

ANDRO: An Argo-based deep displacement atlas

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(1) ALTRAN - (2) LOPS - (3) LOCEAN

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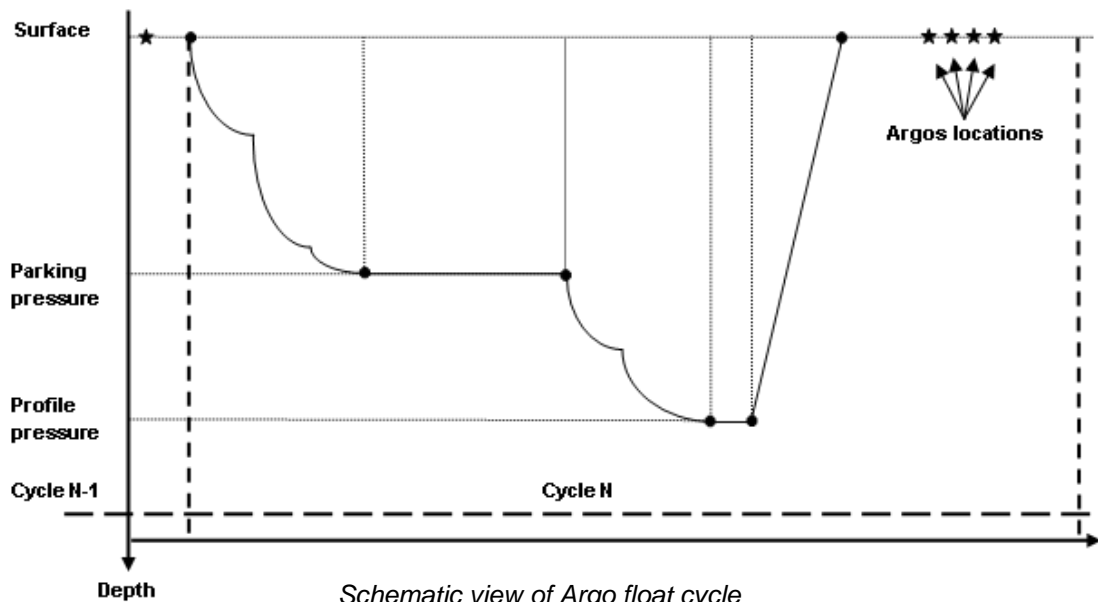
alTRAN



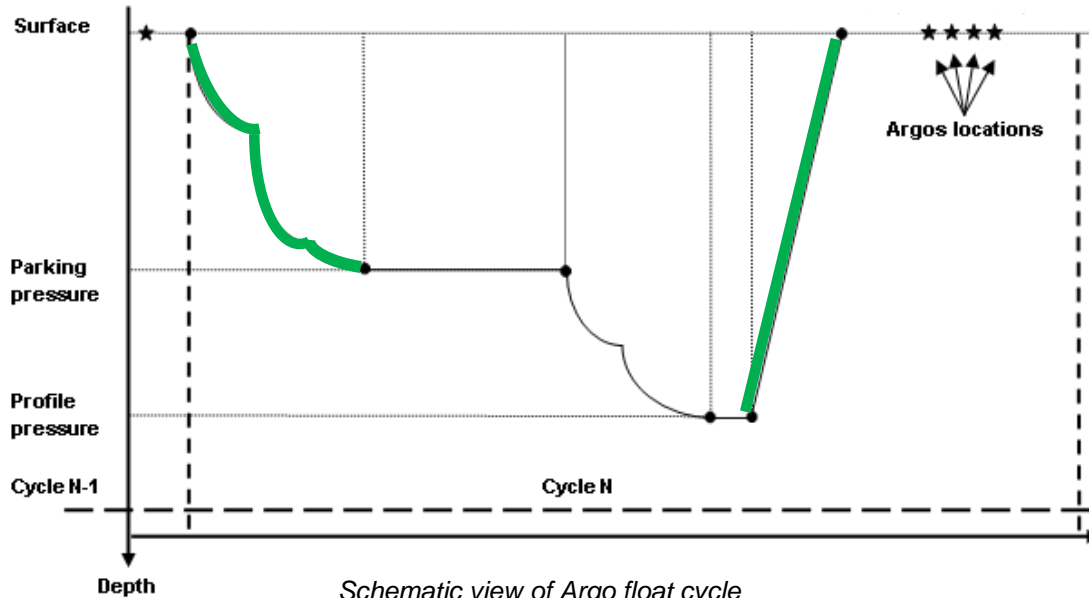
Summary

1. Historical context
2. DEP files
3. ANDRO atlas, production
4. Subsurface currents
5. Conclusion / Prospect

Historical context

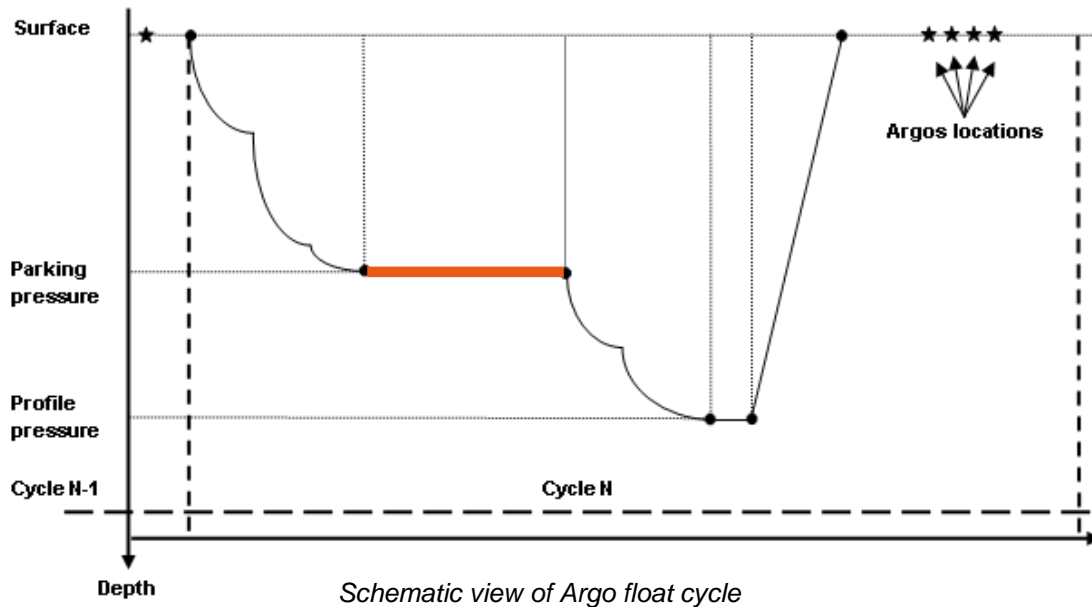


Historical context



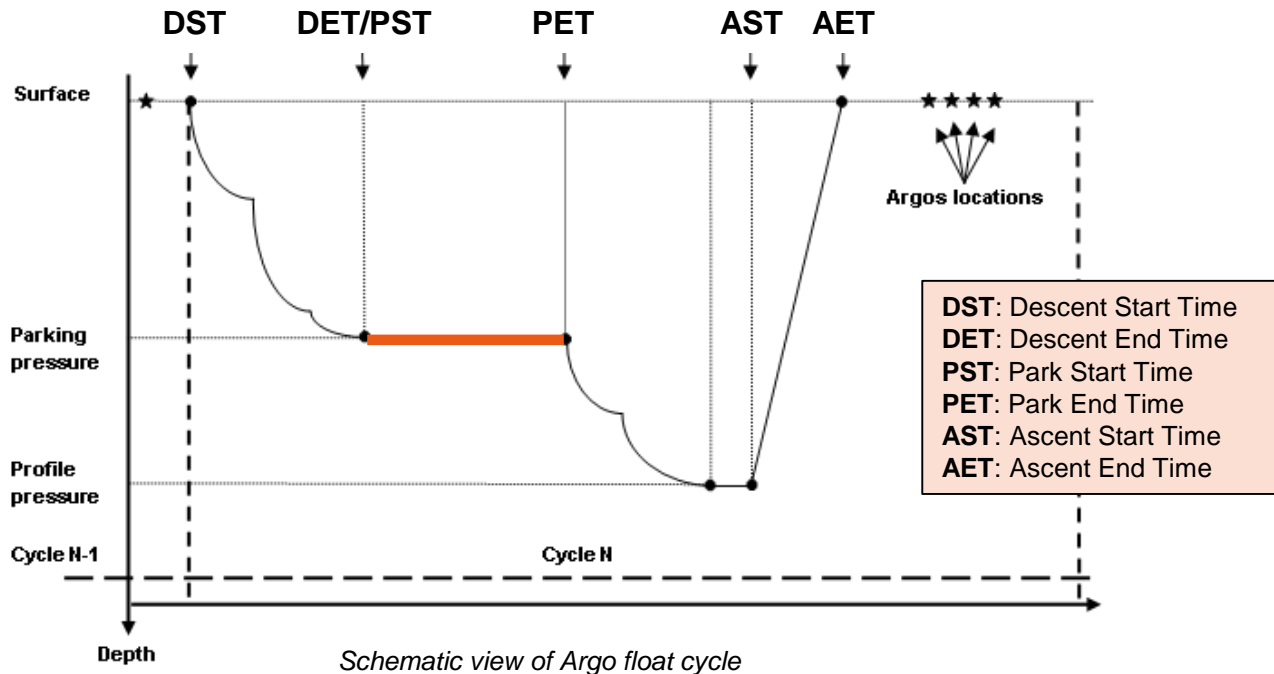
**Argo users community:
ascending/descending profiles exploitation
(0,5/10 days)**

Historical context



2006: M. Ollitrault & JP. Rannou
Exploitation of other parts of the cycle
(9,5/10 days)

Historical context



2006: M. Ollitrault & JP. Rannou
Exploitation of other parts of the cycle
(9,5/10 days)
→ drift measurements ; timings

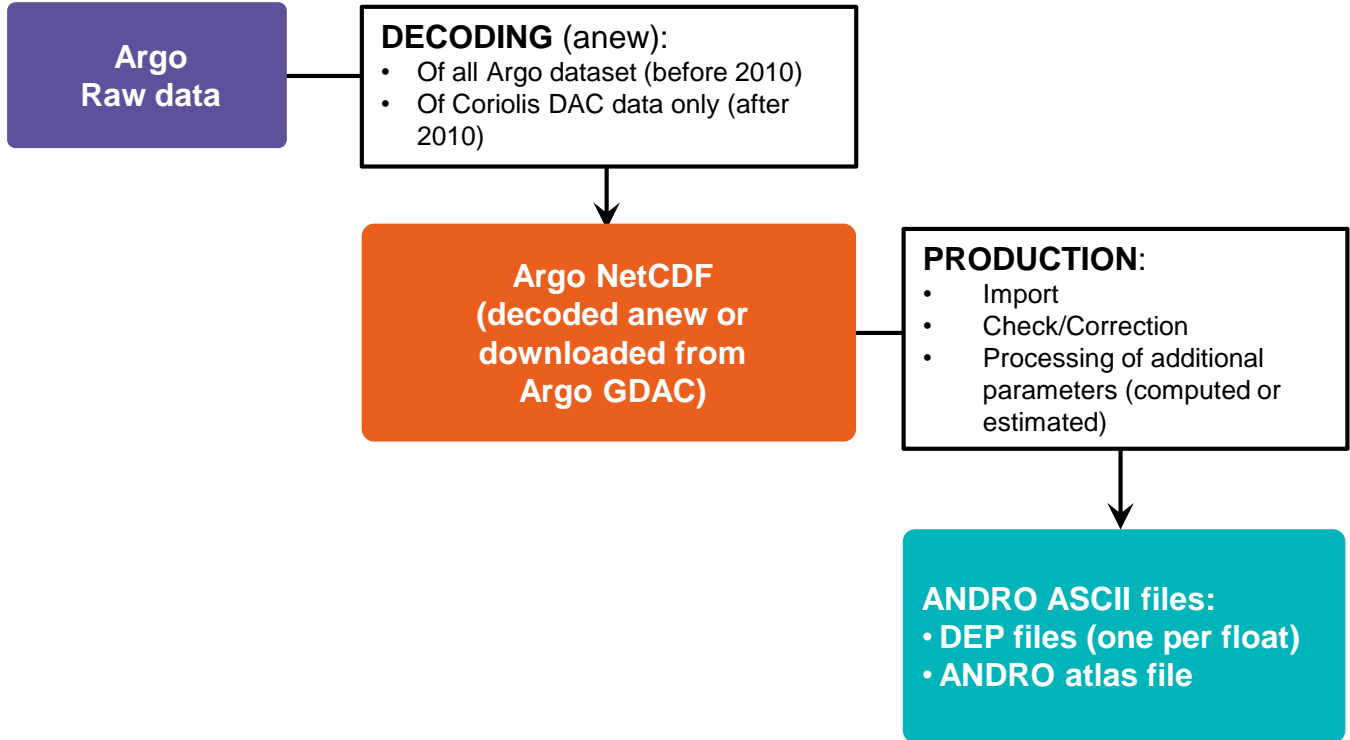


Creation of DEP files

2.

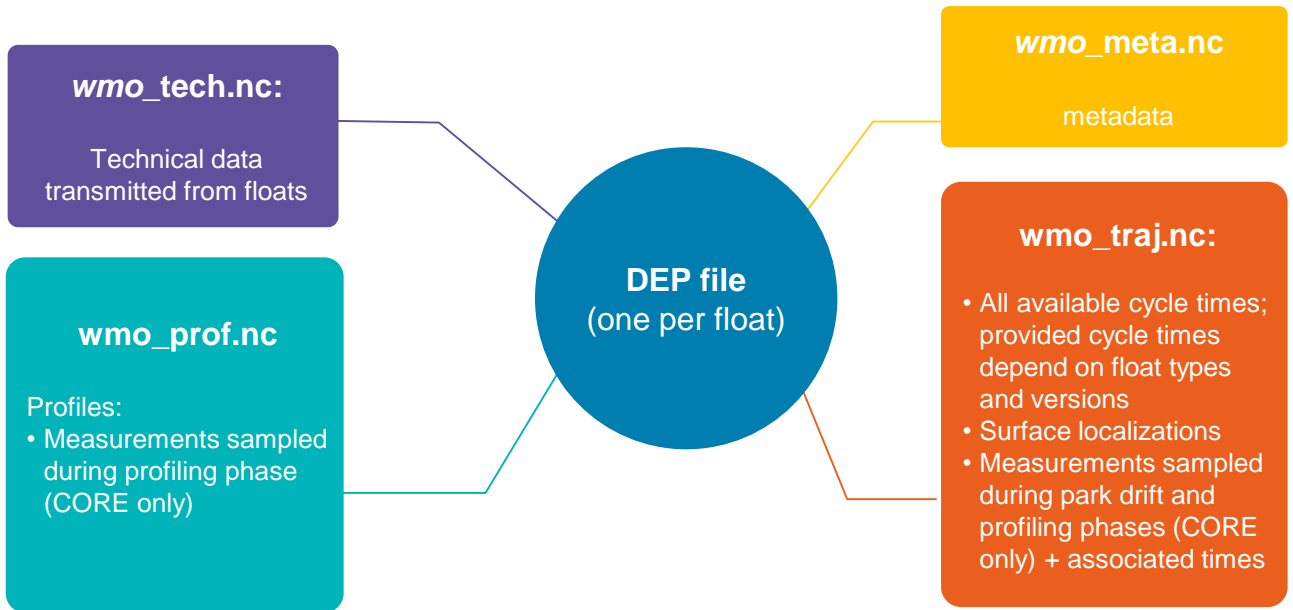
DEP files

DEP files, production line



DEP files, initial import

Collect, in a same ASCII file, all NetCDF Argo information useful for displacements determination



DEP files, treatment

Succession of processing steps (content and order specific to each type of floats)

Some step examples :

- initial import
- check of cycle number
- processing/estimation of additional cycle times
- check of cycle timings consistency
- check of Argos surface trajectory (*[Nakamura et al., 2008]* + visual check)
- adding of a RPP (Representative Parking Pressure) for each cycle
- identification of grounding cycles
- ...

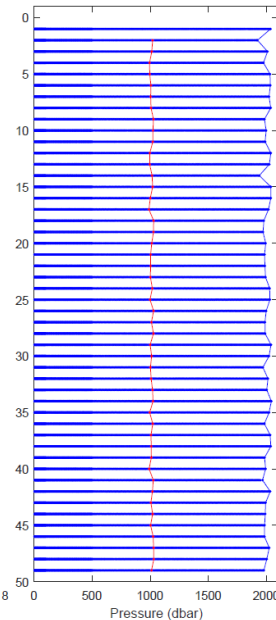
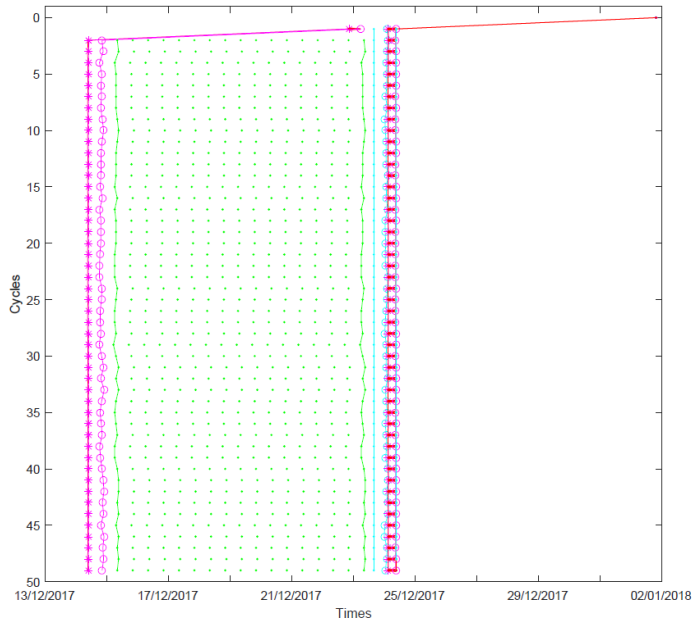


DEP files, treatment

Succession of processing steps (content and order specific to each type of floats)

Some step examples : 

- initial import
- ...

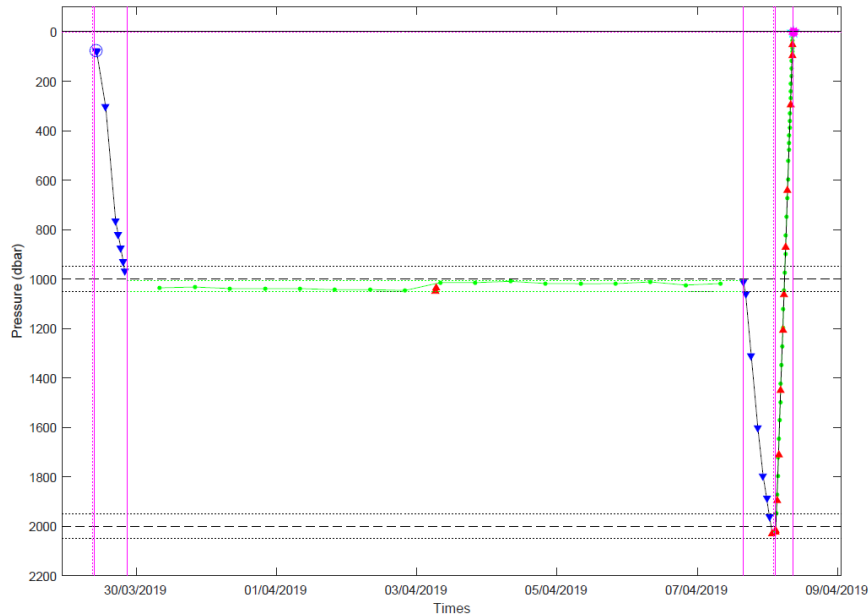


Float 3902135
(Coriolis Arvor Iridium)

DEP files, treatment

Succession of processing steps (content and order specific to each type of floats)

Some step examples : 



Float 3902135
(Coriolis Arvor Iridium)
Cycle 47

DEP files, treatment

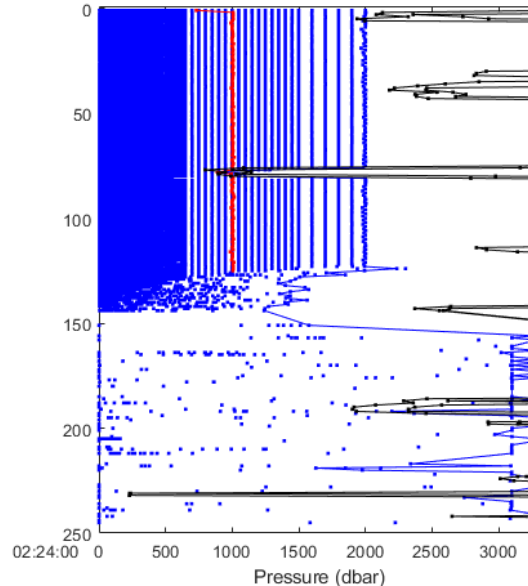
Succession of processing steps (content and order specific to each type of floats)

Some step examples :

- initial import
- ...



Detection of
« Druck micro-
leaks »

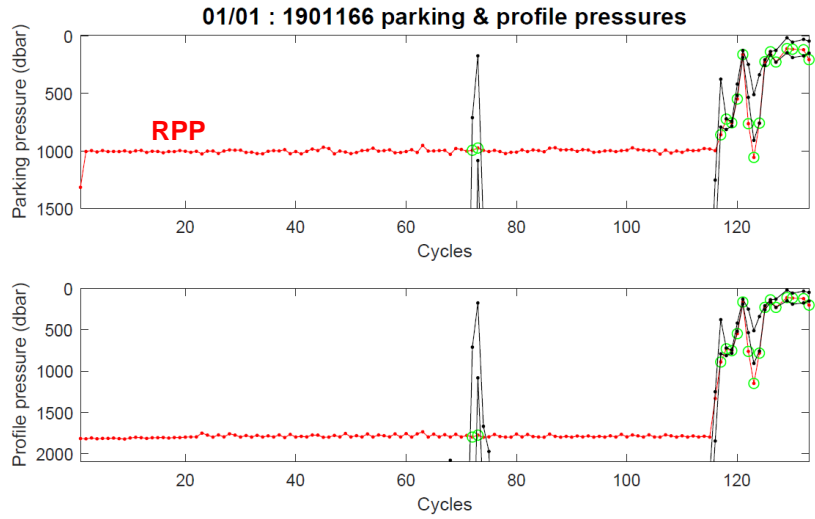


Float 5901665
(CSIRO APEX Argos APF8)

DEP files, treatment

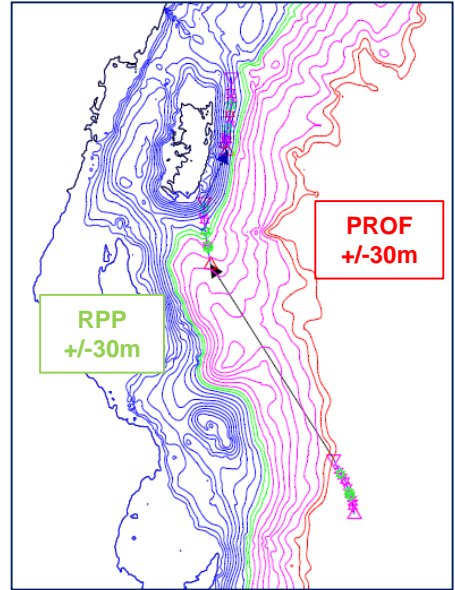
Succession of processing steps (content and order specific to each type of floats)

Some step examples :  • identification of grounding cycles
• ...



Float 1901166

Bathymetry: SMTR 30+



3.

Production of ANDRO atlas

ANDRO atlas, method

Deep displacements, calculated between the last surface location of a cycle and the first one of the next cycle.

Application of following criteria:

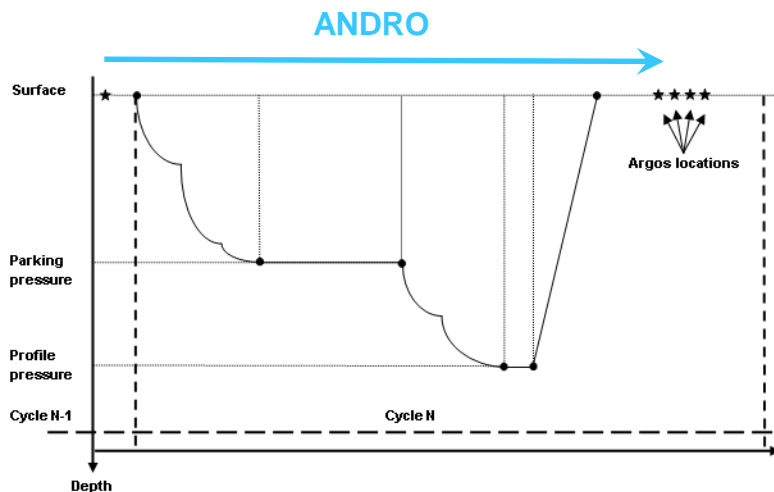
Locations:

- All GPS
- Argos location classes 1, 2 or 3

GROUNDNED cycles: excluded

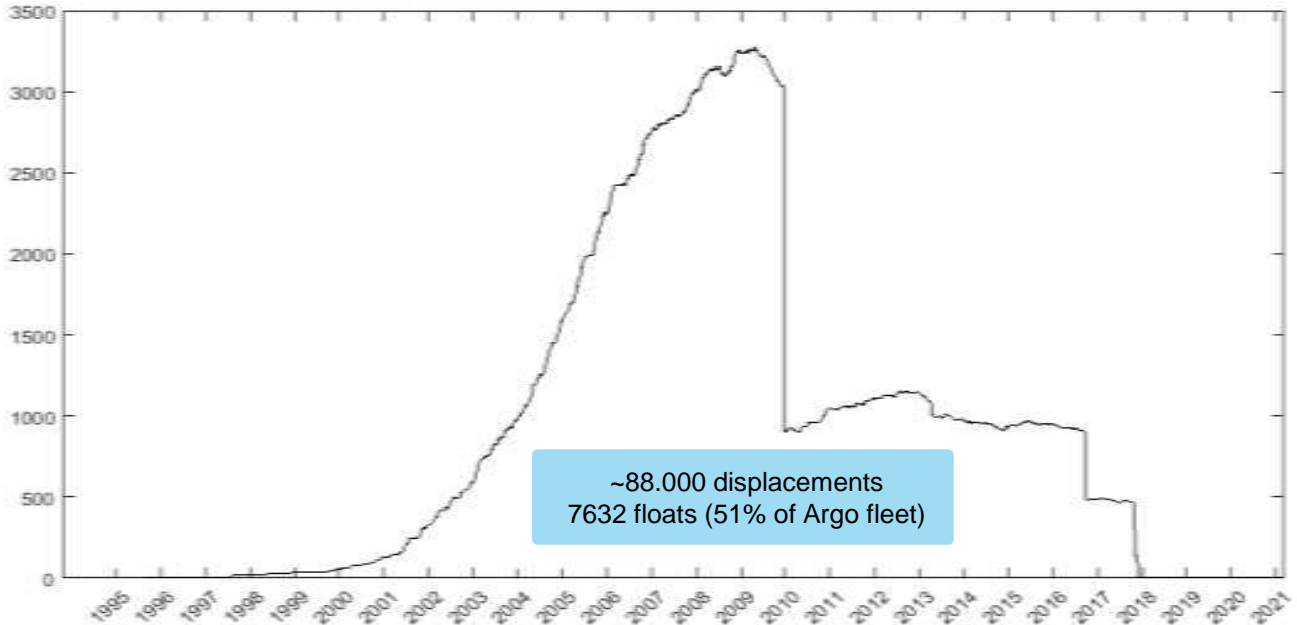
Surface velocities considered as zero if agglomerated positions

Surface velocities $> 3 \text{ m.s}^{-1}$ set to default value



ANDRO atlas, with numbers

Number of active floats



~88.000 displacements
7632 floats (51% of Argo fleet)

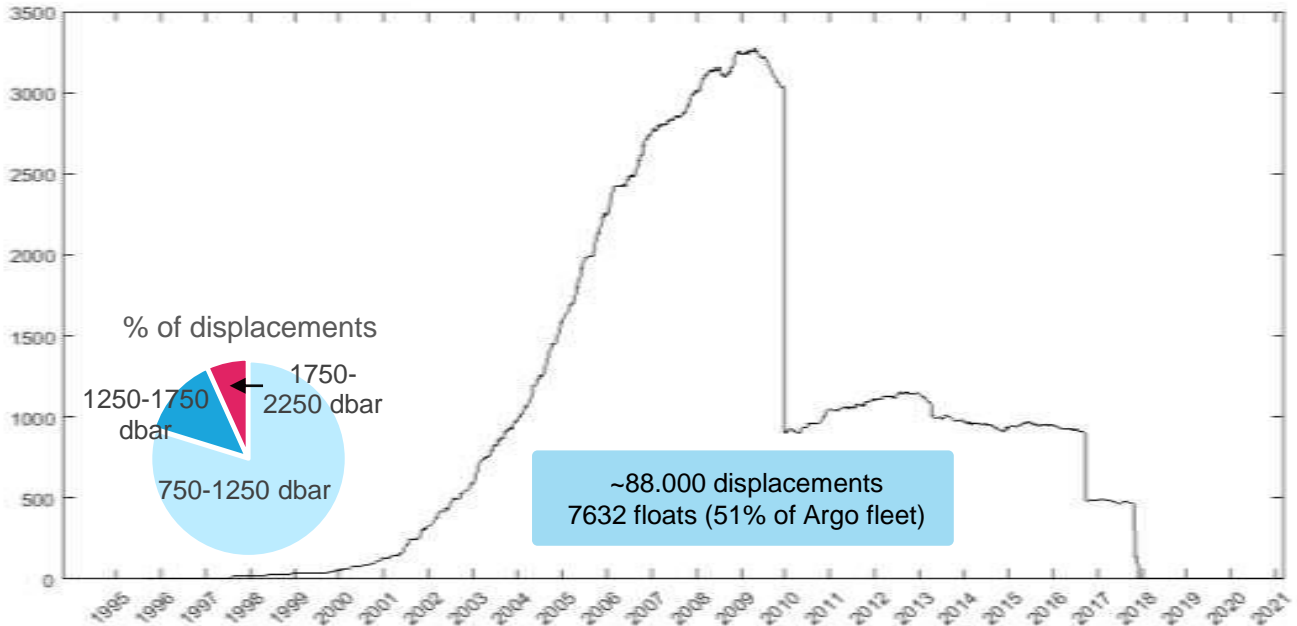


All Argo dataset

Regularly updated on a yearly basis: firstly processed with DAC Coriolis + others DAC

ANDRO atlas, with numbers

Number of active floats

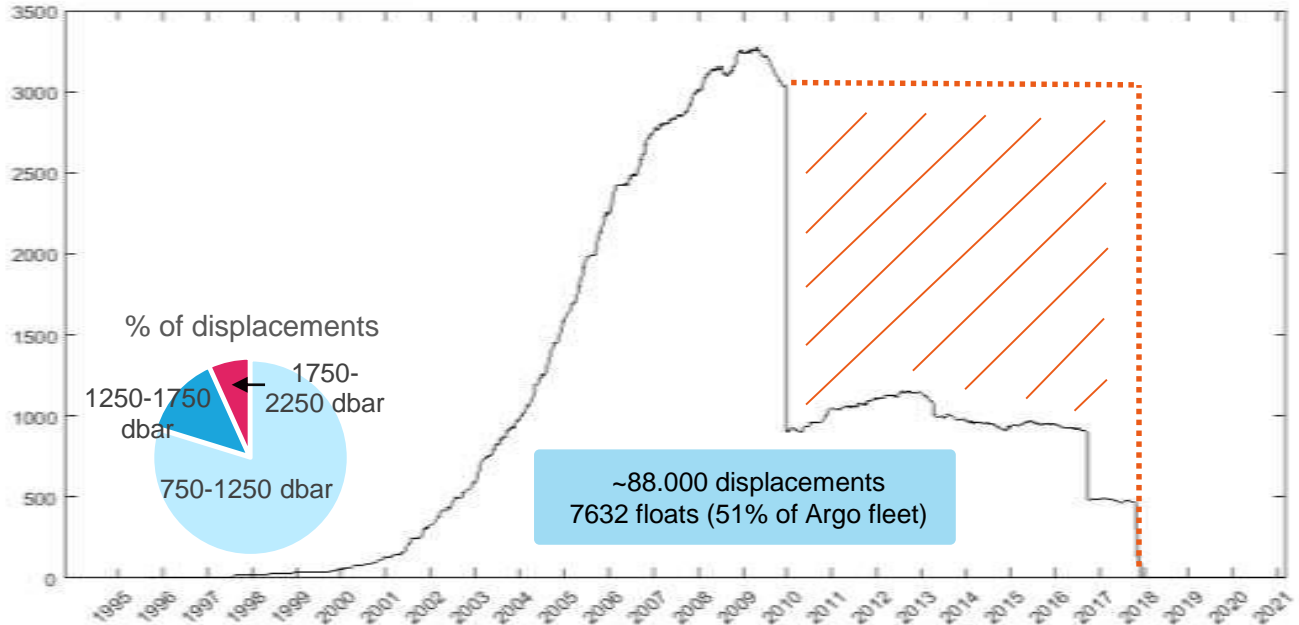


All Argo dataset

Regularly updated on a yearly basis: firstly processed with DAC Coriolis + others DAC

ANDRO atlas, with numbers

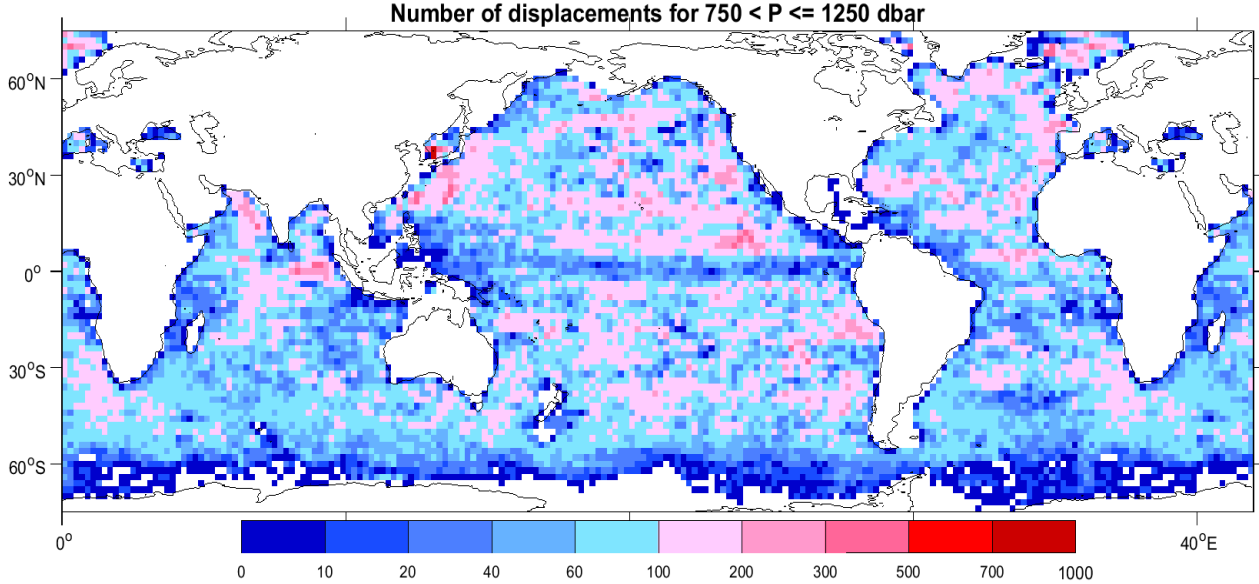
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All Argo dataset

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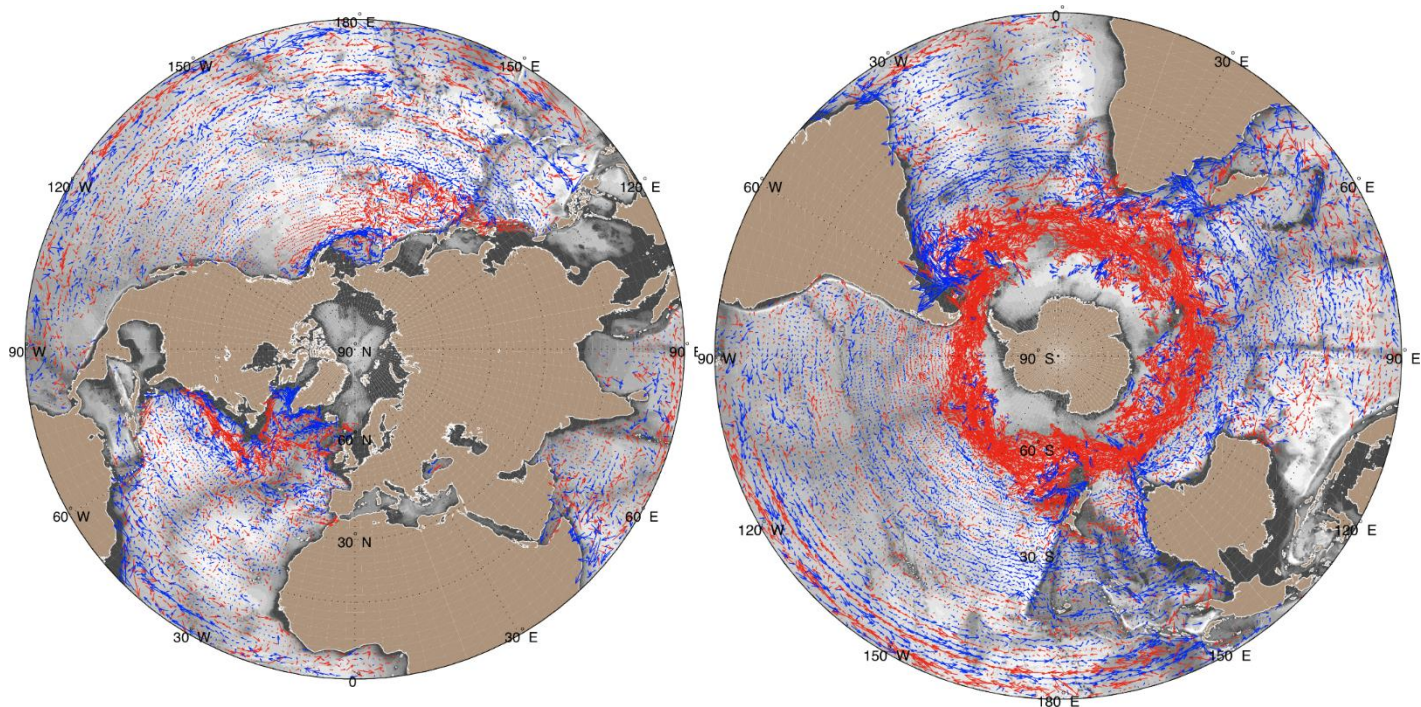
ANDRO atlas, with numbers



4.

Subsurface currents

Mean circulation near 1000 dbar



Deep displacements (eastward and westward) over 60 days near 1000 dbar and for the Northern and Southern Hemispheres

Comparison ANDRO/YoMaHa'07

'YoMaHa'07' et 'ANDRO' formats: ASCII (28 and 37 columns respectively)

- Deep displacements
- Surface/deep velocities
- Associated errors

ANDRO:

- + Cycle number carefully checked
- + Displacement depth is determined from in situ measurements (RPP)
- + Grounded cycles are not preserved
- + RPP is not set when measurements are not reliable (Ex: in case of instrument failure such as sensor pressure microleak)

- DMQC (visual check) → uncompleted dataset

YoMaHa'07:

- Possible error in cycle numbers (a deep displacement may include surface phase(s))
- Displacement depth is a theoretical value (float configuration parameter)
- All cycles are preserved (including grounded ones or those which are affected by instrument failure)

+ Automatic updates → complete dataset

Comparison ANDRO/YoMaHa'07

In blue: common displacements

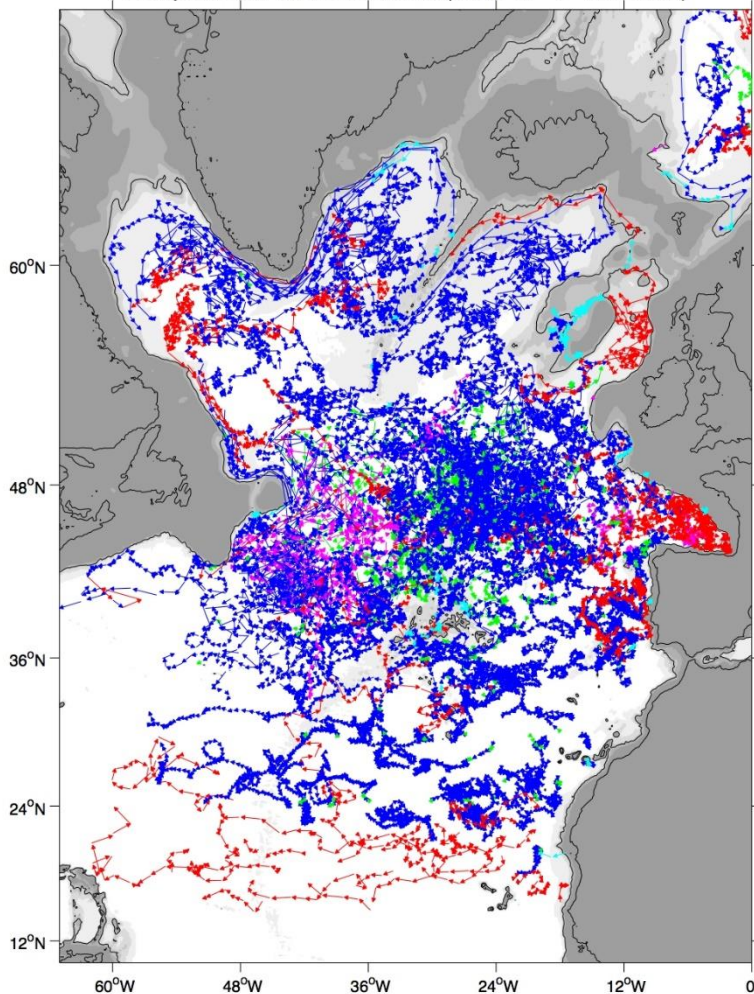
In magenta: YoMaHa'07
displacements found outside the layer
[1250, 1750] dbar

In green: ANDRO added
displacements

In red: YoMaHa'07 displacements
found in this layer, erroneously

In cian: YoMaHa'07 displacements not
in ANDRO

Comparaison ANDRO/YoMaHa (1250 < P <= 1750 dbar)



5.

Conclusion / Prospect

Conclusions

- Argo subsurface displacements are an unprecedented data base of direct and absolute measurements of the ocean circulation (but one needs their exact drifting depths).
- Very good quality product: good data, DMQC, lot of information...
- Product manually checked (trajectory DMCC) → clean (vs automatized YaMaHa'07)
- Complete version of ANDRO available in 2012 ; since then: regular but partial updates → need support
- DEP = trajectory DMQC, lot of information whereas ANDRO = tiny exploitation of DEP

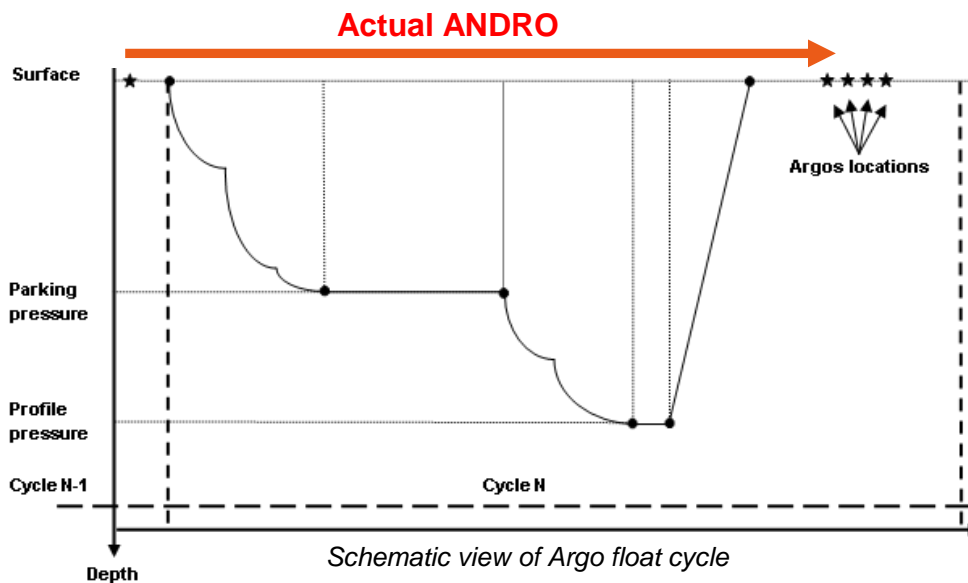
Product available here: <https://www.seanoe.org/data/00360/47077>

Prospects

- Use of DEP in Argo DMQC (trajectory Delayed Mode)

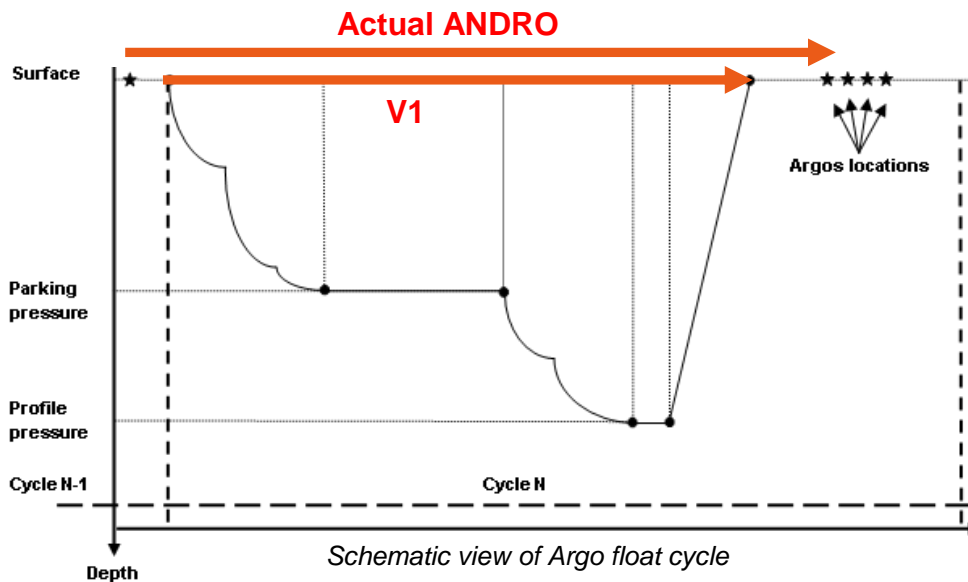
Prospects

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- Possible evolutions of ANDRO:



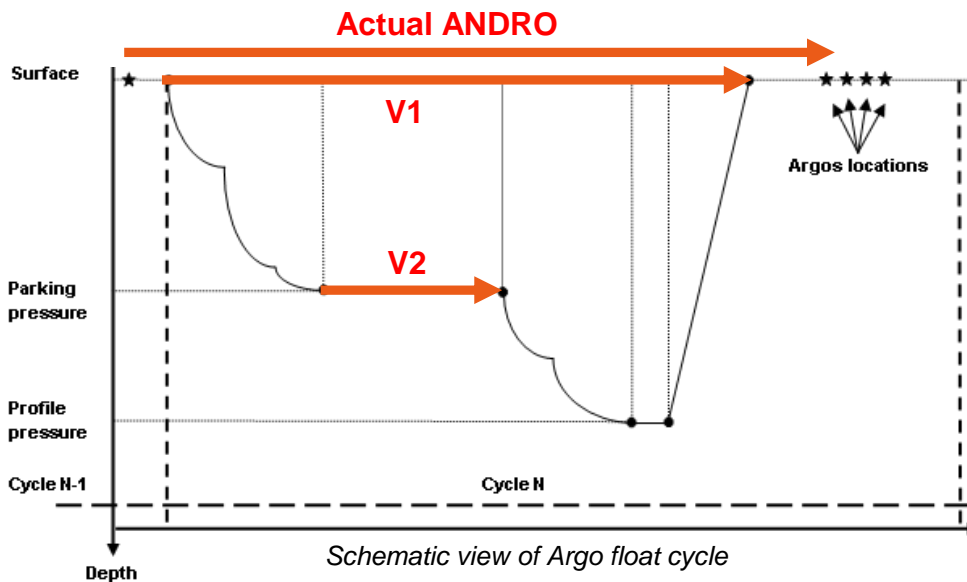
Prospects

- Use of DEP in Argo DMQC (trajectory Delayed Mode)
- Possible evolutions of ANDRO:
 - ❖ **V1: decrease surface errors** → circulation model or in situ data (drifters, satellite)



Prospects

- Use of DEP in Argo DMQC (trajectory Delayed Mode)
- Possible evolutions of ANDRO:
 - ❖ V1: decrease surface errors → circulation model or in situ data (drifters, satellite)
 - ❖ V2: decrease errors during descent/ascent (shear) → vertical shear model





Thank you !

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Two superimposed cold and fresh anomalies enhanced Irminger Sea deep convection in 2016 – 2018

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