Case-study :

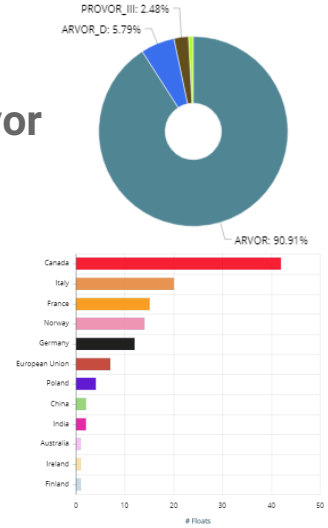
Arvor WMO 6902729 under ice

Presented at:
Arvor-Provor Workshop , 30/12/2020

Arvor Ice Facts

In numbers

+121 NKE “Ice” floats

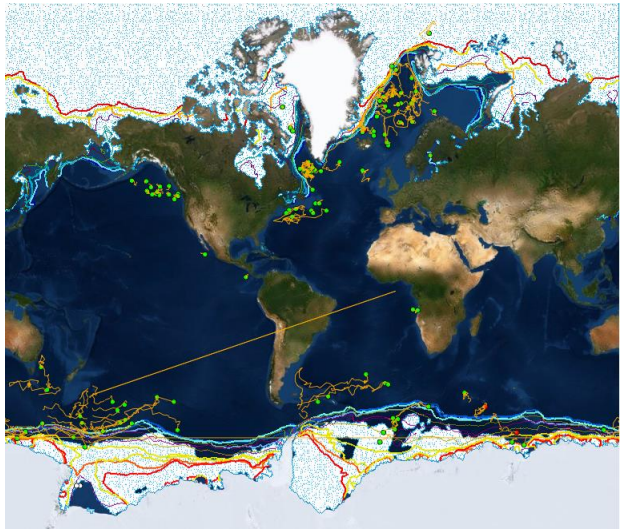


+ Mainly **Arvor**

+ Canada
+ Italy
+ France
+ Norway
+ Germany..

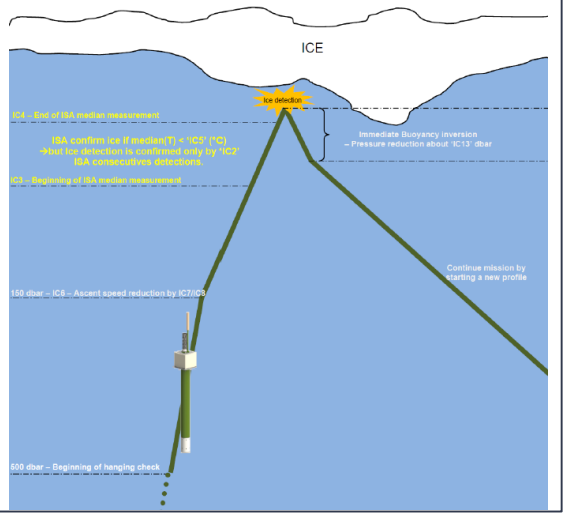
Where

+78 North / 43 South



ISA triggered

+ 4 out of 10 French Arvor triggered on ISA / Sat. mask



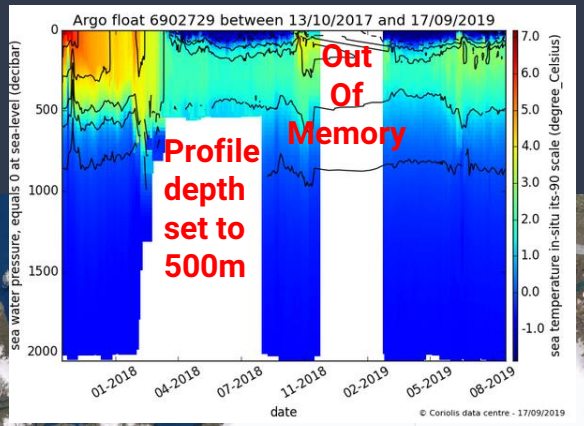
The « NARVAL » configuration

--- ICE DETECTION ---	
IC0 - Nb of days without emergence (0=No Ice Detection)	10
IC1 - Nb of days before force an emergence (days)	90
--- ISA ---	
IC2 - Number of ISA detection before an ice confirmation	3
IC3 - Start pressure (dbar)	40
IC4 - Stop pressure (dbar)	10
IC5 - Temperature median (°C)	-1.6
IC6 - Deceleration treshold (dbar)	150
IC7 - Scrutation pressure delay on ascent (minutes)	2
IC8 - Stabilization pressure on ascent (dbars)	4
IC9 - Pumping activation delay on ascent (csec)	500
--- SATELLITE MASK ---	
IC10 - GPS session timeout (minutes)	5
IC11 - 1st Iridium lock timeout (minutes)	10
--- ASCENT HANGING ---	
IC12 - Confirmation delay (minutes)	80
--- BUOYANCY INVERSION ---	
IC13 - Offset pressure (dbars)	20
IC14 - EV volume per action (cm3)	9
IC15 - EV volume max (cm3)	900

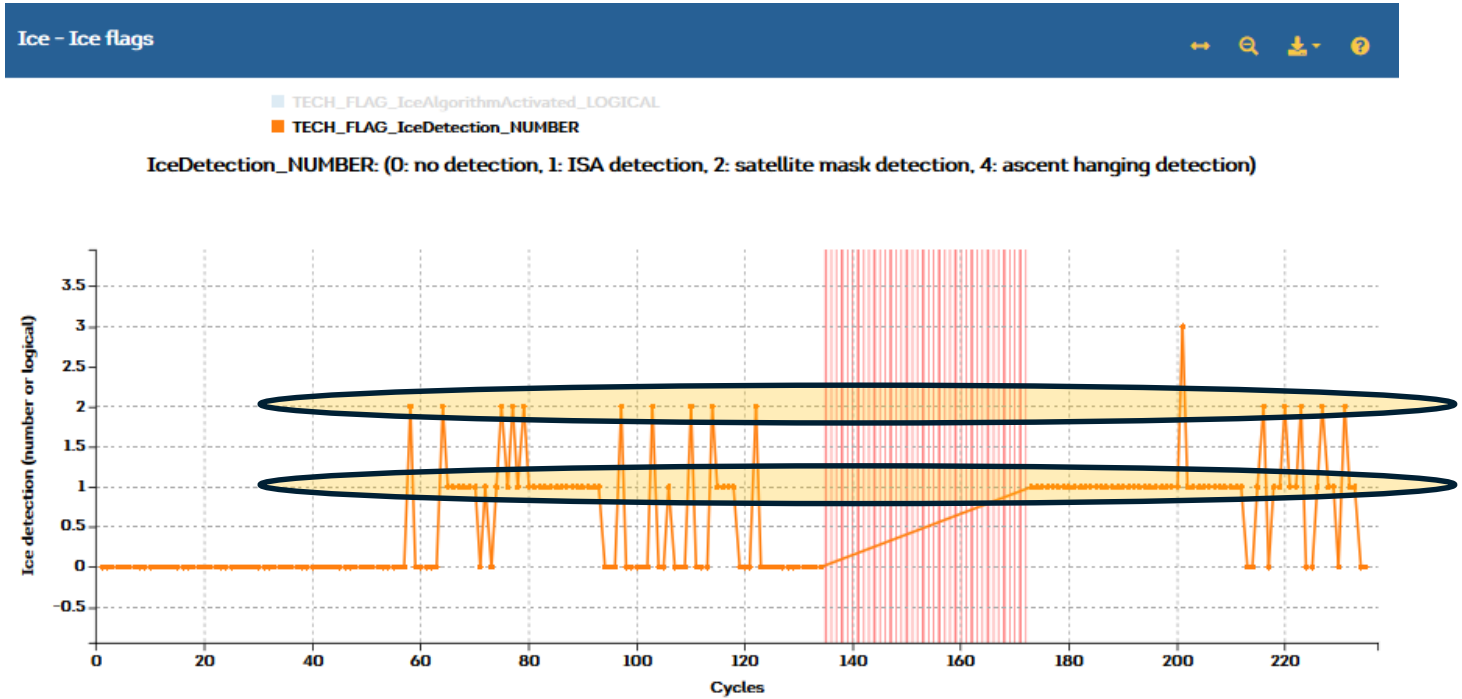
- Adjustment of the temperature threshold to -1.6°C (Default= -1.78°C, Baffin bay = -1.3°C)
- Range set to 10 to 40 dbars (default 20 to 50)
- IC12 increased to 80 minutes to get around false detections

Arvor 6902729 :

- 93 cycles show ISA or Sat. mask detection over 196 recorded cycles and 2 years of operation
- Good concordance between those cycles location and satellite imagery
- In comparison, the 3 other floats show a total of 31 cycles with ISA or Sat. mask detection.



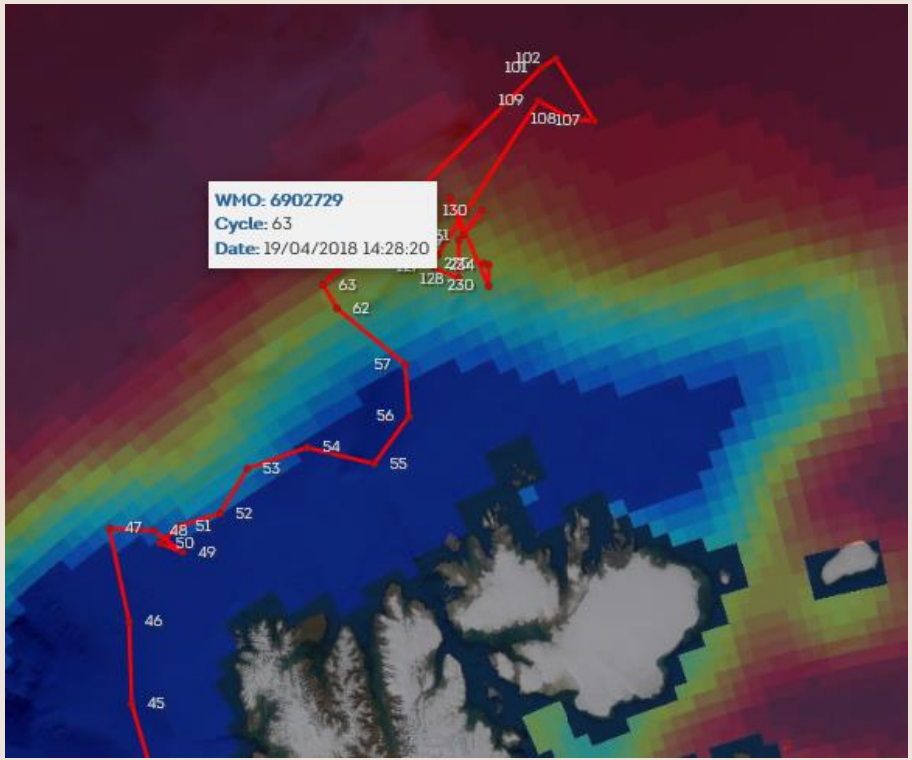
Technical plots : Ice flags

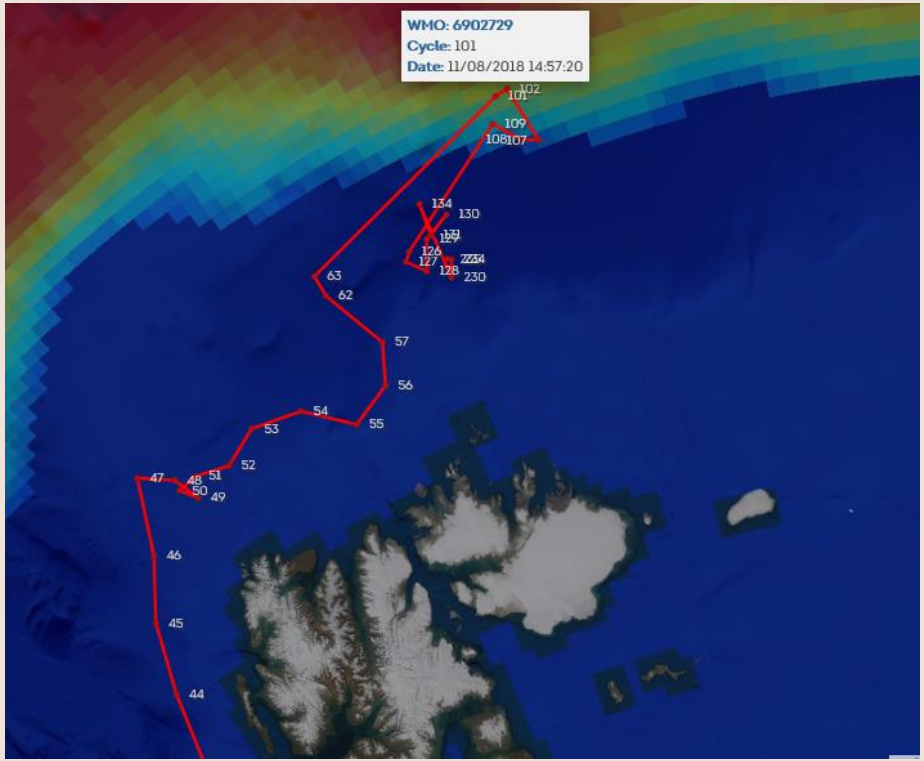


Sat. mask

Mean t° < -1.6°C

First « wintering » : From #63 April to #101 mid-August 2018

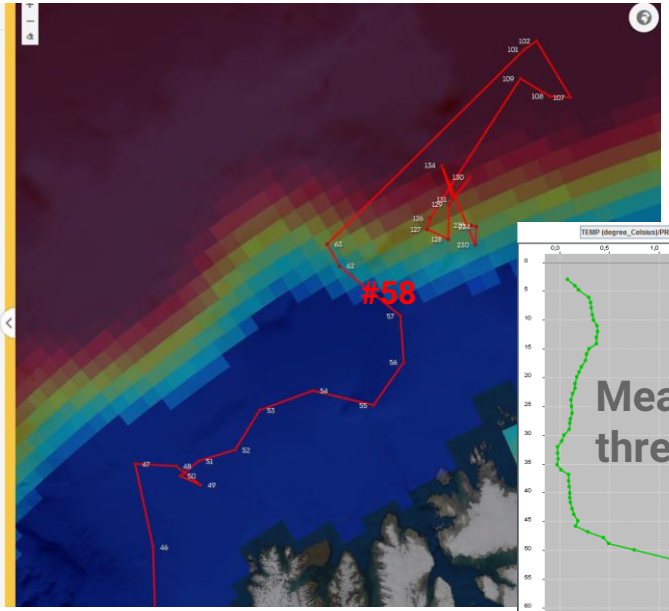


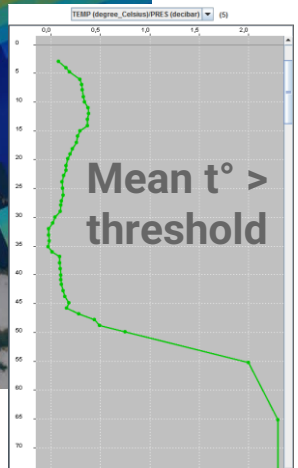


Satellite mask example : cycle #58

Ice detection = 2 :Sat. mask detection

GPSValidFix = 0 : No fix





Consequences :

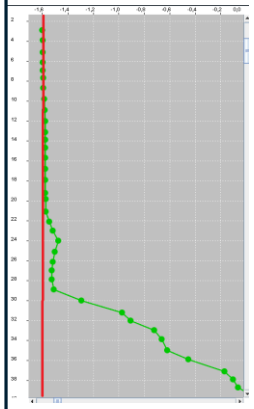
IC0 = 10 next days without surfacing

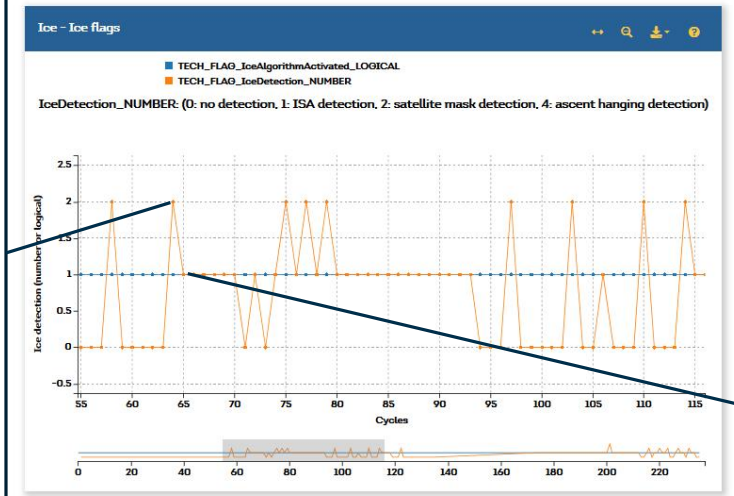
>>> Next surface 10 days later @ #62

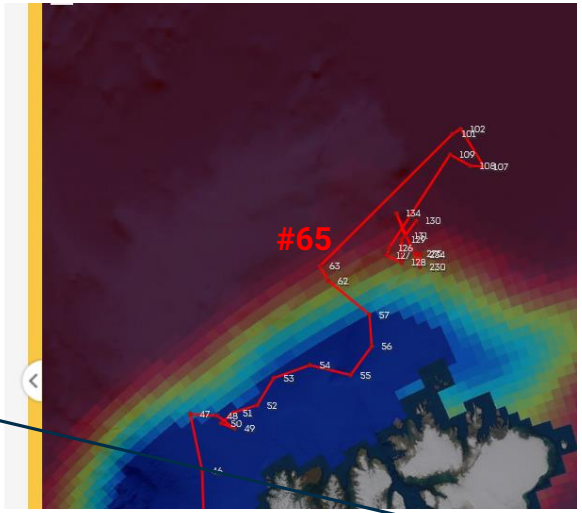
For sat. mask and ascent hanging ice detection IC0 applies immediately

ISA detection example : cycle #65 to 101

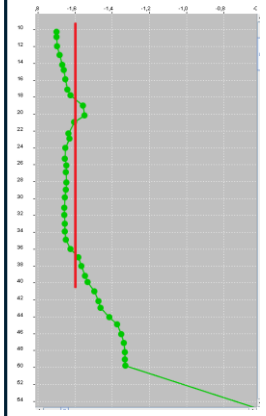
Cycle #64 temperature just above threshold value : Sat. mask





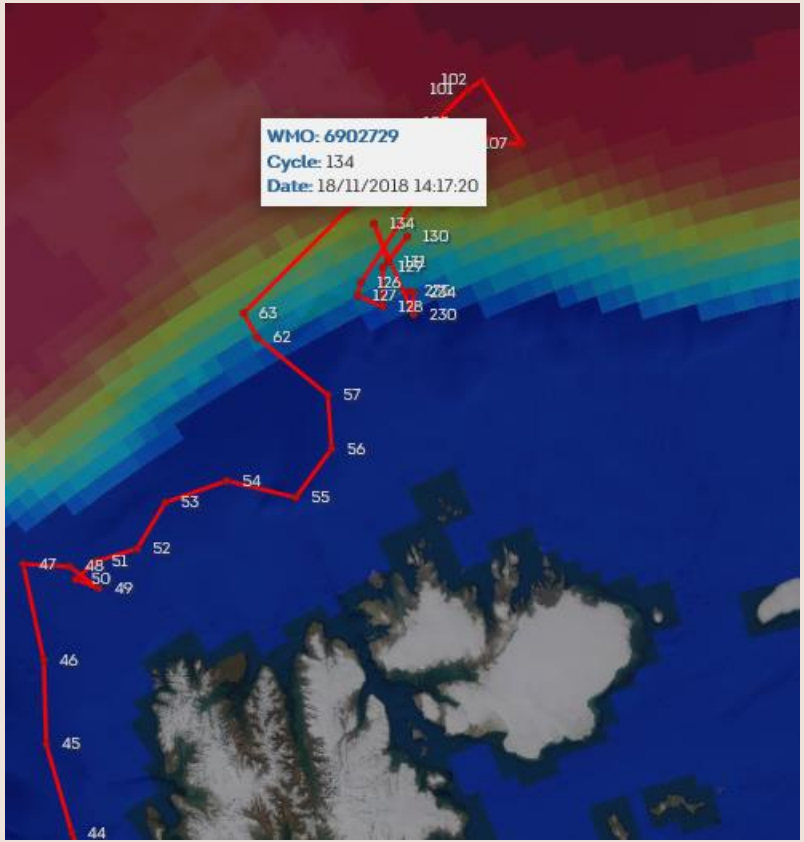


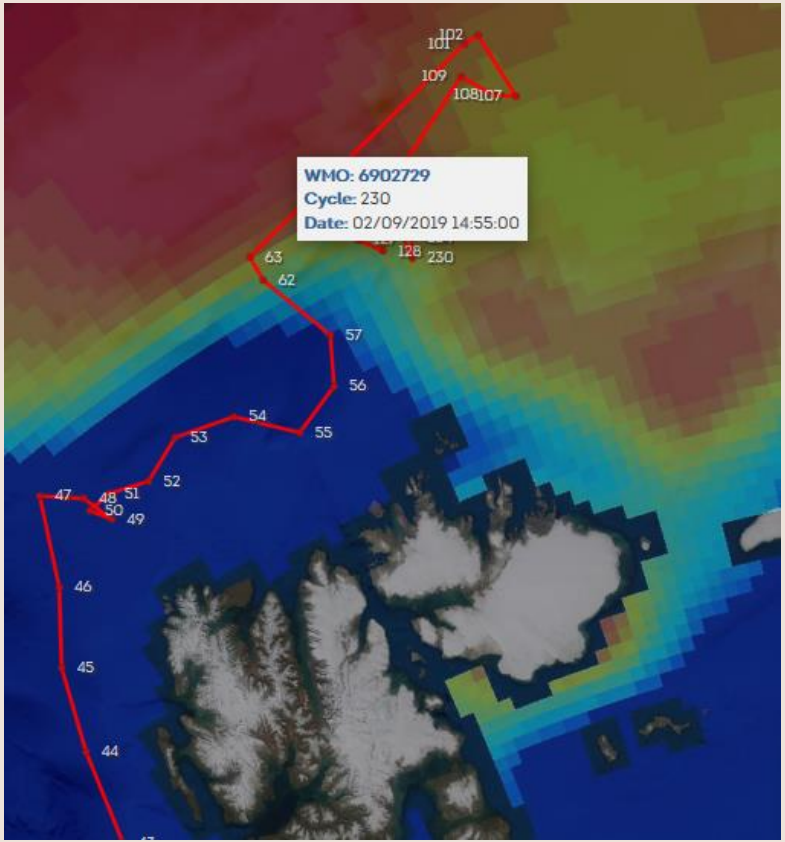
Cycle #65 to 70 : Mean t° < -1.6 °C ISA detection



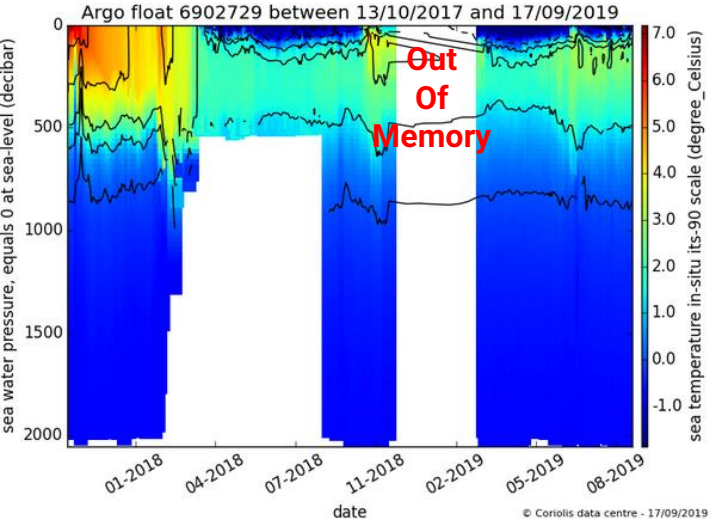
Consequences : 3 consecutive ISA detections forbid emergence for 10 days.
Then No ISA detection an no Sat. Mask for 10 consecutive days allow float to surface @ cycle # 101.

Second « wintering » : From #134 november 2018 to #230 september 2019





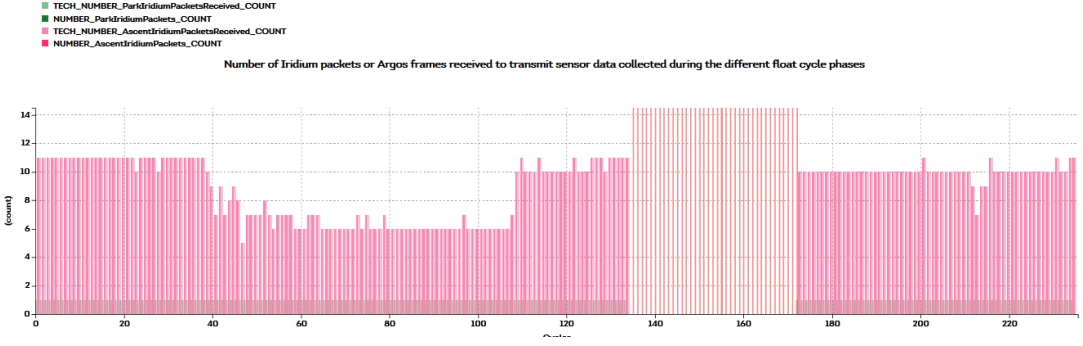
YLA5900A04 memory example



When the float surfaced @ cycle #230, it had been under ice for 288 days (= 96 3-days profiles)

MC2 - Cycle Period 1 (hour)	72
MC11 - Drift Depth of period 1 (dbar)	500
MC12 - Profile Depth of period 1 (dbar)	2000
MC8 - Descent Sampling Period (second)	0
MC9 - Drift Sampling Period (hour)	12
MC10 - Ascent Sampling Period (second)	10
MC17 - Threshold Surface/Intermediate Pressure (dbar)	50
MC18 - Threshold Intermediate/Bottom Pressure (dbar)	500
MC19 - Surface Slice Thickness (dbar)	1
MC20 - Intermediate Slice Thickness (dbar)	10
MC21 - Bottom Slice Thickness (dbar)	25

The chosen vertical sampling of 160 CTD points generates 19 SBD packets/profile and Arvor 5900A04 memory space is limited to 1000 SBD packets (=54 prof.) >>> Loss of 39 profiles



Ascent hanging example

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By default, in 30 min (IC12), the float must have moved up more than 4 dbars (IC8) every 2 min (IC7) since 500 dbars.

Note that if ISA is activated the pump action in ascent is 5 sec (IC7) instead of 7.2 sec (TC3)

Experience showed that it is good practice to increase IC12 from 30 to 80 min to avoid false detections…not all!