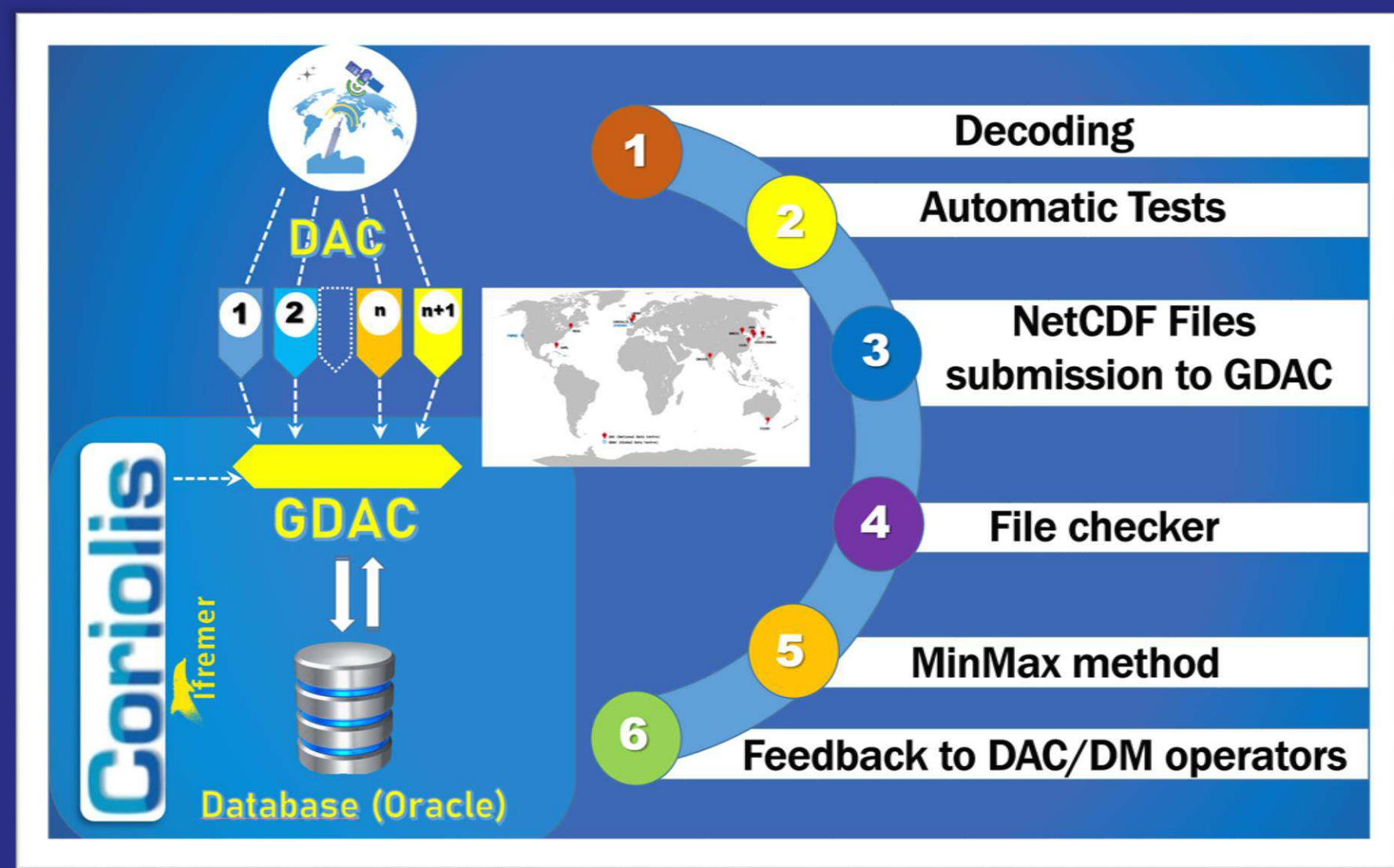
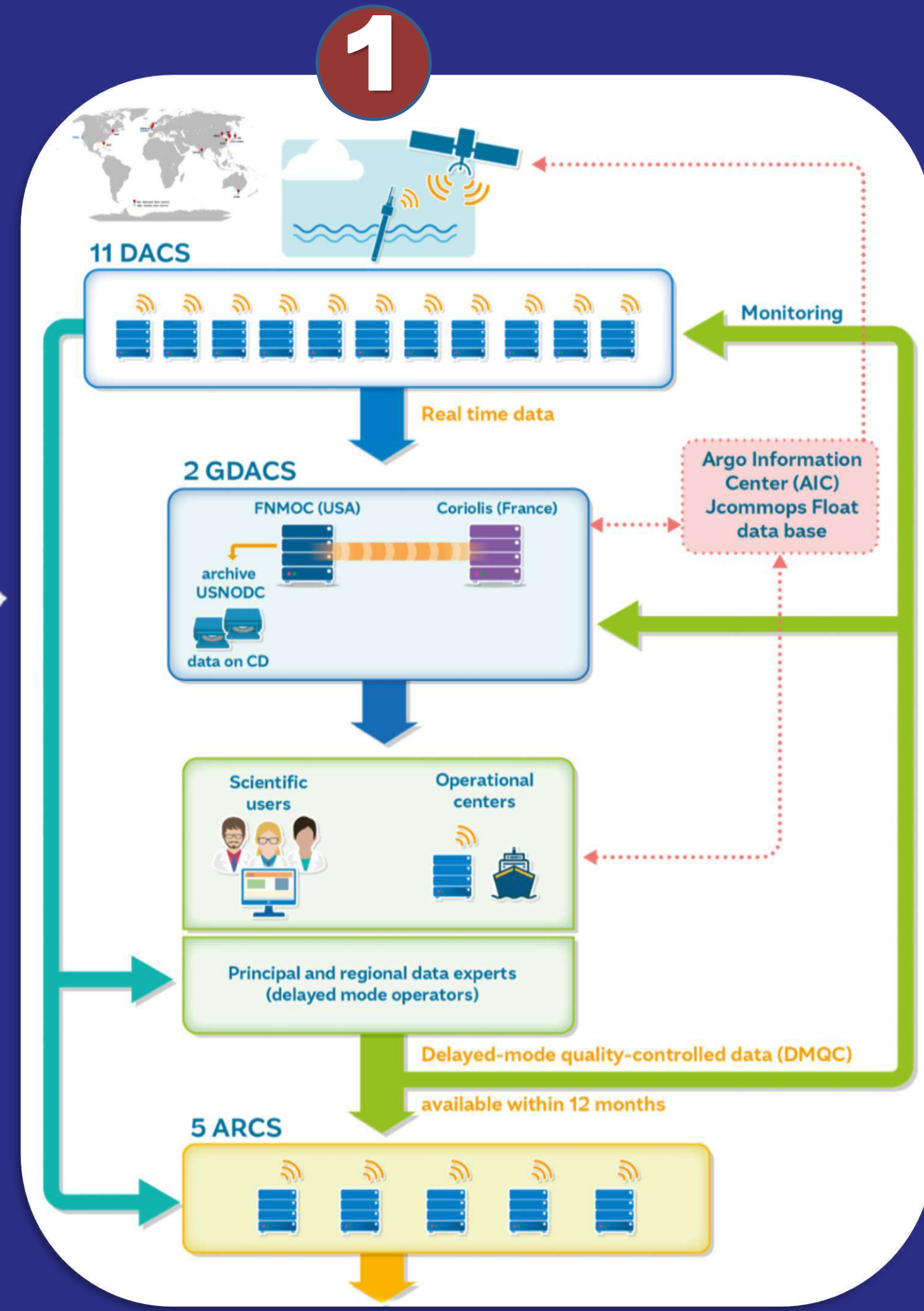


Quality control on Argo data From the automatic tests to the MinMax method

The international Argo Data System is based on a series of 11 national Data Assembly Centres, two Global Data Assembly Centres, and several Argo Regional Centres.



Argo data processing steps



© <https://www.euro-argo.eu/Activities/Data-Management/Argo-Data-System>

The Argo real-time QC tests on vertical profiles are applied following a well-defined order. The Test Number (n) is a unique number assigned permanently to each QC test. It is used to fill HISTORY_QCTEST in the Argo profile files. Therefore, each Test Number (n) is associated uniquely to a QC test, and is never replaced, changed, or duplicated.

Application Order	Test Number (n)	Test Name
1	1	Platform Identification Test
2	2	Impossible Date Test
3	3	Impossible Location Test
4	4	Position on Land Test
5	5	Impossible Speed Test
6	15	Grey List Test
7	19	Deepest Pressure Test
8	6	Global Range Test
9	7	Regional Range Test
10	8	Pressure Increasing Test
11	9	Spike Test
12	25	MEDD Test
13	12	Digit Rollover Test
14	13	Stuck Value Test
15	14	Density Inversion Test
16	16	Gross Salinity or Temperature Sensor Drift Test
17	18	Frozen Profile Test
18	23	specific test for Deep SBE CTD data > 2000 dbar
19	26	specific test for RBRArgo ² 2K TEMP CNDC data
20	24	specific test for RBRArgo ² 2K CTD data < 2000 dbar
21	17	Visual QC Test

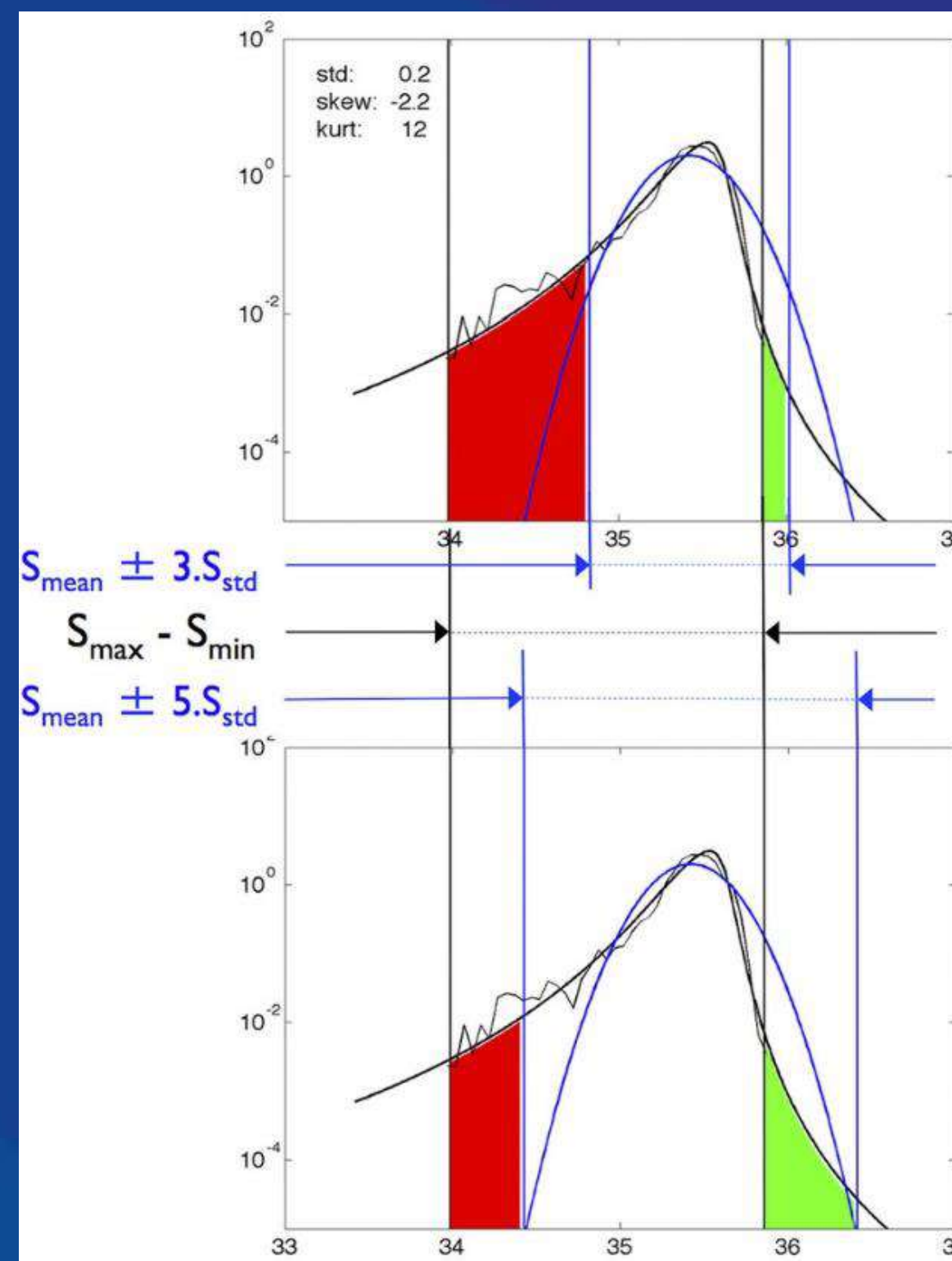
5 MINMAX METHOD

What is the MinMax method ?

This work proposes to infer them directly from minimum and maximum observed values instead of a classical approach that estimates validity bounds from first- and second-order moments of the climatological parameter distribution (mean, variance).

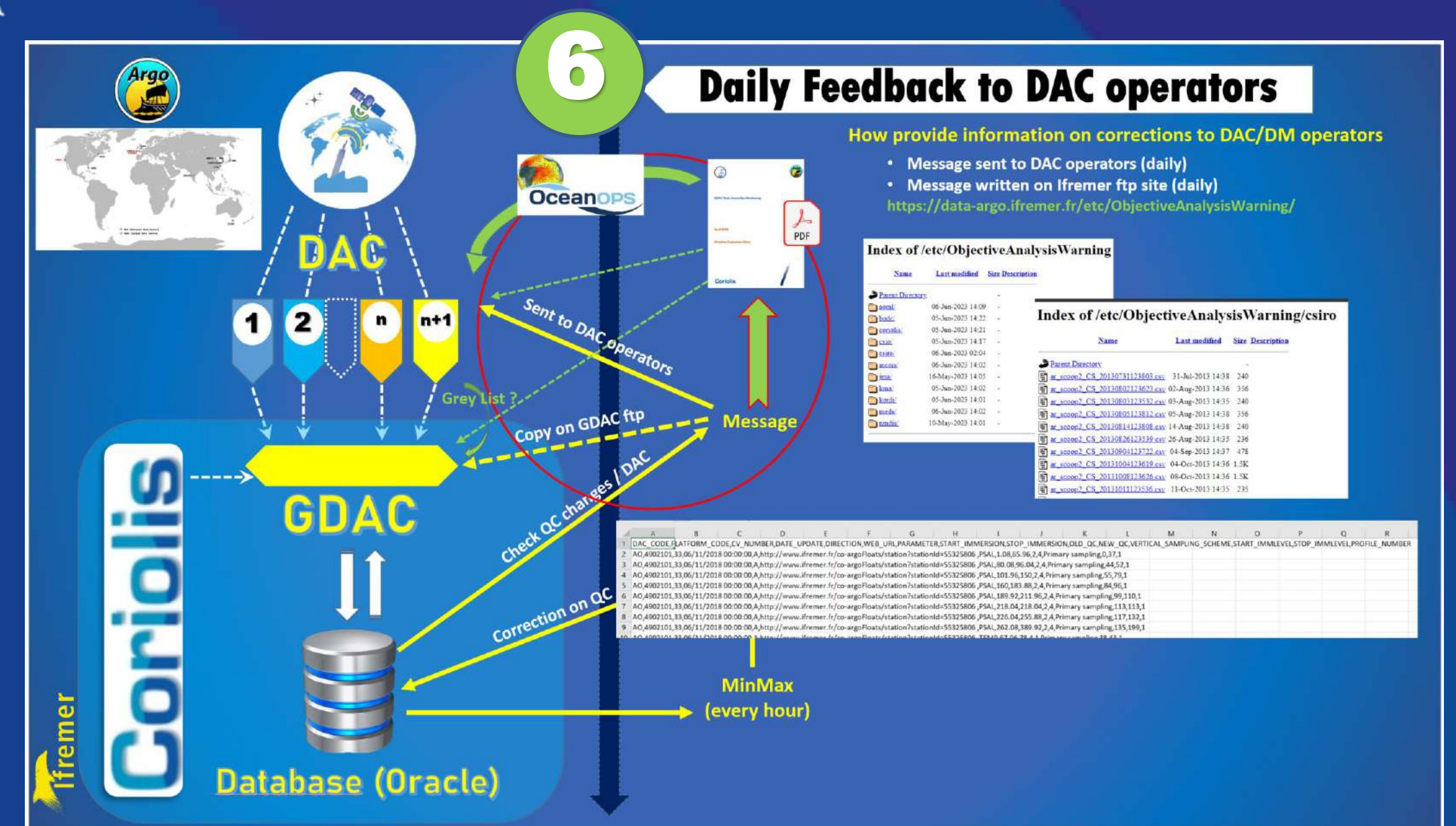
Scheme describing the impact of Gaussian assumptions on the quality control of a realistic salinity distribution.

- Thin black curve : example asymmetric salinity distribution.
- Thick black line : skewed Student pdf model with same mean, variance, skewness, and kurtosis.
- Blue line is a Gaussian model with the same mean and variance and location of the validity interval boundaries with (top) $N = 3$ and (bottom) $N = 5$.
- Vertical black lines give the validity range based on minimum and maximum values.
- Vertical blue lines give the validity range based on 3 (top plot) and 5 (bottom plot) standard deviations.
- Red patches indicate ranges of values for which the classical approach erroneously detects good data, and the green patches correspond to ranges for which erroneous data are not detectable.



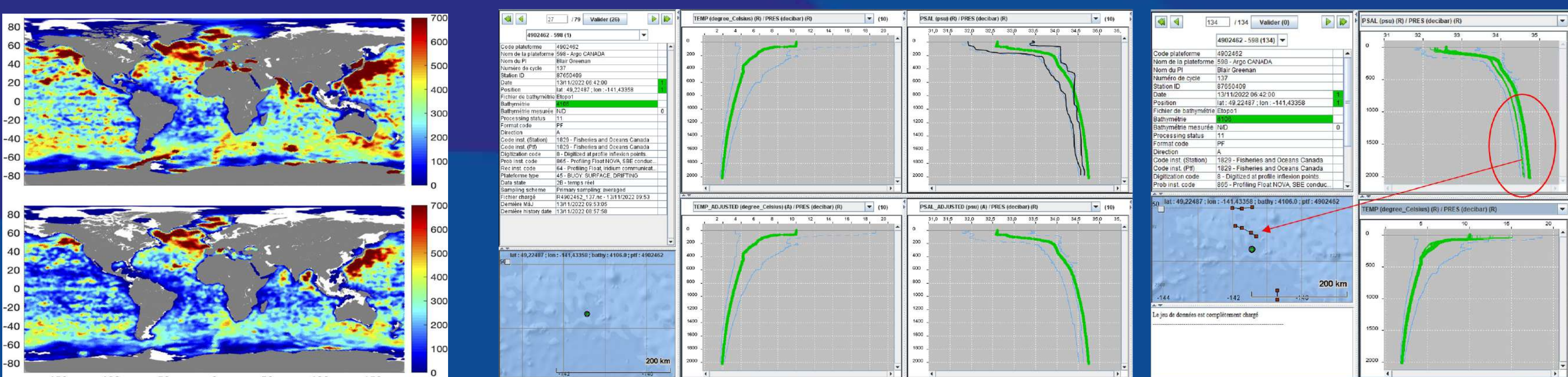
Due to the requirement of delivering data to users within 12-24 hours of the floats reaching the sea surface, the real-time quality control test procedures on Argo data are automatic but limited. When a file is detected to have been uploaded/updated on the GDAC (submission of NetCDF files 3 and controlled by a file checker 4), it is also uploaded/updated on the Coriolis Oracle database.

These files then receive supplementary tests. The resulting alerts are checked visually by using the Scoop software (Detoc et al., 2021) and the QC flags are modified in the Coriolis database where appropriate. These alerts are based on the MinMax test (Gourrion et al., 2020).



Whenever a quality code is changed in the Coriolis database, an automatic message (.csv file) is generated and sent to the corresponding DAC. The list of generated messages is also available on the Ifremer ftp site:

<ftp://ftp.ifremer.fr/ifremer/argo/etc/ObjectiveAnalysisWarning>



Number of profiles per grid cell : (top) 0-20m layer (bottom) 1000-1200 layer

Use Scoop software to check the profile and correct the QC flags if necessary (in blue line, minmax ranges) with several options such as comparison with neighboring profiles on other platforms.

References

- Detoc Jerome, Thepault Baptiste, Carval Thierry, Mahoudo Pierre, Garo Mickael (2021). Scoop-Argo : visual quality control for Argo NetCDF data files. SEANOE. <https://doi.org/10.17882/48531>
- Gourrion, J., Szekely, T., Killick, R., Owens, B., Reverdin, G., & Chapron, B. (2020). Improved Statistical Method for Quality Control of Hydrographic Observations. *Journal of Atmospheric and Oceanic Technology*, 37(5), 789-806. <https://doi.org/10.1175/JTECH-D-18-0244.1>
- Wong Annie, Keeley Robert, Carval Thierry, Argo Data Management Team (2024). Argo Quality Control Manual for CTD and Trajectory Data. <https://doi.org/10.13155/33951>