	26.57
6	8	258.8752	11	258.6414	0.9754	0.83019	-77.629	31.399
6	9	260.07	7	259.9758	0.96498	0.52051	-77.503	31.286
6	10	252.1189	3	252.101	0.9542	0.89066	-77.528	31.196
6	11	262.5858	-1	262.5839	0.9885	0.95473	-77.51	31.332
6	12	295.6878	-13	295.4019	0.96506	0.54515	-77.335	31.614
7	1	336.6774	15	336.3431	0.95196	0.88816	-76.25	29.227
7	2	381.2206	5	381.1878	0.97363	0.92295	-76.18	28.277
7	3	389.7878	14	389.5363	0.96702	0.92956	-76.448	27.78
7	4	430.2269	10	430.1106	0.95982	0.88679	-76.087	27.598
7	5	508.7497	-2	508.7457	0.96736	0.89938	-75.944	26.675
7	6	492.2943	-6	492.2578	0.96998	0.91101	-76.289	26.591
7	7	477.1128	-10	477.008	0.96782	0.89903	-76.556	26.57
7	8	256.3031	11	256.067	0.98022	0.92585	-77.629	31.399
7	9	257.6389	7	257.5438	0.97089	0.84093	-77.503	31.286
7	10	249.7456	3	249.7276	0.96725	0.90154	-77.528	31.196
7	11	260.1163	-1	260.1143	0.98911	0.96064	-77.51	31.332
7	12	293.1169	-13	292.8285	0.97173	0.82442	-77.335	31.614
8	1	372.321	16	371.977	0.95375	0.9154	-76.25	29.227
8	2	463.456	6	463.4171	0.99003	0.91104	-76.18	28.277
8	3	500.4314	15	500.2065	0.98522	0.91035	-76.448	27.78
8	4	534.1553	11	534.0421	0.9901	0.96851	-76.087	27.598
8	5	632.8332	-1	632.8324	0.99484	0.91399	-75.944	26.675
8	6	628.324	-5	628.3041	0.99318	0.91593	-76.289	26.591
8	7	621.516	-9	621.4508	0.99406	0.91997	-76.556	26.57
8	8	110.7896	12	110.1378	0.99031	0.27435	-77.629	31.399
8	9	126.8832	8	126.6307	0.97108	-0.2302	-77.503	31.286
8	10	129.9168	4	129.8552	0.98196	0.55126	-77.528	31.196
8	11	123.605	0	123.605	0.97132	0.59725	-77.51	31.332
8	12	129.372	-12	128.8142	0.99591	0.055524	-77.335	31.614
9	1	506.869	17	506.5839	-0.9879	-0.98393	-76.25	29.227
9	2	571.6675	7	571.6247	0.86785	0.98897	-76.18	28.277
9	3	588.6316	16	588.4141	-0.69835	0.64655	-76.448	27.78
9	4	628.2377	12	628.1231	-0.96249	-0.68	-76.087	27.598
9	5	712.0076	0	712.0076	0.60526	-0.60605	-75.944	26.675
9	6	697.0605	-4	697.049	-0.99289	0.98577	-76.289	26.591
9	7	682.574	-8	682.5271	-0.91462	-0.67615	-76.556	26.57
9	8	309.8558	13	309.5829	0.72257	0.98703	-77.629	31.399
9	9	322.0902	9	321.9644	0.57166	-0.50159	-77.503	31.286
9	10	320.3082	5	320.2692	-0.04213	-0.64454	-77.528	31.196
9	11	321.0746	1	321.073	-0.99033	0.98531	-77.51	31.332
9	12	338.208	-11	338.0291	-0.60892	-0.56686	-77.335	31.614
10	1	505.9233	17	505.6376	-0.8167	-0.87563	-76.25	29.227
10	2	571.0111	7	570.9681	0.68562	0.85187	-76.18	28.277
10	3	588.1736	16	587.956	-0.47951	0.55388	-76.448	27.78
10	4	627.747	12	627.6323	-0.91481	-0.57813	-76.087	27.598
10	5	711.6982	0	711.6982	0.704	-0.52762	-75.944	26.675
10	6	696.8436	-4	696.8321	-0.87942	0.861	-76.289	26.591
10	7	682.4228	-8	682.3759	-0.90103	-0.60489	-76.556	26.57
10	8	308.1753	13	307.901	0.78793	0.85768	-77.629	31.399
10	9	320.4539	9	320.3275	0.66567	-0.42099	-77.503	31.286
10	10	318.7103	5	318.6711	0.16259	-0.55635	-77.528	31.196
10	11	319.4189	1	319.4173	-0.89201	0.85363	-77.51	31.332
10	12	336.4494	-11	336.2695	-0.70893	-0.48831	-77.335	31.614

Table 12: Description: see paragraph p. 22

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4.3 ARGO and CTD profiles

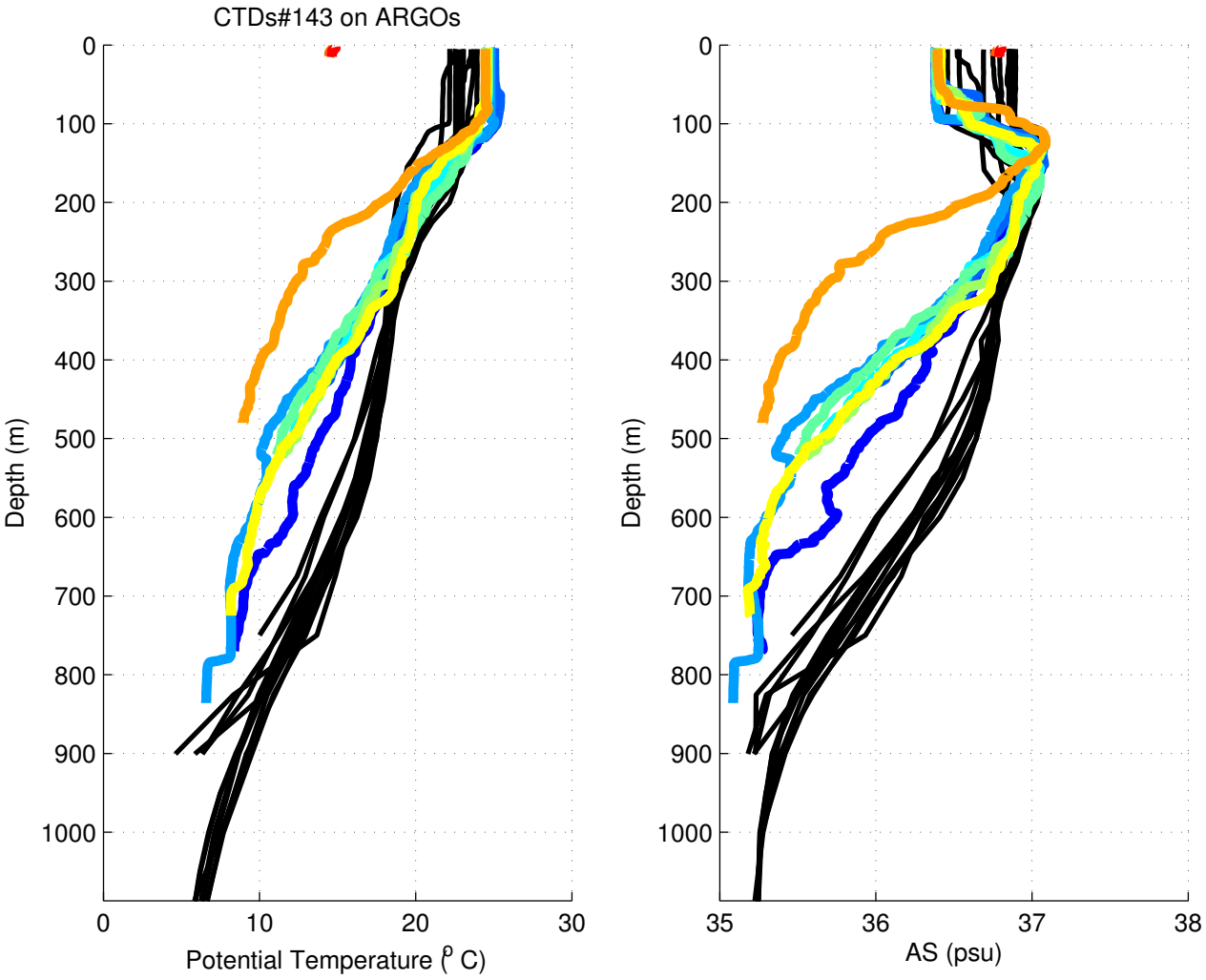

Figure 12: Description: see paragraph p. 22

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4.4 ARGO and CTD $\theta - S$ diagrams

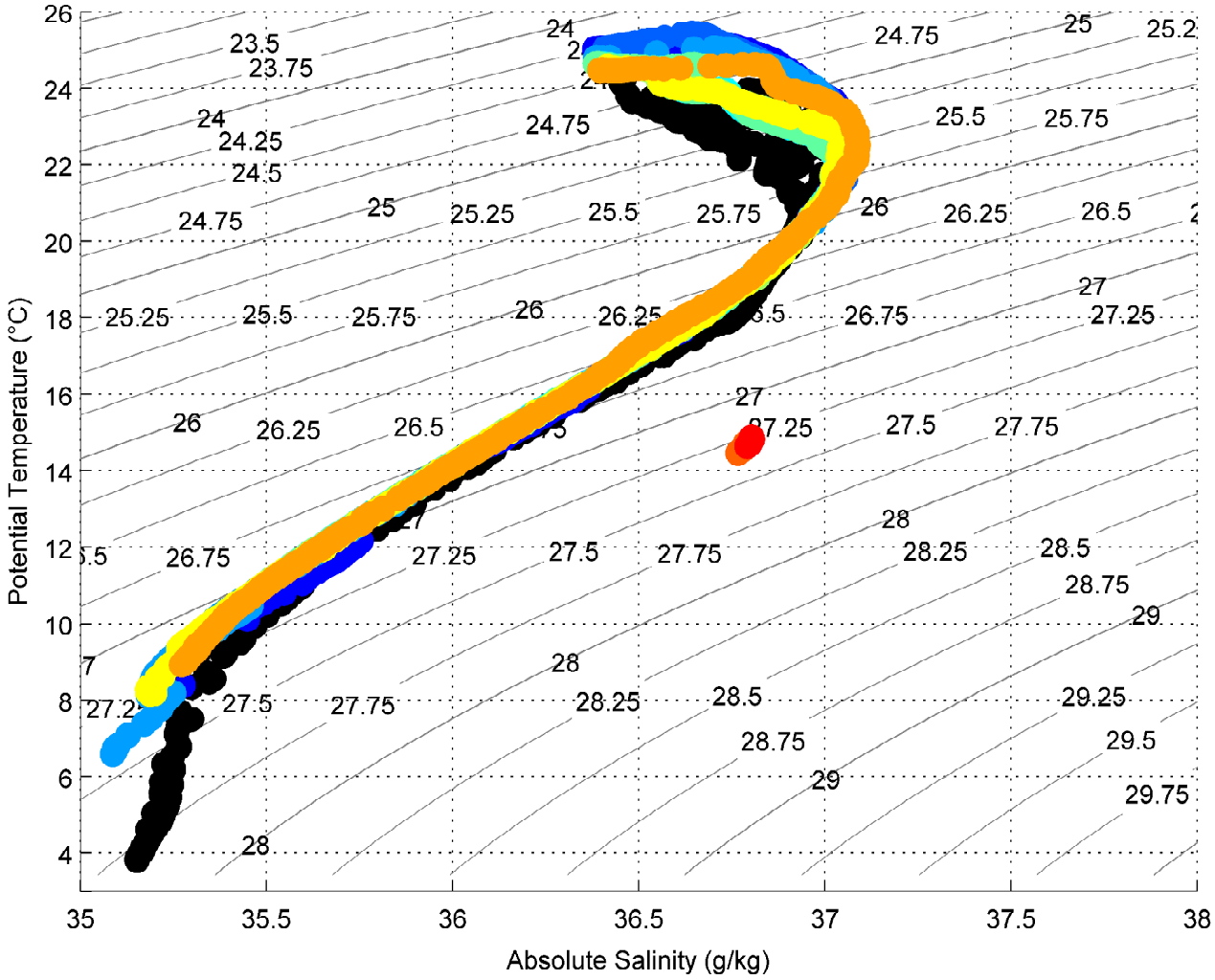

Figure 13: Description: see paragraph p. 22

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