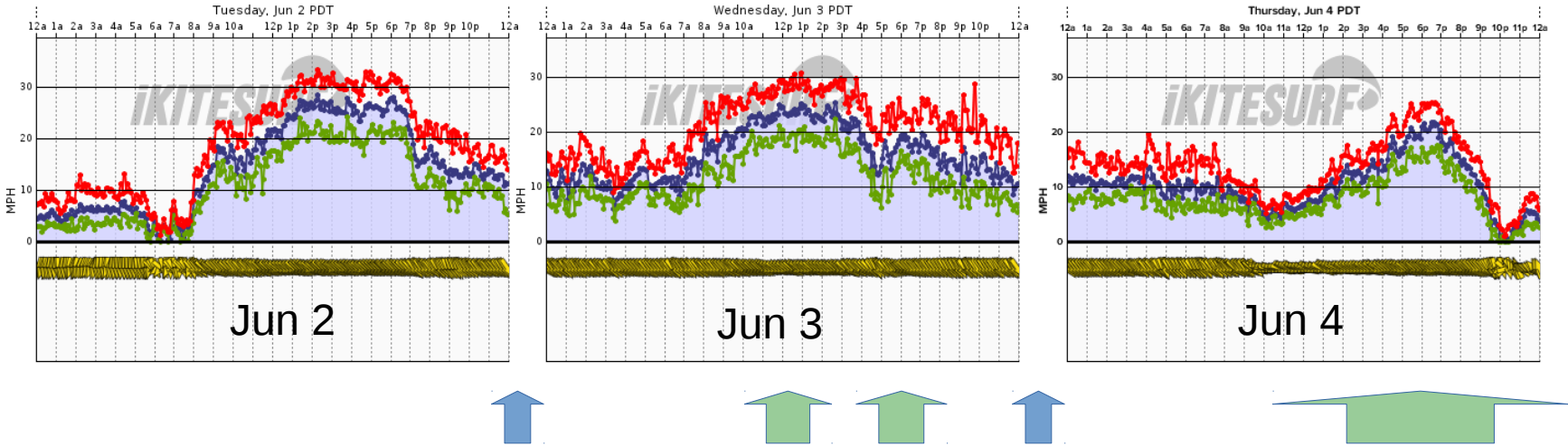
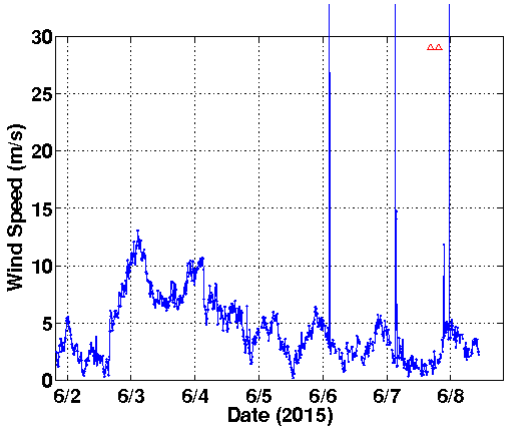
Drifts in upwelling waters

Part of the 13h drift starting on Jun 4th

General timeline

Ano winds: Jun 1st weak south winds, upwelling 2nd and 3rd, weaker & shorter on the 4th, south winds on the 5th





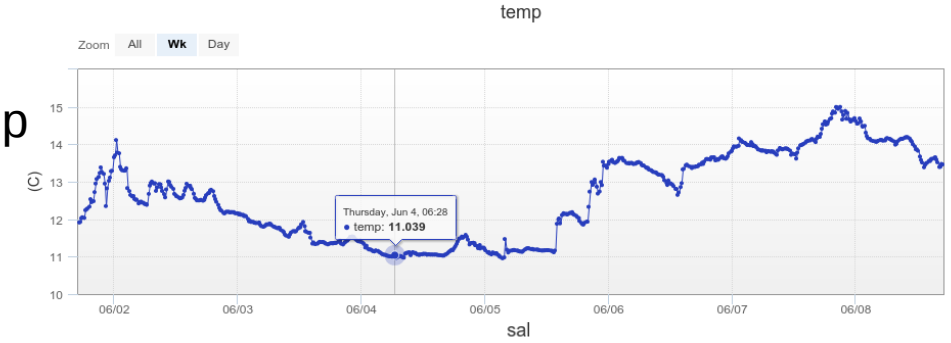
Winds at M1

- Jun 2 night: surveys
- Jun 3 daytime: two 4h-drifts starting at 122.15°W

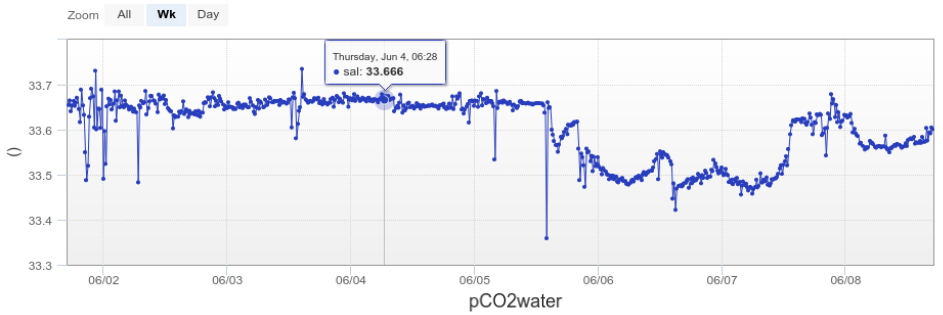
- Jun 3 night: surveys
- Jun 4 daytime: 1h drift then 13h drift starting at 122.1°W

OA2 mooring data

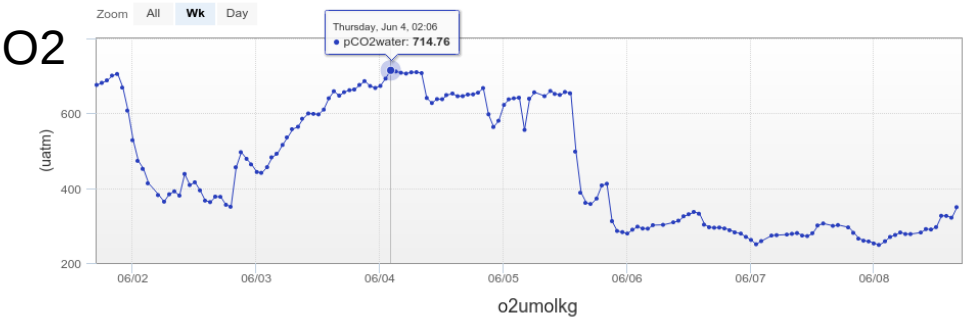
temp



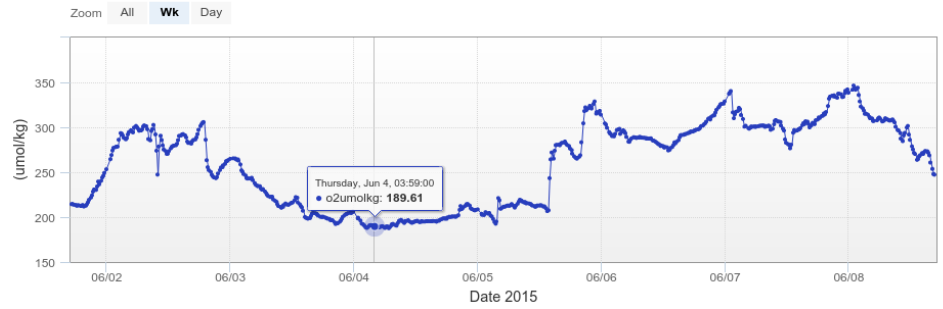
salt



pCO2



O2

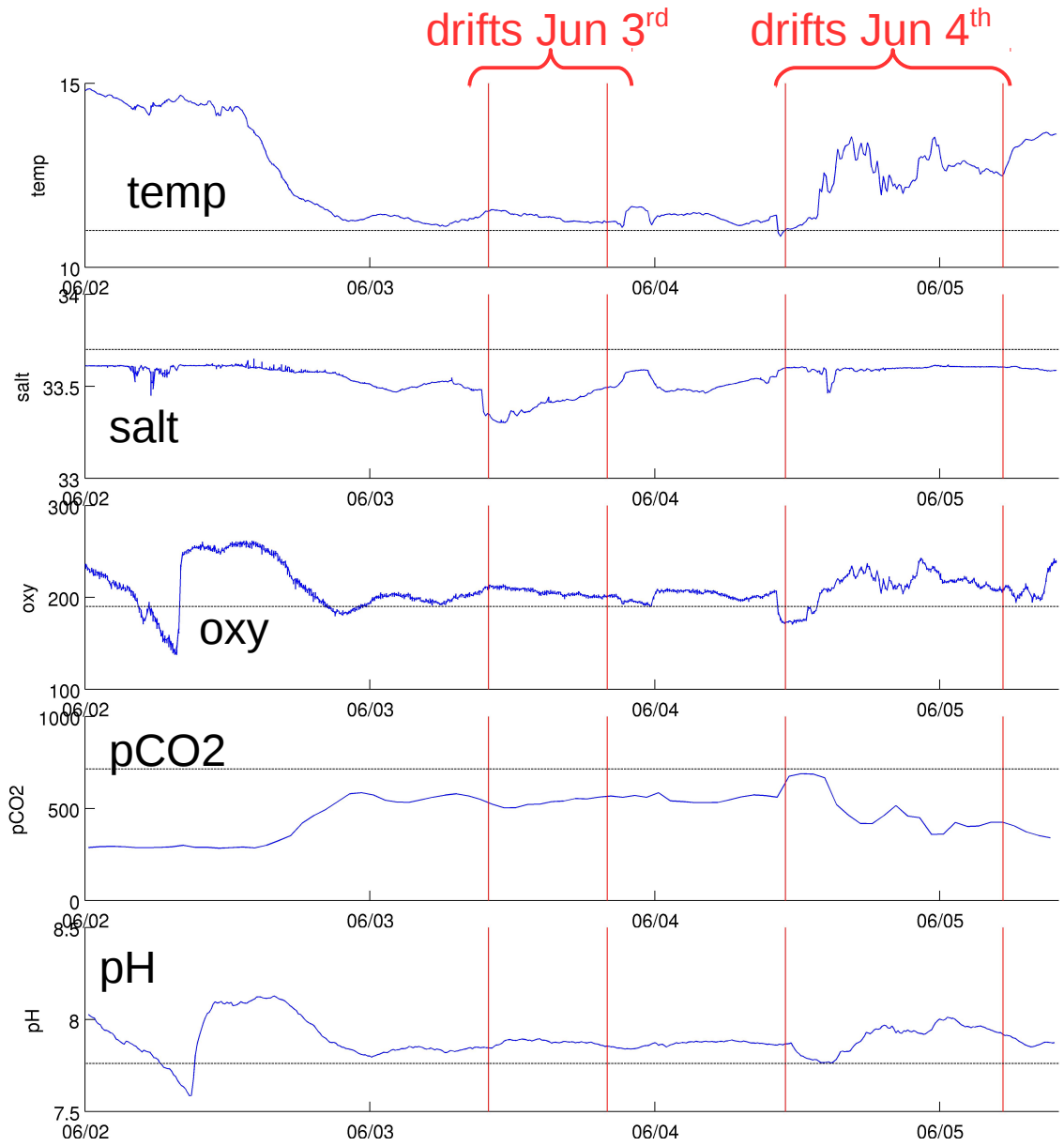


Strongest upwelling around 2-6 am Jun 4 GMT, ie 7-11pm Jun 3 (a few hours after the winds slowed down).

Regarding the onset, pCO2 started to increase / O2 decrease around 11 am on Jun 2nd (local time) ie a couple hours after the winds ramped up.

Water masses characteristics at the time of strongest upwelling:
T ~ 11°C
S ~ 33.7°C
pCO2 ~ 715 uatm
O2 ~ 190 umol/kg

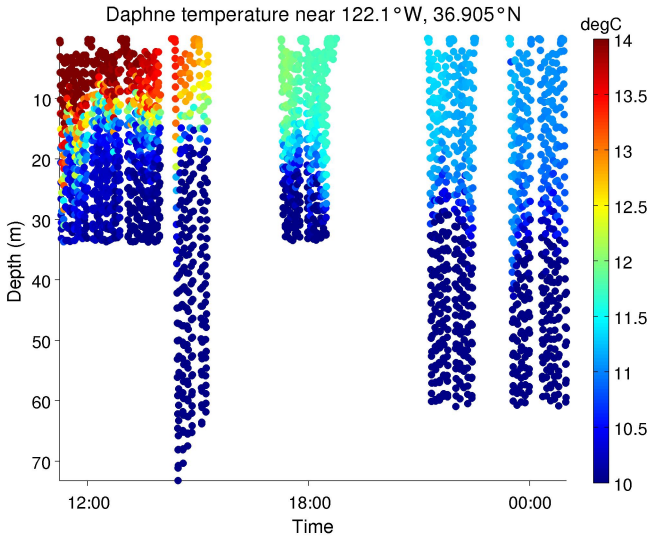
Tiny data

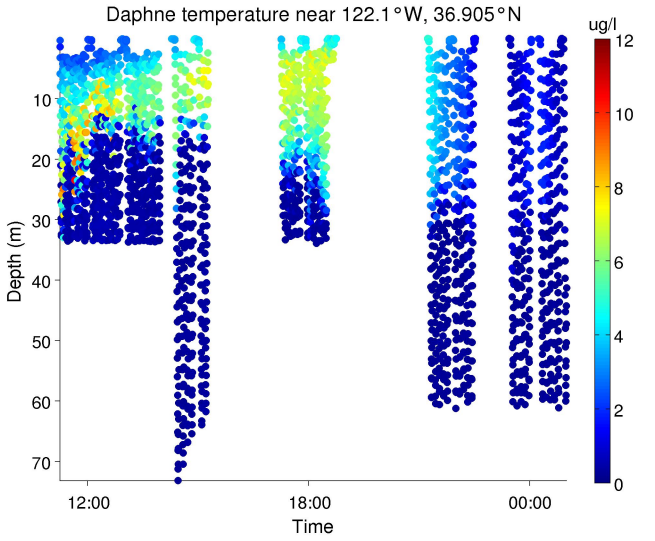


Horizontal black line = upwelled water characteristics from OA2.

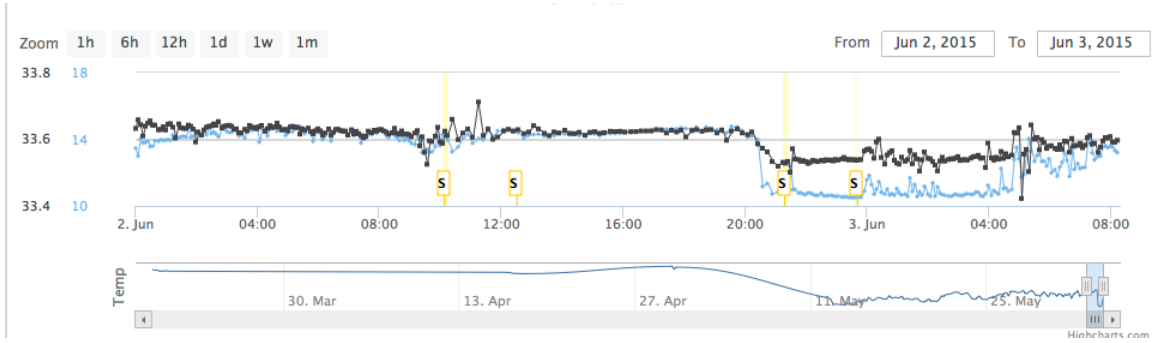
Suggests we were in the plume of the strongest upwelling at the beginning of the June 4th drift (but quickly ended up under the front, cf later).

Jun 2nd – temperature drop



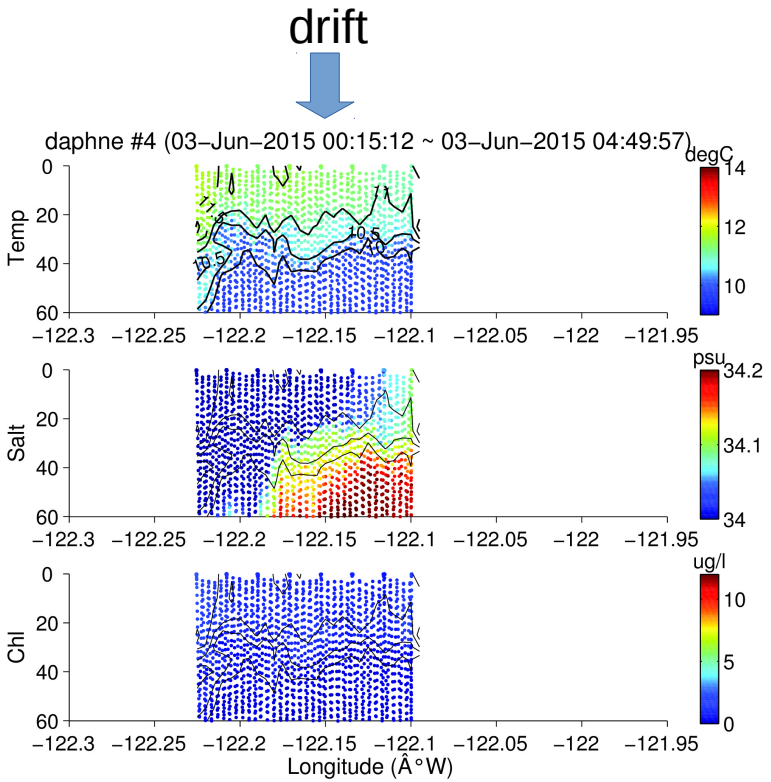


Between noon and midnight, temperature dropped by 3°C+ at 122.1°W and Chl concentrations dropped. Salt didn't change.



Bruce saw the cooling too, but later (8pm) and accompanied with lower salinity, hence the hypothesis that the cooling was due to wind mixing rather than upwelling (the halocline was deeper than thermocline in the morning, near 20m).

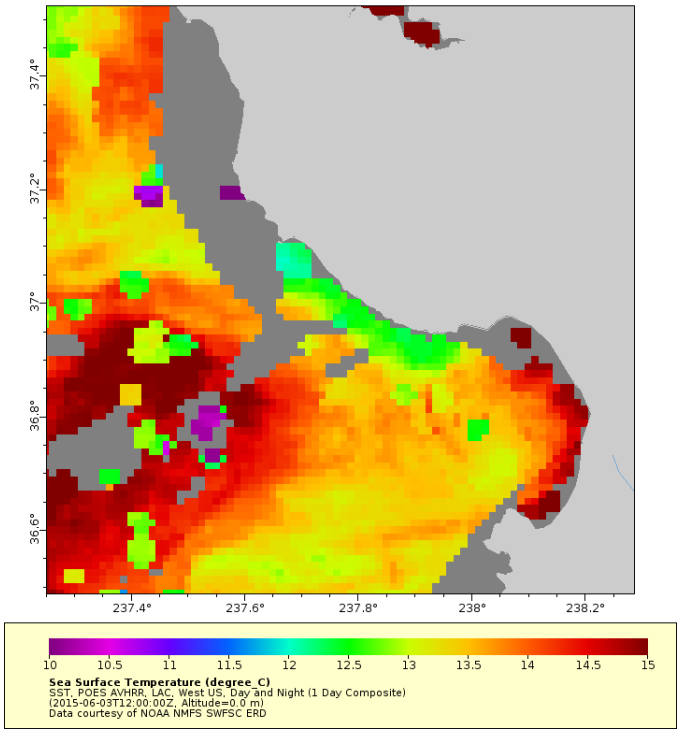
AUV survey, Jun 2nd night



Daphne section along 36.905°N – Makai was running the 122.15°W longitude north/south.

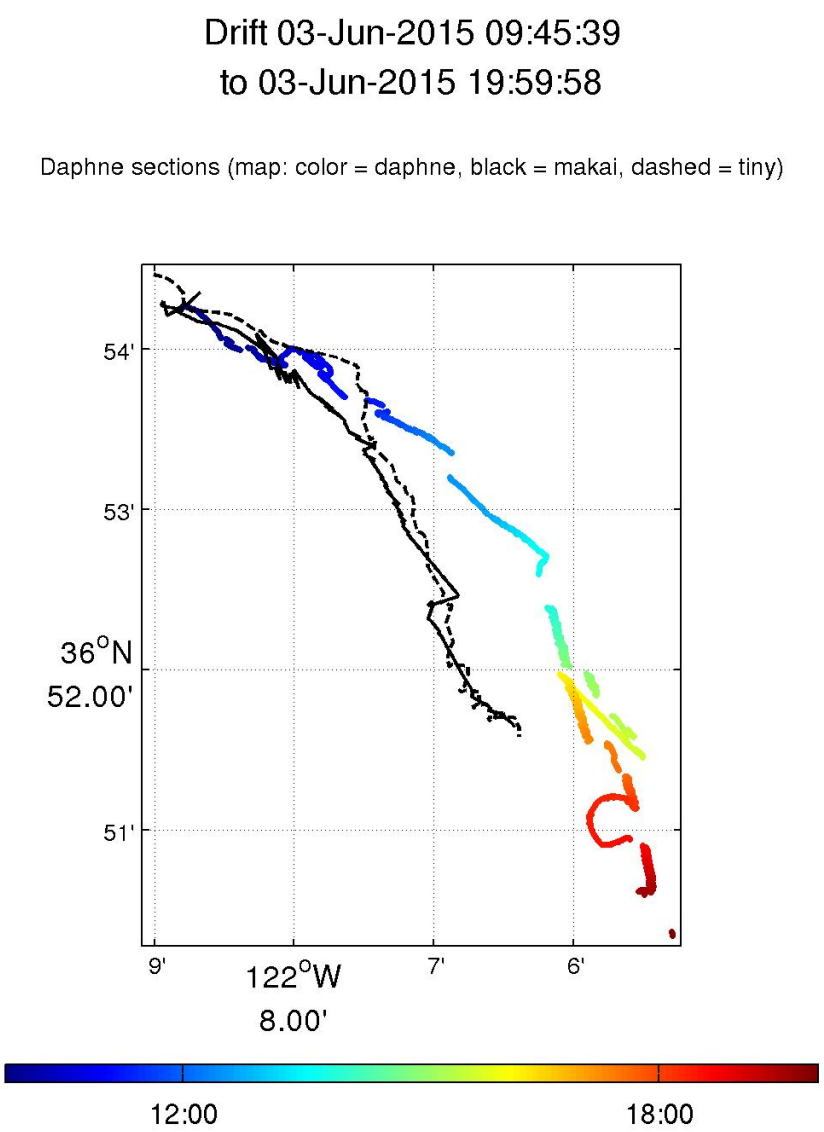
We had decided to move west a little to increase our chances to catch the plume, and relocated at 122.15°W in the morning. Turns out 122.1°W might have been a better spot (higher salt and lower temp – plume?). It is still unclear whether there was a true plume yet or not.

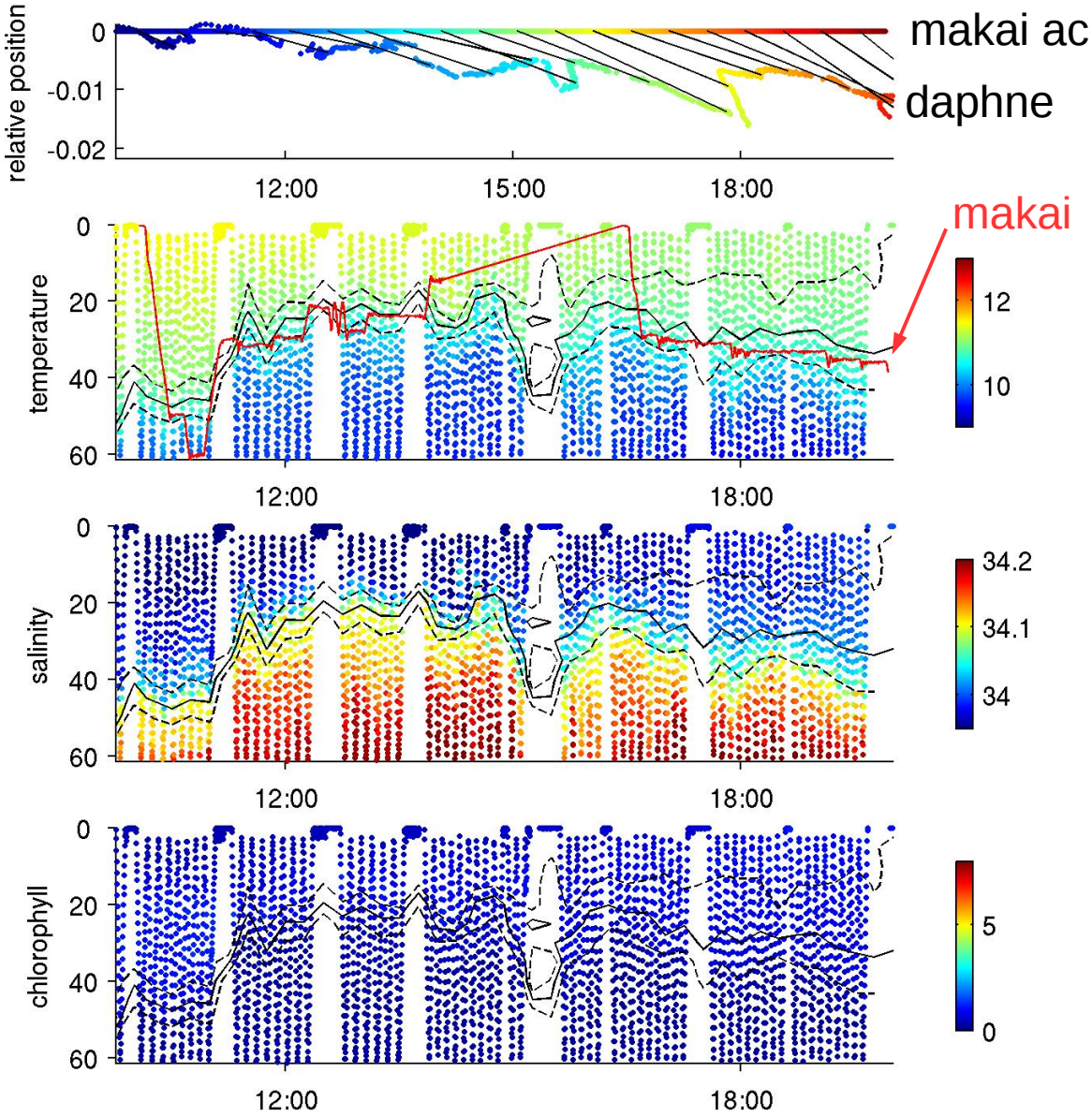
The only satellite SST image of the week was the day after and shows a very moderate plume. In general upwelling was not long-lasting enough to develop a plume fully.



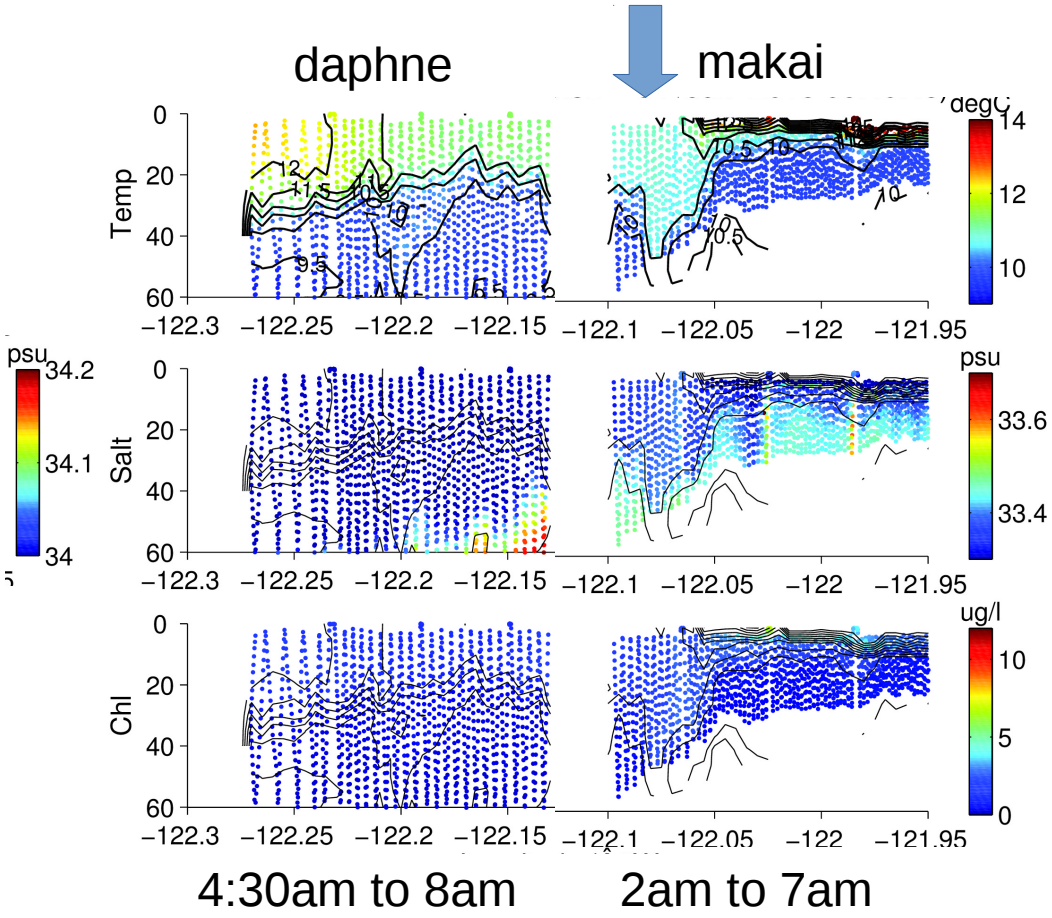
Makai drifts, Jun 3rd

Tracking the 10.8°C isotherm from ~ 10am to 2pm, then again from 4:30pm to 8pm
No relocation of assets in between (Makai held position), so considered to be the same drift.





AUV survey, Jun 3rd night

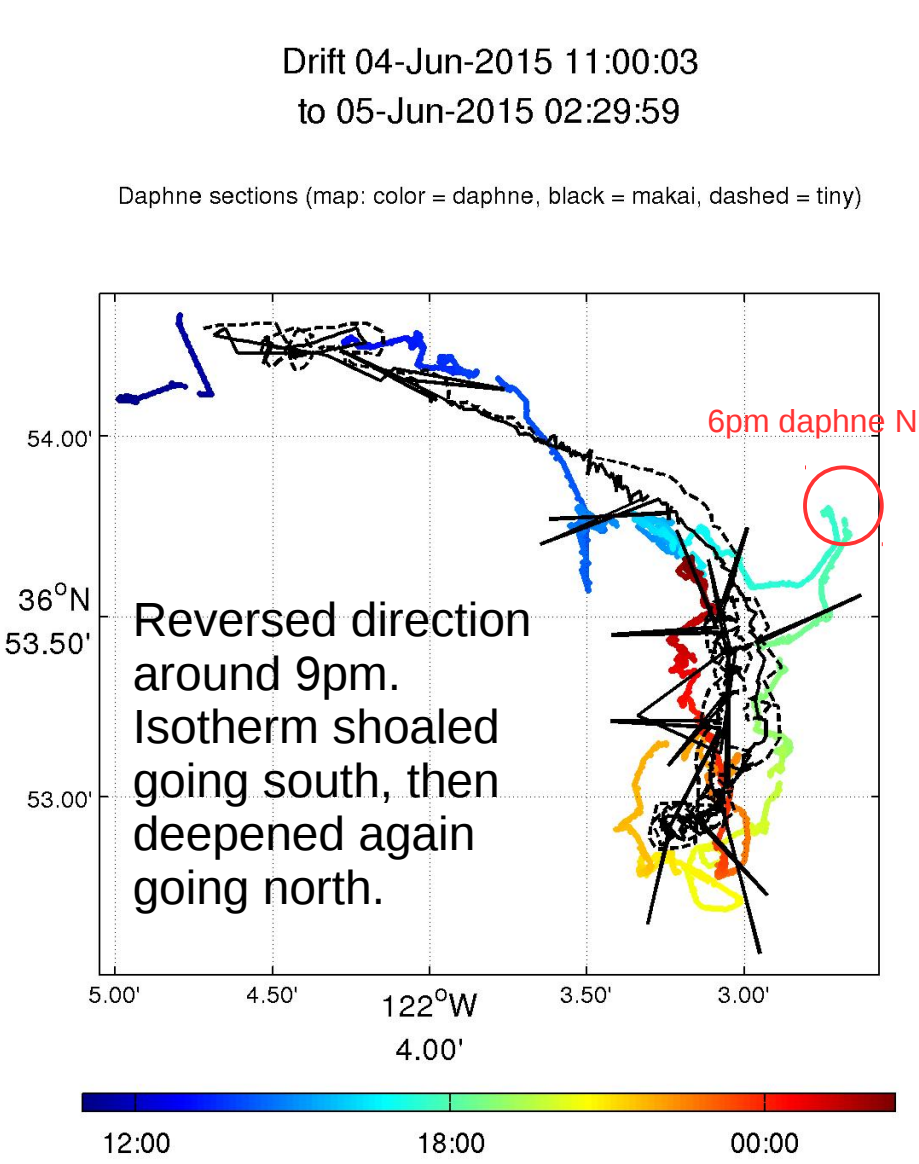


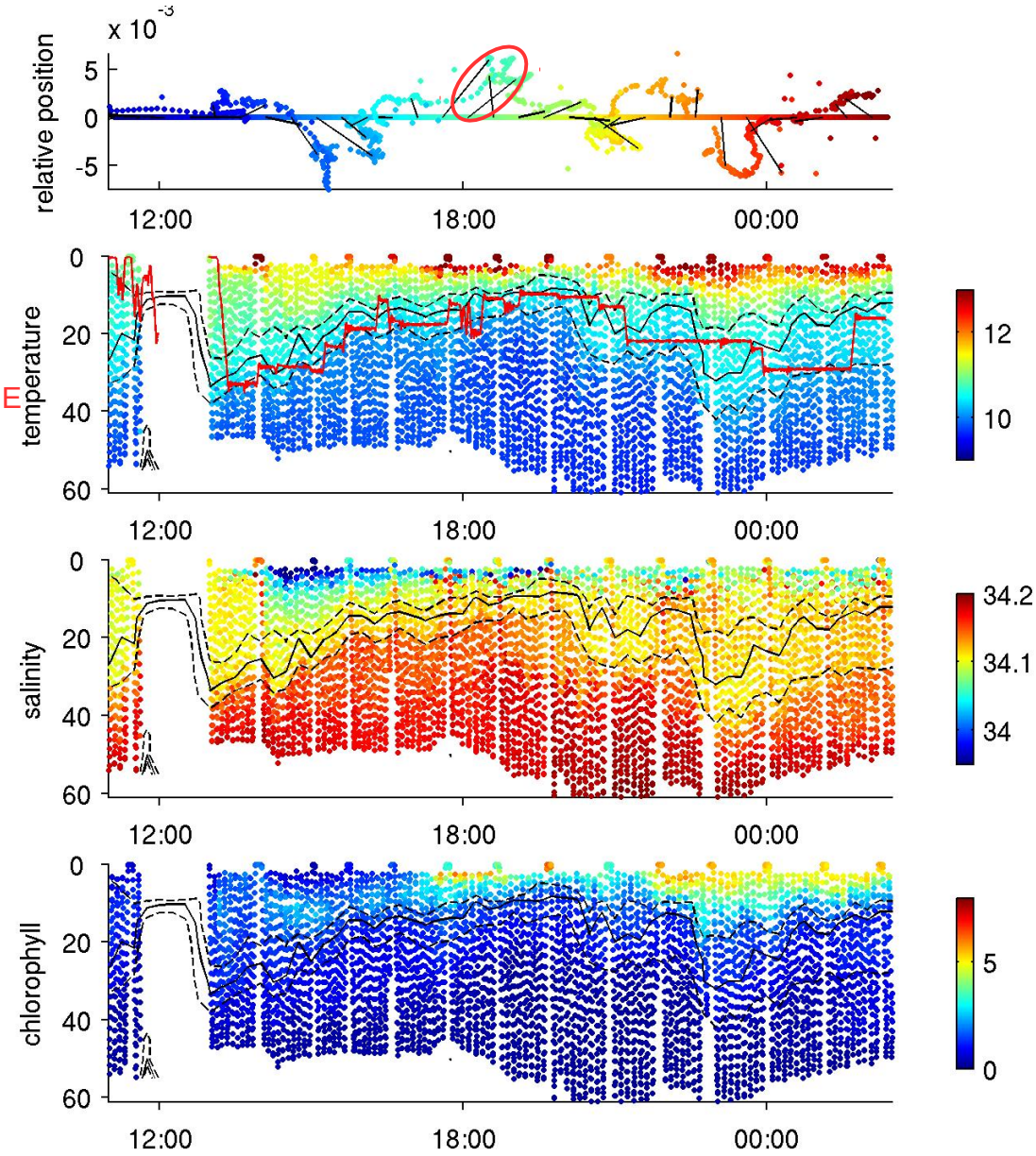
The survey was such that daphne & makai were ending at 122.1°W in the morning (moved east compared to the previous day).

Decided to relocate at 122.08°W to be more in plume waters, and closer to the front (to increase chances to witness mixing with the shadow area over 24h).

Of course by the time the drifts started, or even by the time we relocated, conditions had changed.

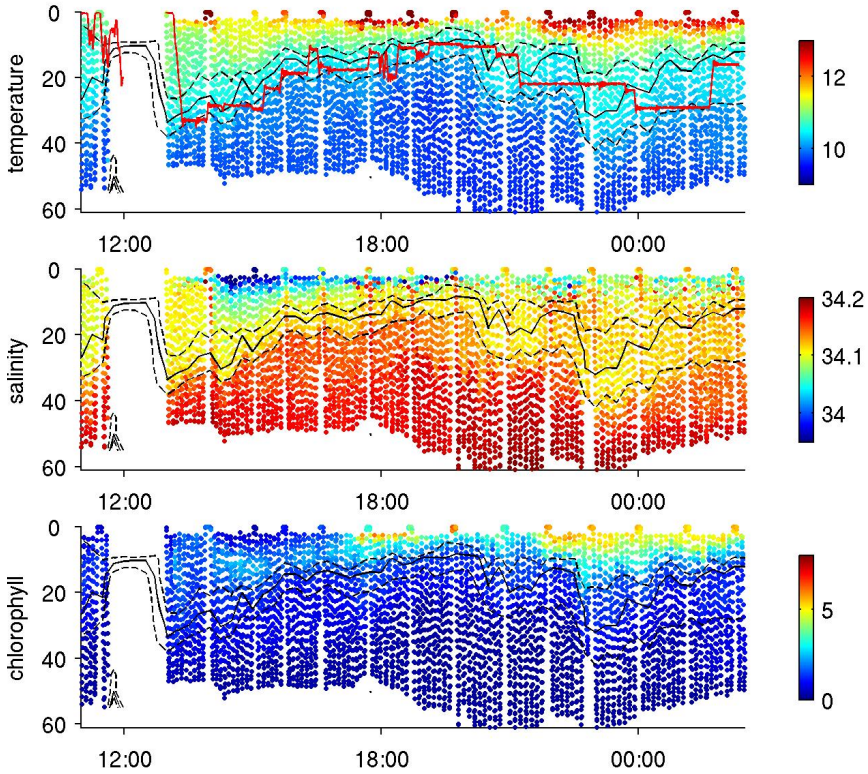
Makai drifts, Jun 4th



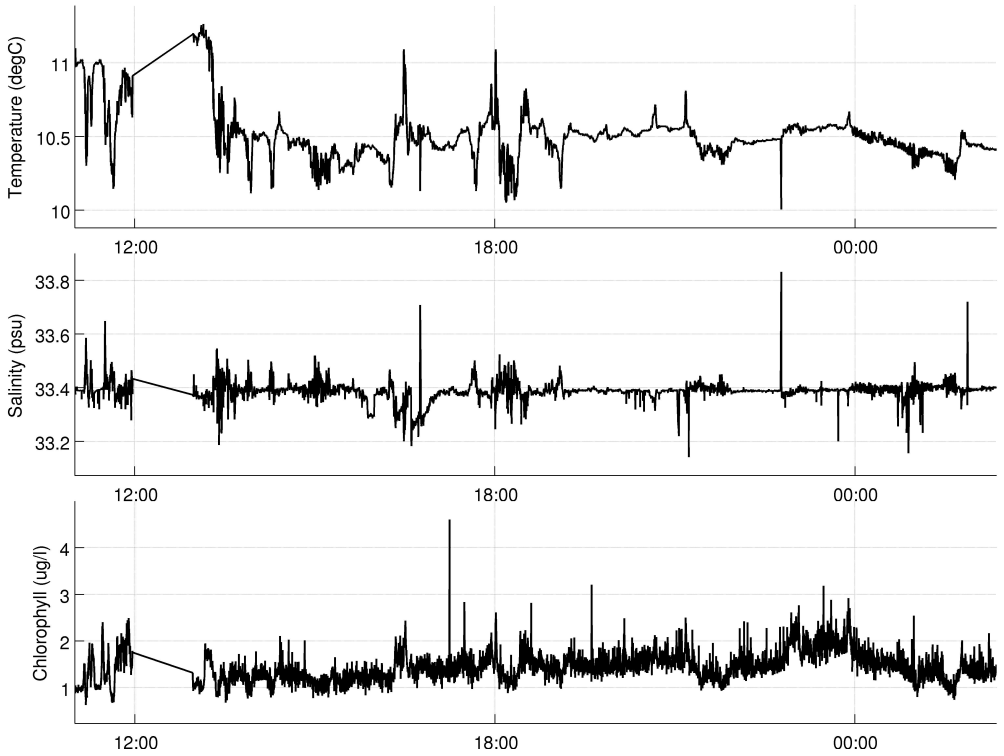


Makai drifts, Jun 4th

Daphne



Makai



Ended up below the front fairly fast, although possibly going in & out of it (especially Daphne around 6pm was further cf previous slide). So probably really under only after turning around (9pm), although Tiny may be telling a different story.

Temp & salt relatively constant for Makai (as expected), Chl increased over time.