

Temperature and salinity accuracy of SVP drifters

DBCP

Paris, 28 September 2009



Gilles Reverdin Antonio Lourenco, Nicolas Martin,
Jacqueline Boutin (LOCEAN)
Pierre Blouch, Jean Rolland (CMM/CNRM)
Fabienne Gaillard and other colleagues (IFREMER, SIO...)

www.locean-ipsl.upmc.fr/SSS or
www.locean-ipsl.upmc.fr/CAROLS





Salinity drifters



- SVP drifters

- Sphère (~41 cm diameter, ~20 kg de poids)
- Drogue (~6 m long, centered at 15m depth)

- Measurements

- Drogue presence (submergence)
- Surface temperature sensor (since 2008 for Pacific Gyre)
- Atmospheric pressure (and tendency)
- Near-surface conductivity (salinity)

- Data transmission

- Argos (or recently Iridium for Metocean drifters)
- SMT



The early models



- SIO (SBE 37 SI)

C/T SeaBird sensors



- Metocean (SBE 47)



Deployments in 2005



Groupe	Flotteurs	Date - Navire	Position
#1	56362 56363 56373	Avril 2005 Thalassa	46.9 N – 5.9W
#2	52198 56365 56369	Avril 2005 Thalassa	46.2 N – 6.5W
#3	56366 56370 56371	Avril 2005 Thalassa	45.2 N – 4.5W
#4	42656 56364 56368	Mai 2005 Cote de la Manche	46.5 N – 6.2W
#5	52197 56367 56372	Mai 2005 Cote de la Manche	45.7 N – 6.0W

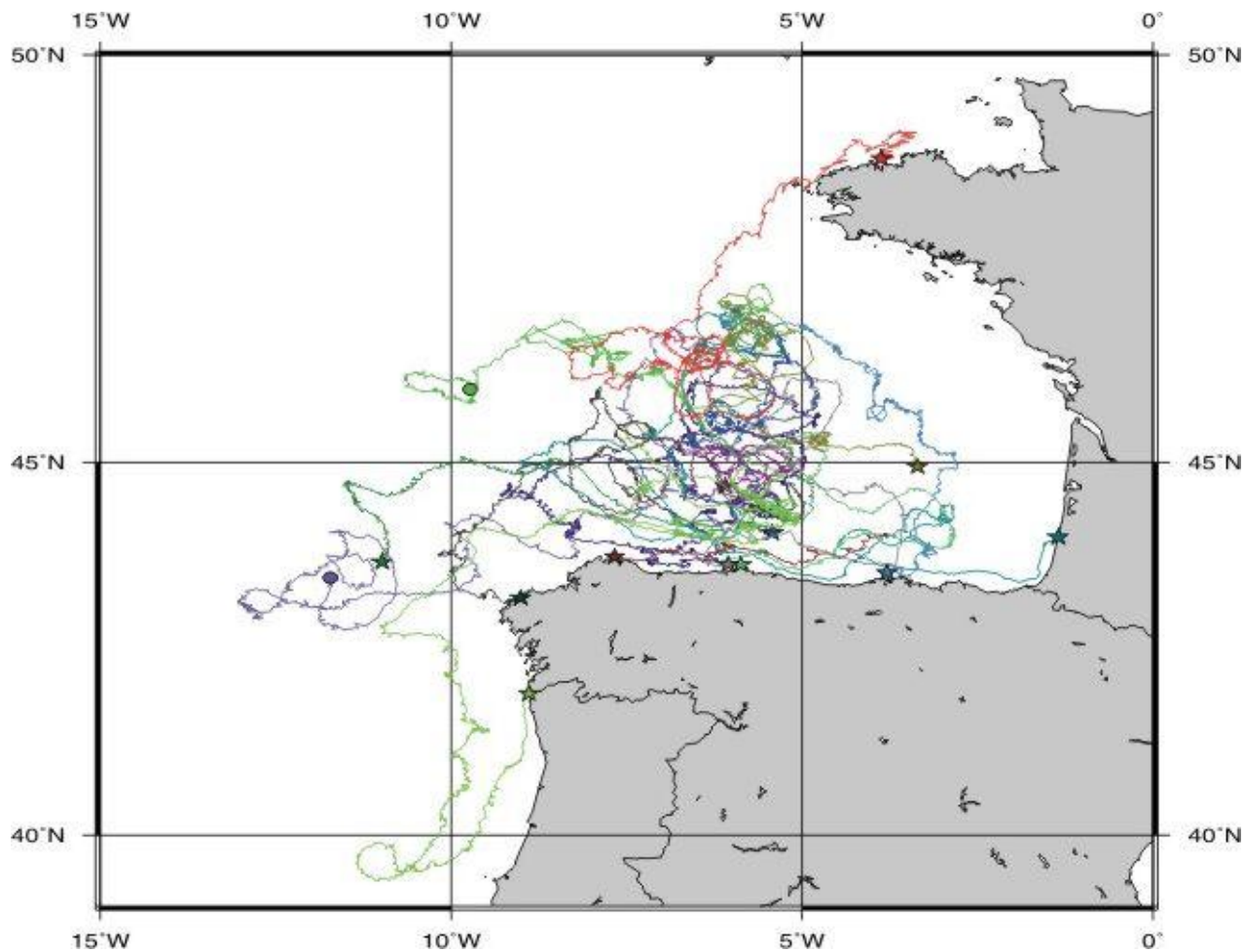
- Validation experiment
In 2005 (Cosmos)
(3 deployments of 3
drifters in April)
- (2 deployments of 3
drifters in May)

Metocean
SIO



Drifter trajectories

April - December 2005

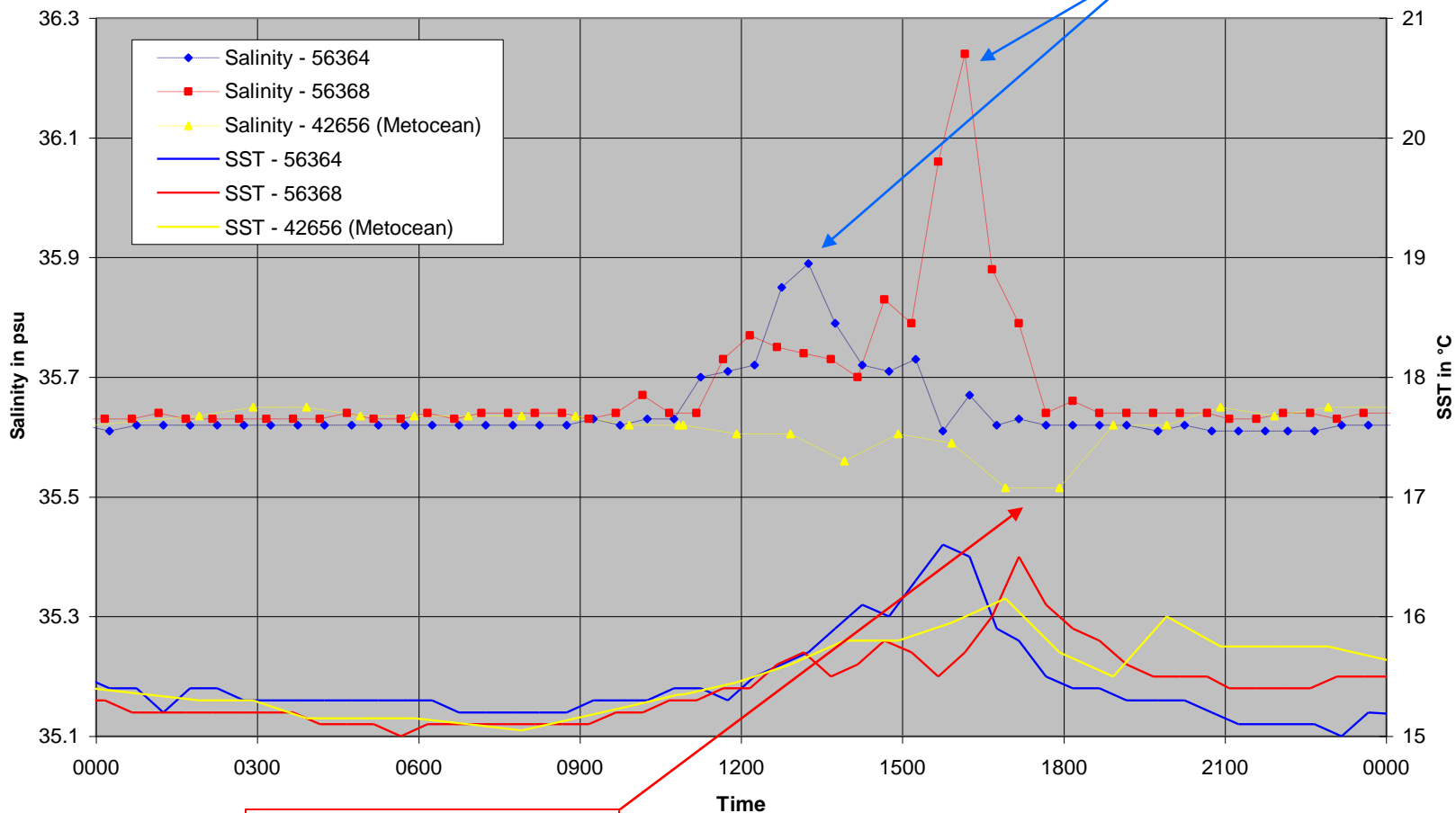




Diurnal variability

Salinity drifters - Group #4
June 2nd, 2005

Positive for Pacific Gyre



Negative for Metocean



Intercomparaisons

- Salinity daily cycles resulting mostly from temperature stratification (C and T cells not at the same place, and is therefore mostly artificial)
Requies further study based on different sensors, with less distance T and C cells and better vertical resolution of temperature profile

- Comparisons at deployment (COSMOS)

- Biases between -0.006 et + 0.008 psu for Metocean drifters
- Biases between -0.007 and -0.026 psu for Pacific Gyre drifters

- Fouling and evolution of biases

- Up-to -0.017 psu in 80 days during spring bloom;
- However, average of -0.005 psu for this period
- During summer (90 days), larger evolution observed up to -0040 psu



Checking drifters after 80 days (June 2005)



- Inspection



- After deployment



Bouées récupérées par l'Argonaute Décembre 2005

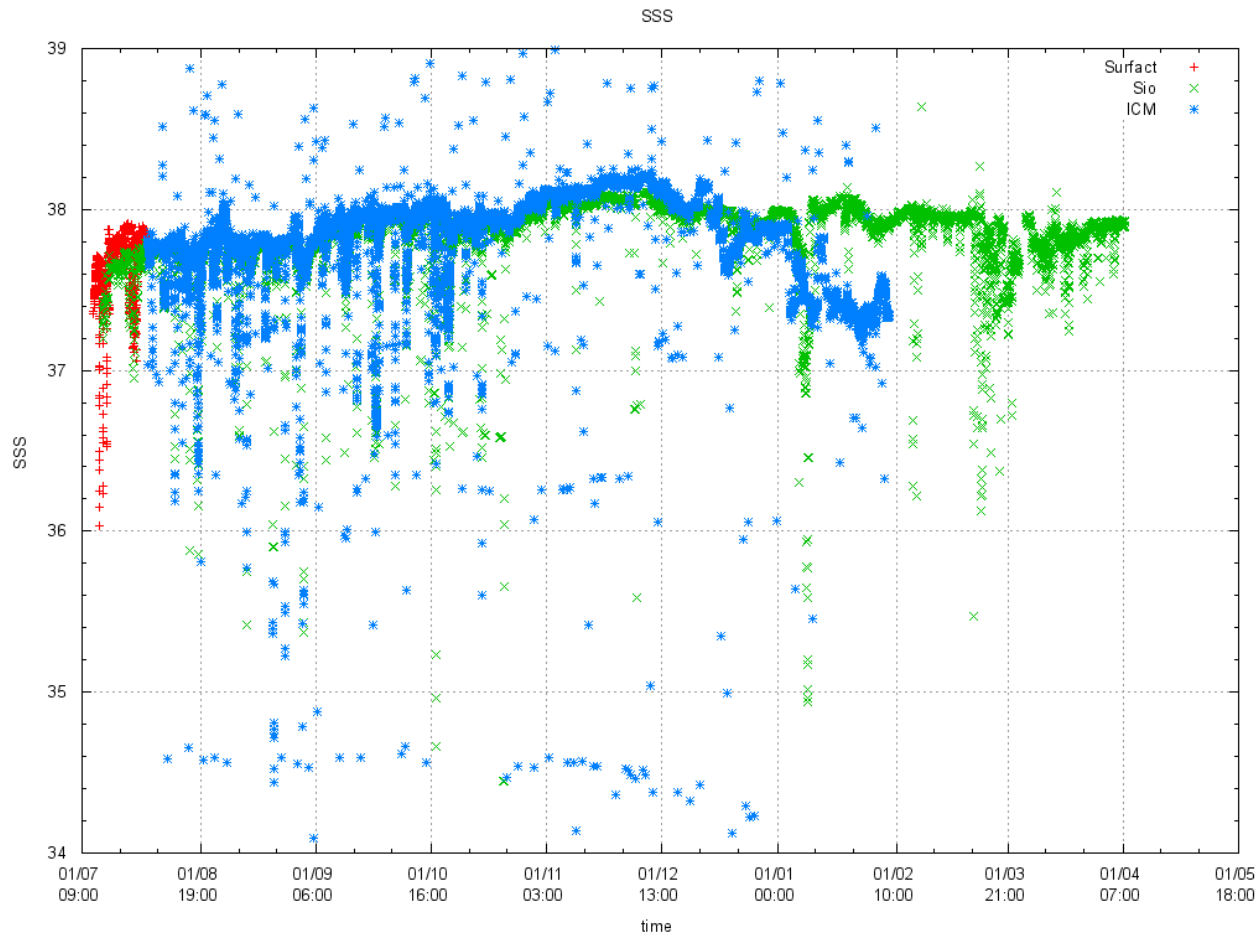


← Biais: -0.010 à comparer à celui de CoSMOS2 +0.001



← Biais de -0.005 à comparer à celui du déploiement - 0.009

In an upwelling environment, (Catalunya), joint deployment of pumped and unpumped C/T Seabird cells. After 8 months, large drift develops in unpumped measurements (biofouling). Not long enough for large drifts in other drifters (-0.02 pss after 7 months)





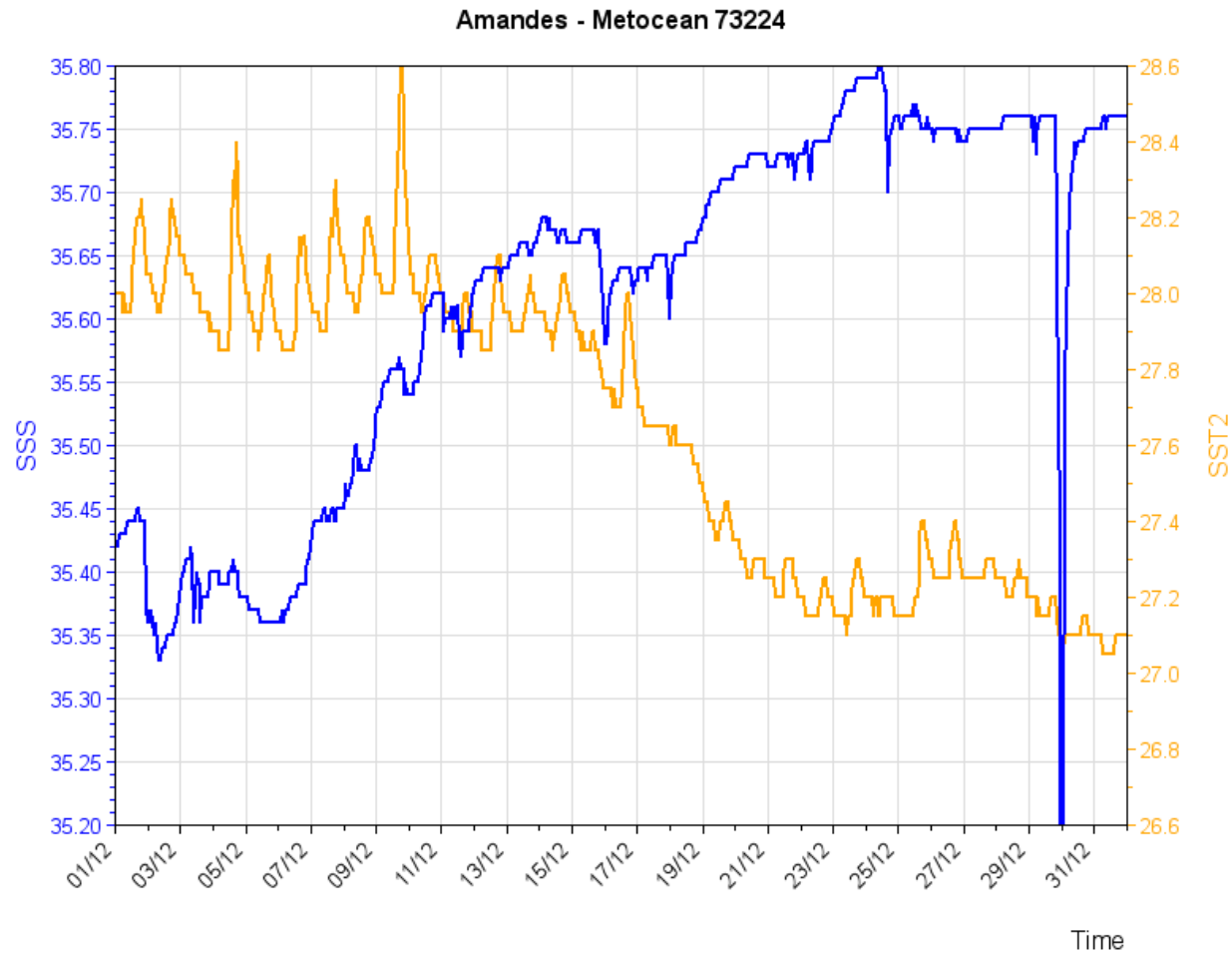
Conclusions



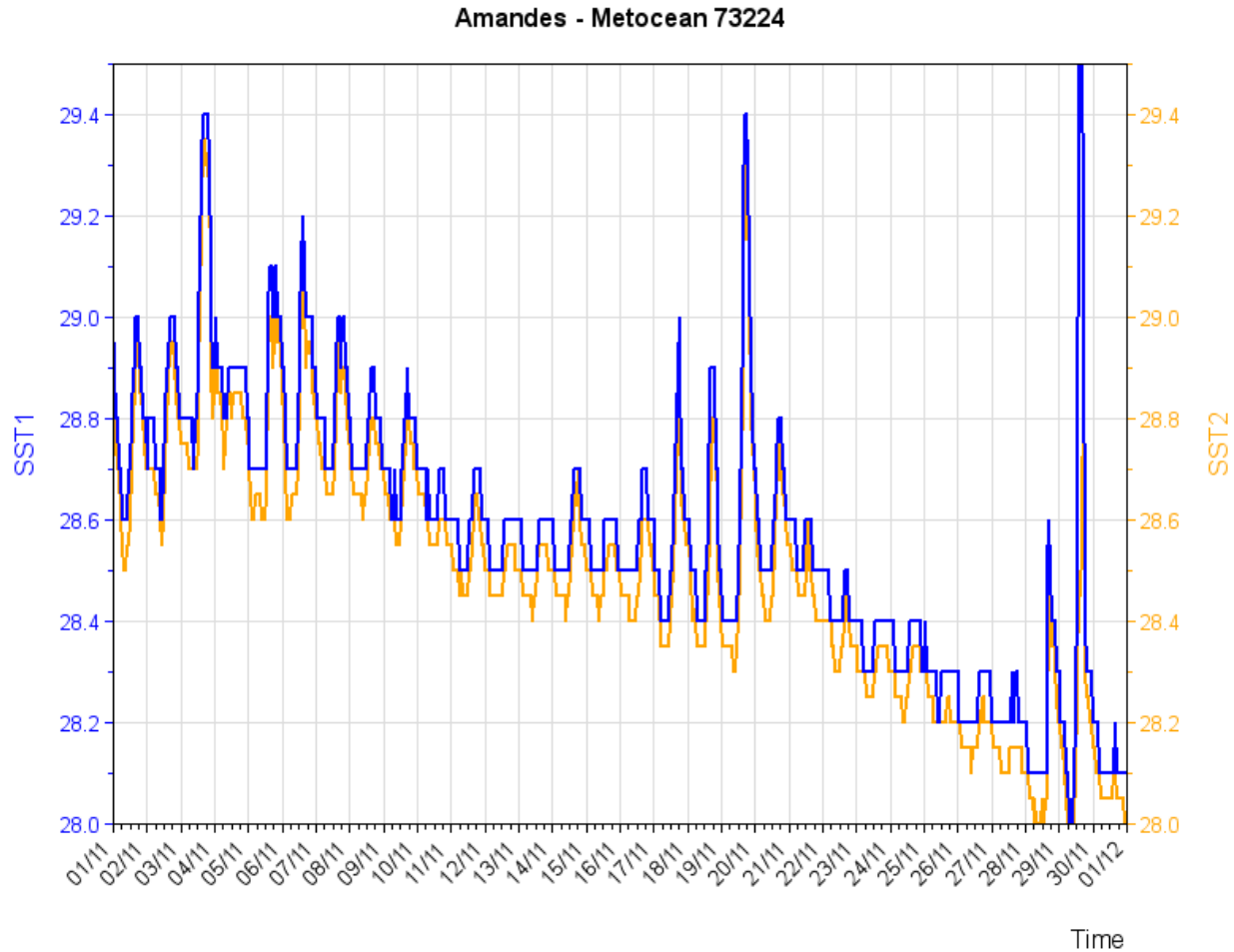
- Other experiments since 2005 in different regions support these results. Up to 6 months of « good » data (at least at night) that can easily be corrected. On some (4) tropical/subtropical drifters, later data suspicious, but also some drifters with life longer than one year and « good » data (at least 4 of them).
- Requirement to estimate and correct biases
(intercomparisons as during Cosmos (2005) not always available;
Use of other data: Argo, TSGs...)
- Daily data might help improve statistics of vertical temperature stratification near the surface

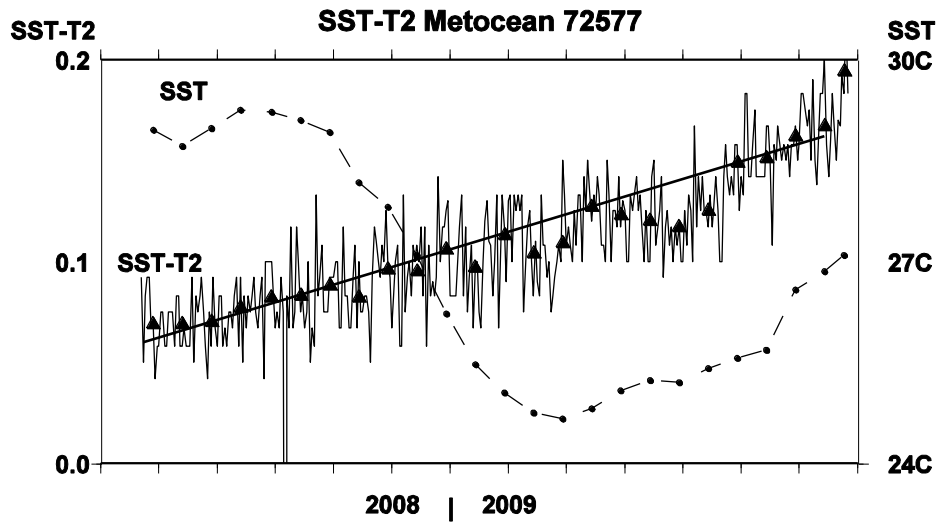
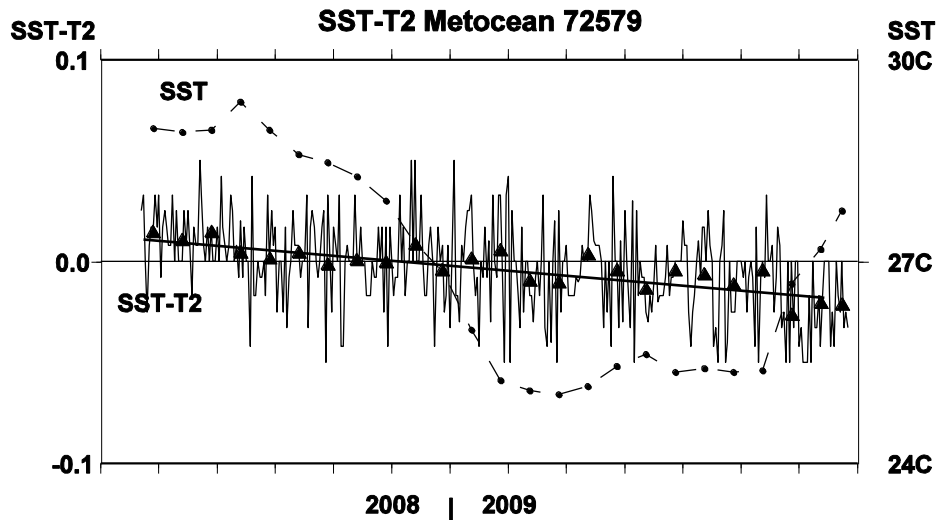
La fin de la 73224: forte décroissance le 30/12 associée à un fort évènement précipitant

Légère tendance à avoir bas S quand fort T en milieu de journée



On salinity drifters, often two sets of T measurements with accurate
Susurface and less accurate SVT thermistor-based measurement

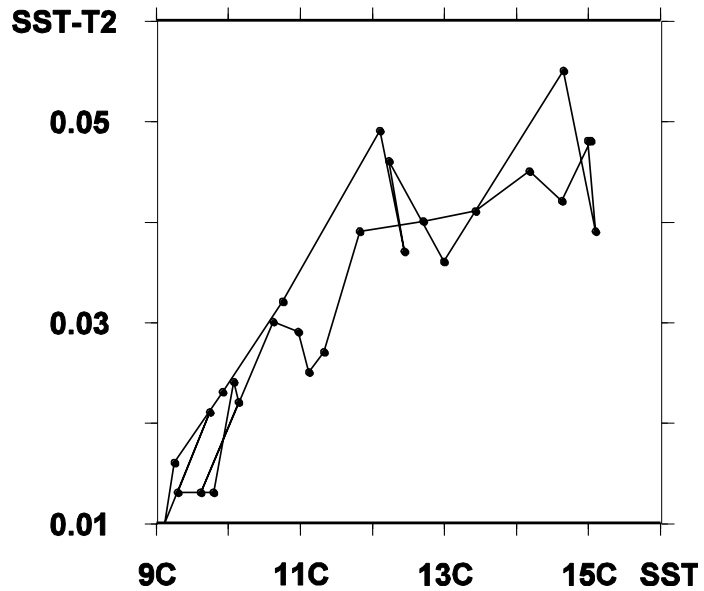




Number of drifters (out of 18), in classes of average offsets (one drifter with 0.44°C offset was not retained)

Offset	-0.045	-0.015	0.015	0.045	0.075	0.105	0.135	0.165	°C
n. drifters	0	2	4	7	2	2	1		

Pacific Gyre 84006



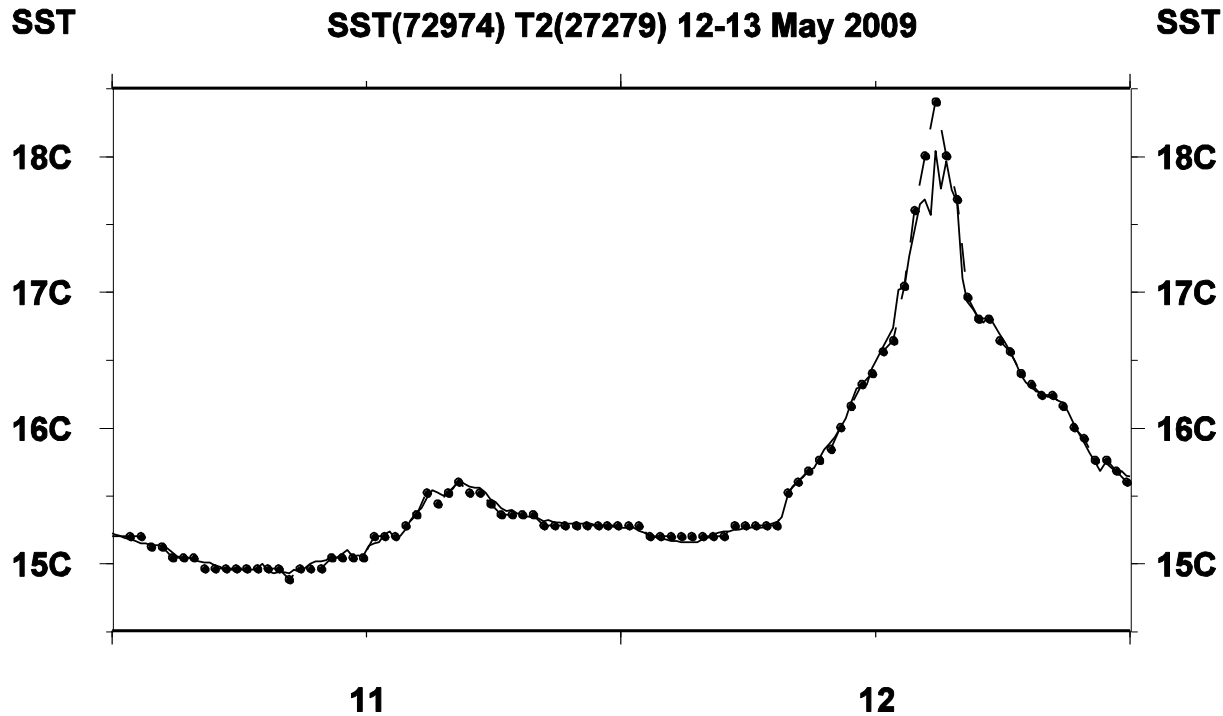
Number of drifters (out of 12 with life span longer than 4 months)
in classes of average trends over (line 1) life span, over (line 2) 1 year.

Average trend	-0.14	-0.10	-0.06	-0.02	0.02	0.06	0.10	0.14°C
n. drifters		0	0	3	7	1	0	1
n. drifters		1	0	2	7	1	0	1

SST biases in set of salinity drifters (2005-2009) (Metocean, Pacificgyre) have been positive (averaging more than 0.05°C) (and in 4 out of 19 deployments by more than 0.1°C) Trends variable (can reach $0.1^{\circ}\text{C}/\text{year}$), but average very close to 0. (we had only in one case with comparisons over 2-year duration). In one case, large change (0.1°C) after a recovery and redeployment

Other SVP drifters present differences probably related to manufacturer, (Clearwater < Technocean < Pacificgyre (in 2008 joint deployments) or year of manufacturer (Technocean; in 2007 or 2008, small positive bias, whereas in 2009, larger positive bias)

And what does the drifter measures?
(might be important in case of large near surface stratification)



Mid-day T larger than at 17 cm, suggesting that SVP measurement
 Characteristic of 0-17 cm and not near 17 cm
 (two scamp profiles indicate at that time T gradients on the order of 1°C
 Between 1 and 20 cm depth)