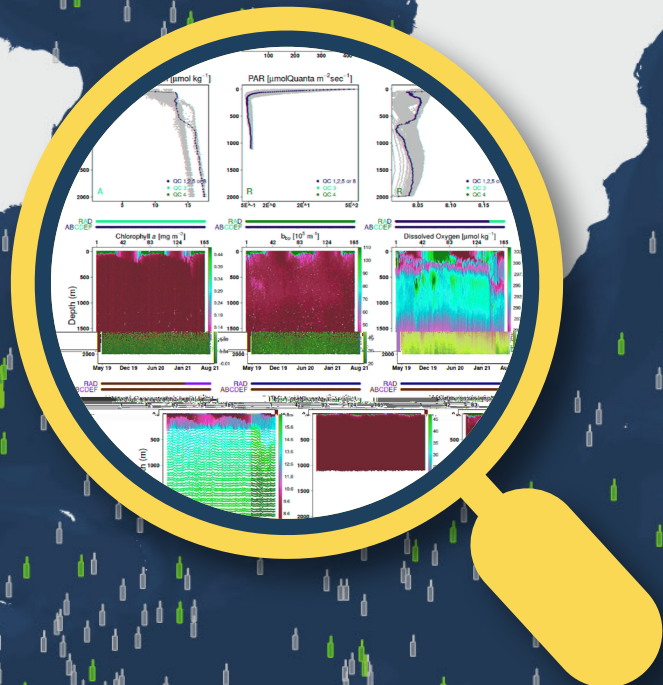




# GUIDE TO UNDERSTANDING AND USING PROFILING FLOAT DATA



Available in



# The adopt a float program

**adopt a float** is a **multidisciplinary educational program** that invites school students at all levels and from all over the world to discover the global ocean and the importance of studying it, in order to better understand and protect it. The basic idea behind this program is to let a class of students **adopt an underwater robot** in the form of a profiling float and **follow it throughout its scientific voyage**.

Designed to take measurements to answer the queries of oceanographic researchers, the profiling float is a ground-breaking robot used in international **global ocean observation**. Today, several thousands of them are deployed throughout the Ocean. Equipped with miniaturized **sensors** and connected to a database fed with data in real time, profiling floats measure and provide a range of parameters — **physical** (e.g. temperature), **biological** (e.g. oxygen) and **chemical** (e.g. pH) — between the Ocean's surface and 2 km depth.

The interactive map associated with the adopt a float program allows **access, in real time, to the measurements collected** by the floats and their **usage in school programs**.

Each class can follow not just its own profiling float, but also the hundreds of others drifting in the global ocean throughout their journeys. Proper use of this wealth of information on different temporal and spatial scales will boost a better understanding of the marine environment and scientific work!

The **format of the data is deliberately highly technical** with the aim of showing students **authentic scientific data**, — the same type that researchers and engineers deal with every day.

This **guide** sets out to be a "**user manual**" to accompany teachers in activities ranging from **use of the map and its tools** to more sophisticated **handling** and **interpretation** of **scientific data**! It **offers tips on how to understand and manipulate this data with their students**. Teachers signed up with the adopt a float program also benefit from follow-up throughout the school year, and they can contact the adopt a float team at any time to get answers to their questions.

To supplement and back up classwork, the adopt a float program offers educational resources as well as in-class sessions to tackle different topics related to the Ocean and marine sciences!

For more information on the program, see the website **[adoptafloat.com](https://adoptafloat.com)**





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# Glossary: speaking of floats...

**Deployment** = Launch.

**Profile** = Measurements taken during the profiling float's ascent stage. These measurements are presented in the form of graphs: (i) vertical profiles e.g. a parameter as a function of depth (ii) time series e.g. a parameter as a function of depth and time.

About the positions of floats:

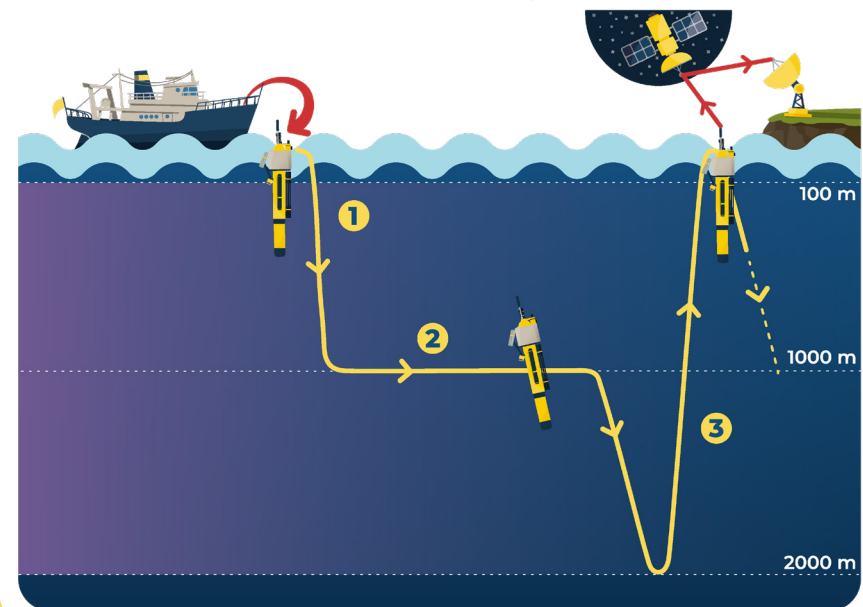
**High latitudes:** Ocean zones at the northern and southern extremities of the Northern and Southern Hemispheres (between  $60^\circ$  and  $90^\circ$ ), towards the poles.

**Temperate latitudes:** Ocean zones between the polar circles and the tropics (between  $50^\circ$  and  $60^\circ$ ).

**Low latitudes:** Ocean zones between the tropics, including the Equator (below  $50^\circ$ ).

**Cycle** = A succession of 3 stages between two data streams transmitted by a profiling float at the water's surface:

- 1 Descent:** the float heads down to the depths without taking measurements (generally);
- 2 Parking:** the float generally stays at 1000 m depth (sometimes deeper, depending on the type of float), where it drifts along currents, for 1 to 9 days;
- 3 Ascent:** the float activates its sensors and rises back up gradually while taking measurements. Once it arrives at the surface, it transmits its data by satellite.





# The interactive map of floats

- Go to the **website A** adopt a float : <https://adoptafloat.com>
- In the menu at the top left, click on **B Interactive Map**.
- The **Interactive Map C** will open up in a new tab. It shows all the profiling floats that have been deployed: the bright yellow ones are active while the pale yellow ones are inactive (due to flat batteries, they no longer transmit data).
- All **adopted profiling floats** are listed in the left column **D**. The float that you have adopted, as well as the floats adopted by other participating classes, are listed here by their ID number\_adoptive name.

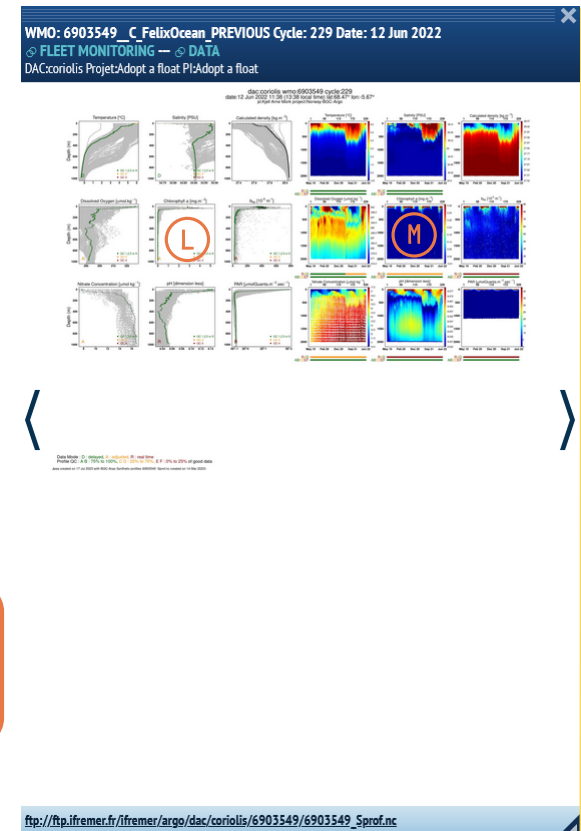
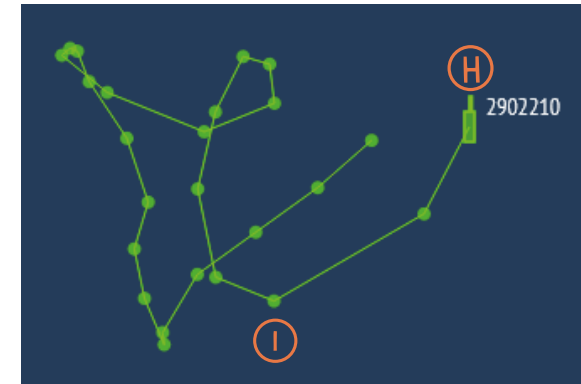
*N.B.:* The school year of adoption of a float is indicated at the end of its name. For example, floats adopted during the French school year 2023-2024 end with "2024". Recycled floats — those that have been recuperated from the Ocean, then updated and redeployed in a new Ocean zone — are tagged "**R**" (for "refurbished") at the ends of their names, before the school year. (e.g. "6990505\_Bob-the-float\_R\_2023")

- Click on **E More filters** to bring up all available options for filtering the profiling floats visible on the map (see page 8).
- Select the profiling float of your choice from the list, or directly on the map: a small box **F « Float ID »** will appear in the left column with information on the float.
- Click on **G Focus** to zoom in on its track.

The screenshot displays the Adopt a float website interface. At the top left, a menu (A) contains options: HOME, THE PROGRAM, OCEAN VOYAGERS, INTERACTIVE MAP (B), and FOR TEACHERS. The main area shows a world map (C) with yellow markers representing floats. On the left, a list of floats (D) is shown, including '2902296\_Poseidon\_2024', '2902296\_MER-SEA\_2024', '2902296\_31-graines-d-explorateurs\_2023', and '4903622\_Pikaflow\_2024'. A 'More filters' button (E) is located above the list. On the right, a detailed view of a float (F) is shown, featuring the MGSS MOKA logo and the following information: NAME : MGSSMOKA2023, My Profil Link : ADOPT156A, N° WMO : 3902472, Float Condition : NEW FLOAT, Class from : Mauritius, School year : 2022-2023, and Interactive Map Handbook (FR). A DASHBOARD button is at the bottom of this panel. At the very bottom of the page, there are 'Focus' (G) and 'Tracks' toggle switches.

## The interactive map of floats

- When you zoom in on a profiling float, you will see its track, composed of:
  - A **float label H** corresponding to its latest GPS position recorded during its last ascent to the Ocean surface.
  - Several **points I** corresponding to all the positions recorded at the Ocean surface since the float's deployment. Scientists program the profiling floats to descend to 2000 m depth, then to rise back up, depending on their scientific and observational strategy ([click here to see the cartoon with explanations](#)).
- You can **trace the track** of a chosen float by sliding the cursor **J** along the bar at the bottom of the map.
- Click on **H** or **I** to select and display a **profile K**. This profile is made up of:
  - **Vertical profiles L** of the different parameters measured as a function of depth;
  - **Time series M** of certain parameters measured as functions of depth and time.



*N.B.:* The graphs are difficult to read in the window **K** apparence that pops up. To read them, click on the image for a new tab to open up with a **zoomable** image that lets you enlarge the graphs that interest you.

## The interactive map of floats

- Right at the top of the profile window **K** you will see:
  - **The WMO identification number and adoptive name N** of the profiling float;
  - The profiling float's **cycle number 0** = the number of times that the float has risen to the surface while taking measurements along the water column;
  - **The date P when the profiling float rose to the surface** to transmit the data measured during cycle **0**.
  - The profile's **raw data 0** can be downloaded as a .txt file: it contains the numerical values of each variable measured as a function of pressure (representative of depth). You can save the file and open it on a comma-separated spreadsheet.

*N.B.:* Variables deemed globally poor following quality control (see page 11) do not appear in the .txt file.

- Click on the side arrows to display **profiles from the preceding or following cycles**.

WMO: 6903549\_C\_FelixOcean\_PREVIOUS Cycle: 229 Date: 12 Jun 2022  
 FLEET MONITORING — DATA  
 DAC:coriolis Projet:Adopt a float PI:Adopt a float

WMO: 6903549\_C\_FelixOcean\_PREVIOUS Cycle: 229 Date: 12 Jun 2022  
 FLEET MONITORING — DATA  
 DAC:coriolis Projet:Adopt a float PI:Adopt a float

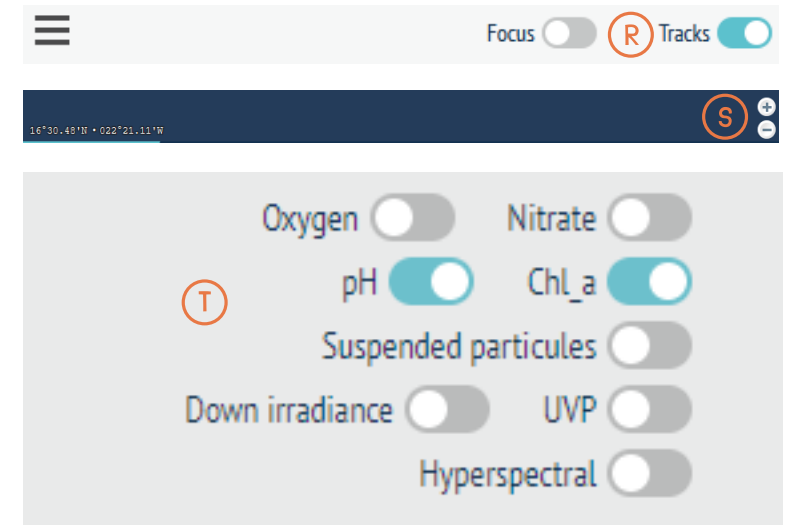
ftp://ftp.ifremer.fr/ifremer/argo/dac/coriolis/6903549/6903549\_Sprof.nc



## The interactive map of floats

In general, the interactive map has other display tools:

- You can display the tracks of all the profiling floats by clicking on **R Tracks** right at the top of the map.
- You can modify, as you like, the map's **zoom S** at the far bottom right.
- If you wish to study one particular parameter, you can activate its **filter T** by clicking on **More filters** and selecting the parameter. In this example, only floats with a pH sensor and a chlorophyll a sensor will appear on the list and on the map.
- On the right column, you can:
  - Obtain a **fullscreen display of the map U**;
  - Obtain an OpenStreetMap **map background V**;
  - Return to a **global display W** of the map;
  - Display the **names X** of all the floats;
  - Display a **graticule Y**;
  - Measure the **distance Z** between 2 points: to do so, click on the starting point and then, without releasing the click, slide the cursor to your second point of choice.







# Vertical profiles

- The measured parameter (horizontal X axis) is represented as a function of depth (vertical Y axis).
- Depending how a particular profiling float is equipped with sensors, up to 9 parameters can be represented:

- **Temperature** : Intuition tells us that the notion of temperature is directly related to the sensation of heat or cold, but its scientific definition is actually far more complex. Temperature measurements allow us, for example, to **identify water masses**, to explain the **development of certain plankton species** or to obtain **information on currents**.

To find out more:  
<http://www.monoceanetmoi.com/web/index.php/en/topics/ocean-properties/temperature>

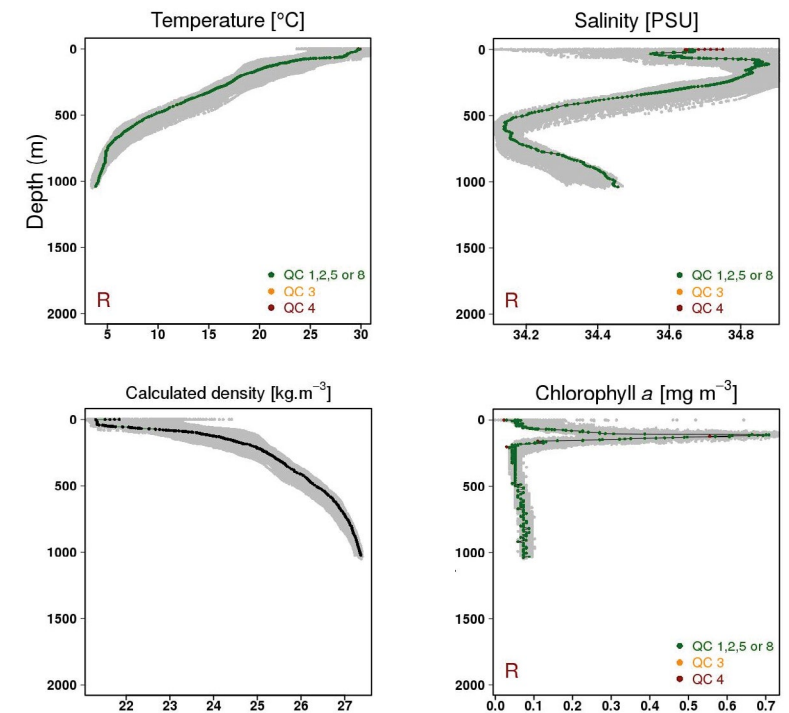
- **Salinité** : This designates the quantity of salt dissolved in water and plays a major role in our understanding of **Ocean circulation**.

To find out more:  
<http://www.monoceanetmoi.com/web/index.php/en/topics/ocean-properties/salinity>

- **Densité** : This primarily depends on the water's temperature and salinity. The saltier and colder the water, the denser (heavier) it is — and the opposite also applies. As a result, the density at a given depth is always equal to or greater than the density observed at a shallower depth: “light” water is always found on top of “heavy” water. Thanks to this information, the **movement of water masses** can be studied.

- **Chlorophyll a** : The quantity of this photosynthetic pigment is an **estimator of the quantity of phytoplankton present**.

To find out more:  
<http://www.monoceanetmoi.com/web/index.php/en/topics/ocean-properties/chlorophyll-a>



## Vertical profiles

- **bbp : backscattering of particles** (of phytoplankton but also bacteria, small detritus or else mineral dusts carried from deserts). The bbp is directly proportional to the quantity of particles: the more abundant the presence of particles in water, the higher this value will be. This measurement is often combined with the measurement of chlorophyll a to **fine-tune the estimation of phytoplankton biomass**.
- **Dissolved oxygen** : By measuring the concentration of oxygen, ocean researchers learn about the **routes and ages of water masses in the Ocean**.

To find out more:

<http://www.monoceanetmoi.com/web/index.php/en/topics/ocean-properties/dissolved-oxygen>

- **Nitrate** : An element crucial for plant growth. Measurement of nitrate concentration therefore enables **identification of the areas favorable for phytoplankton development**.

To find out more:

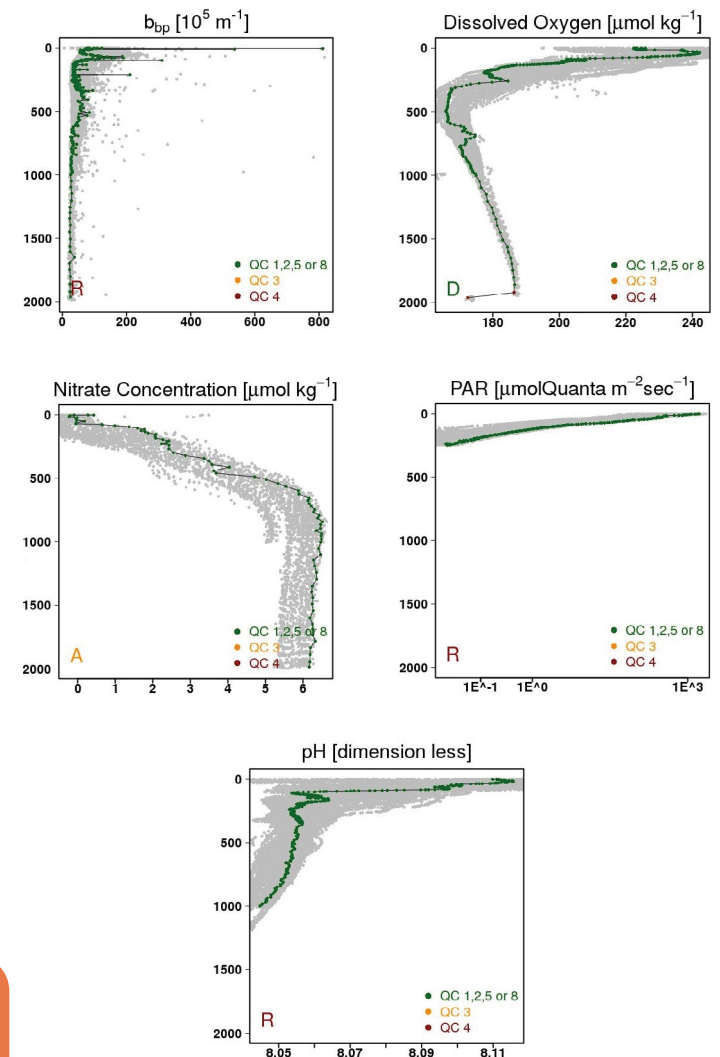
<http://www.monoceanetmoi.com/web/index.php/en/topics/ocean-properties/nitrates>

- **PAR (or « Down irradiance ») = Photosynthetically Active Radiation** : Measurement of all light useful for photosynthesis over the whole of the visible spectrum from 400 to 700 nm. It allows **identification of the areas favorable for phytoplankton development**.

*N.B.:* This parameter is represented on a logarithmic scale (X axis): each gradation changes by one or several factors of 10.

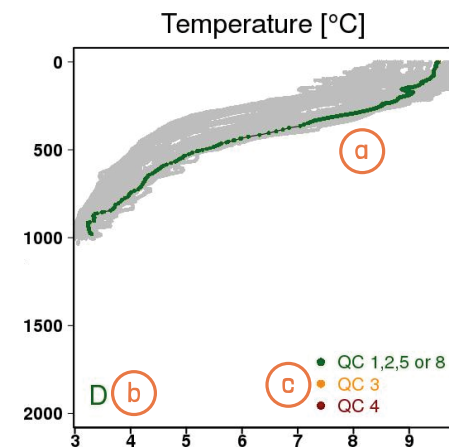
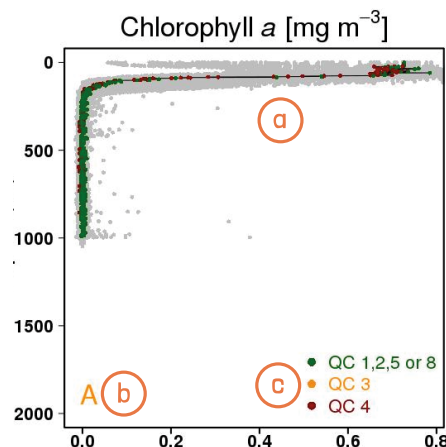
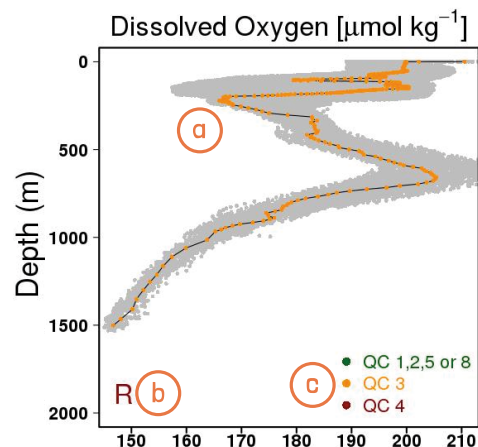
- **pH**: An indicator of water acidity, its measurement enables **monitoring of the phenomenon of Ocean acidification**.

*N.B.:* If certain parameters cannot be measured by a given profiling float (absence of an adequate sensor), you can visualize and study them by activating the different filters (see page 8) and by selecting a float that appears on the filtered map.



This guide provides you with an interpretation of **temperature, chlorophyll a and PAR** (vertical profiles, time series and geographical zones)..

- A general description of the graphs:



- (a) The grey curves correspond to all the vertical profiles performed since the deployment of the profiling float whereas the colored curve corresponds to the vertical profile of the selected cycle (see page 6).
- (b) **Data mode** = 3 letters may be associated with each graph :
  - **R = Real Time Data** = the data are represented as they are picked up by the sensor;
  - **A = Adjusted Data** = the data have been automatically adjusted by computer software;
  - **D = Delayed Mode Data** = the data have been checked, adjusted and standardized by a scientific expert.
- (c) **Quality control** = Each point on the curve is attributed a color depending on its quality:
  - **QC 1, 2, 5 or 8** = the quality of the point is very good or good;
  - **QC 3** = the quality of the point is possibly poor;
  - **QC 4** = the quality of the point is poor.

The quality of a point depends on **known reference values** (and therefore allows the elimination of abnormal points) and the **data mode** (points from **Real Time Data** are generally less reliable than those from **Delayed Mode Data**).



# Interpreting vertical profiles

*N.B.:* This section, along with the ones on time series and geographical zones, offers tips on interpreting 3 parameters (temperature, chlorophyll a and PAR). For other parameters, don't hesitate to contact our team (details at the end of the guide).

**Temperature:** Generally, the Ocean's temperature diminishes from the surface to the depths.

- **Strong variations over a shallow depth:** Diagram 1 shows fast temperature variation in the water column: in this particular case, the temperature falls heavily from 22 to 15°C, between 0 and 100 m depth (orange zone).

**When and where?** This situation is typical of the summer months at temperate latitudes (e.g. in the Mediterranean Sea).

- **Gradual variation:** Diagram 2 shows a gradual drop in temperature along the water column.

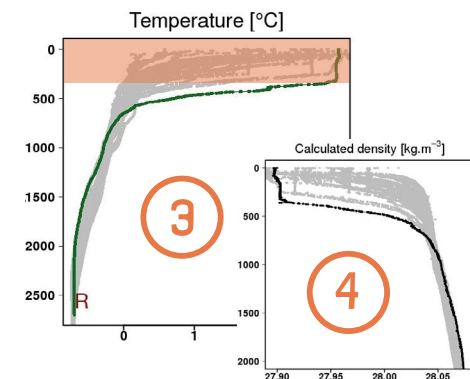
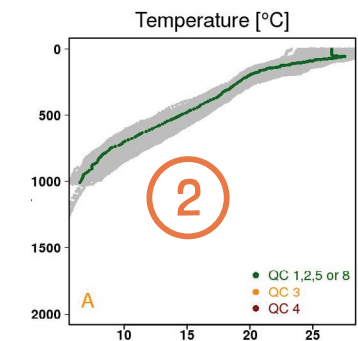
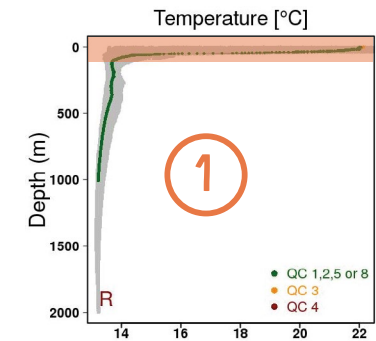
**When and where?** Typical situation in the tropics in summer.

- **Constancy:** This hints at the presence of a “mixed layer,” in other words, the layer in the Ocean's surface where water properties stay homogenous as the water masses are well mixed together (by winds or changes in density).

The temperatures in diagram 3 (orange zone) are steady from the surface down to great depths (sometimes up to 2000 m depth or more): we therefore have an indication that water masses are well mixed together in this part of the water column — as confirmed by the density values (diagram 4).

**When and where?** This type of situation may characterize the winter months at high latitudes such as the North Atlantic (diagram 3) temperate latitudes (e.g. in the Mediterranean), and sometimes even in the tropics.

[Click here for more information.](#)



**Chlorophyll a** : All curves corresponding to chlorophyll a measurements have the same general characteristics (diagrams 5 and 6) :

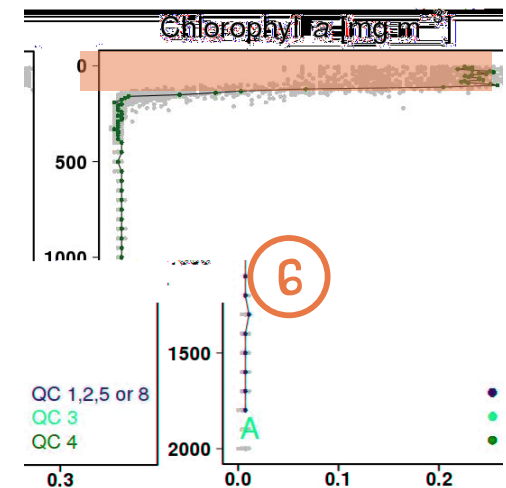
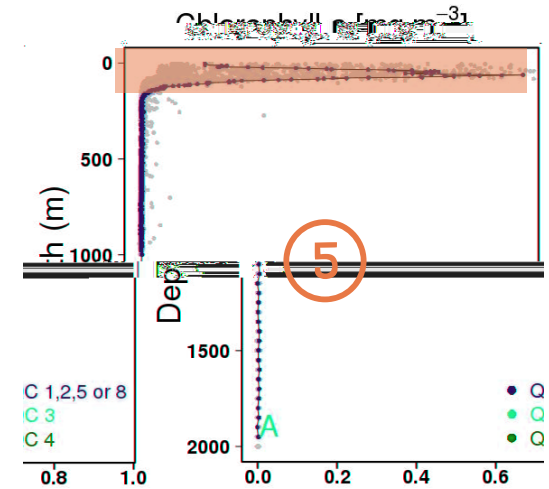
- Between the surface and 200 m depth (orange zones) = Values vary depending on the season and the geographical zone. Two cases can be distinguished:
  - **Peak in chlorophyll a** (diagram 5, zone orange) = Phytoplankton develop at the depth at which the combination of conditions for light intensity (which arrives from the surface) and the availability of nitrates (which arrive from lower layers) is the most favorable.
 

**When and where?** This situation is typical of low latitudes regardless of the season, and of high latitudes during the summer and autumn months.
  - **Homogenous chlorophyll a values** (diagram 6, orange zone) = The water masses are mixed together well — and as a result, so are the phytoplankton.
 

**When and where?** This situation may typify the winter months at high latitudes when mixing is vigorous. In the extreme case of very violent winds, water and therefore chlorophyll a can be mixed down to 500 m depth and over (for example, in winter in the North Atlantic).
- Below 200-300 m depth (below the orange zones) = **Quasi-null values** as a lack of light prevents the development of phytoplankton in this zone.

[Click here for more information.](#)

*Fun fact: In the South Pacific Ocean, the quantity of phytoplankton (and therefore of chlorophyll a) is so low that the water turns deep blue, almost purplish in color. The water is therefore also very clear, and light penetration so strong, that under the midday sun a diver would be able to read a book at 200 m depth, and a diver not wearing a diving suit would risk getting sunburnt at 50m depth!*



**PAR** : The graphs for PAR provide information on light penetration at depth, which is related to the water's turbidity as well as cloud coverage in the sky.

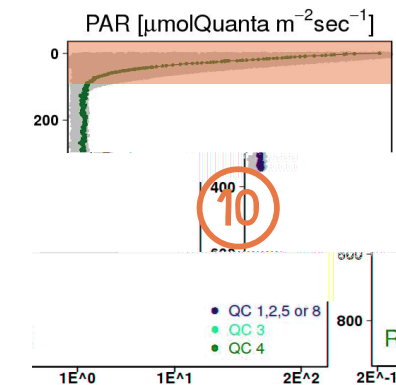
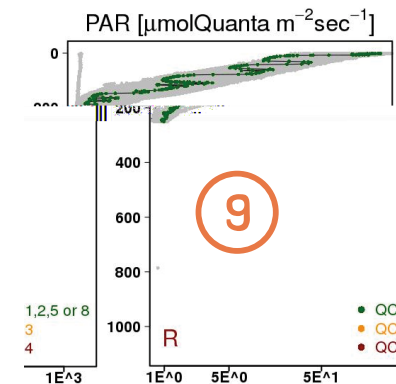
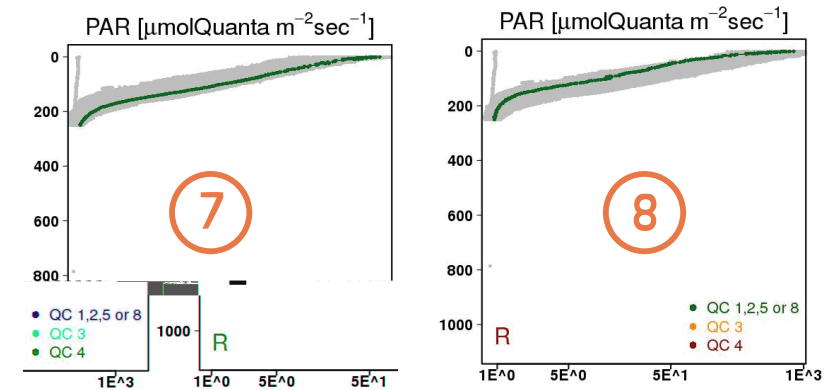
- **Diagram 7 vs diagram 8** : The "smoothness" of the curves' slopes reflects an absence of clouds. Light penetrates deeply down to ~200 m depth as the water is practically transparent. The further to the right that the graph tends, the greater the light intensity at the Ocean's surface (clear sky; diagram 7). If, on the other hand, the curve tends more to the left (diagram 8), this hints at a grey sky or a hazy sun.

- **Diagram 9** : Sudden drops in light intensity throughout the water column indicate clouds passing in front of the sun during the float's ascent, alternating with clear-sky episodes.

**When and where?** Situations typical of the tropics or of high and temperate latitudes during the winter months.

- **Diagram 10** : PAR values drop in the first 50-100 m of the water column (orange zone). This type of curve is typical of water rich in phytoplankton or particles (therefore more turbid), which prevent the penetration of light at depth.

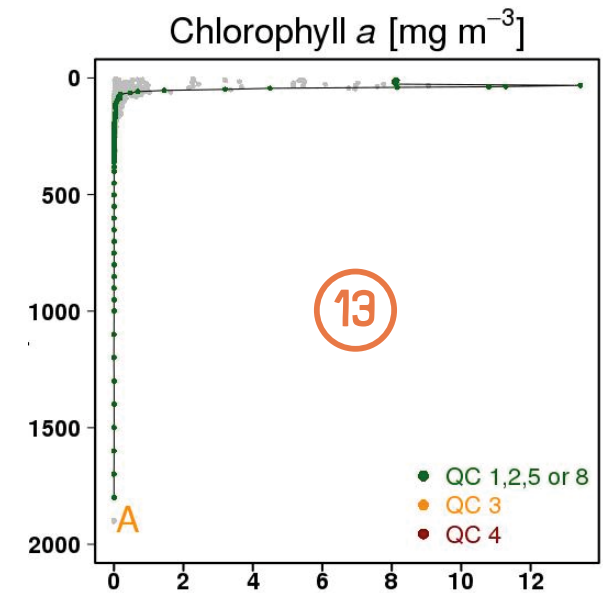
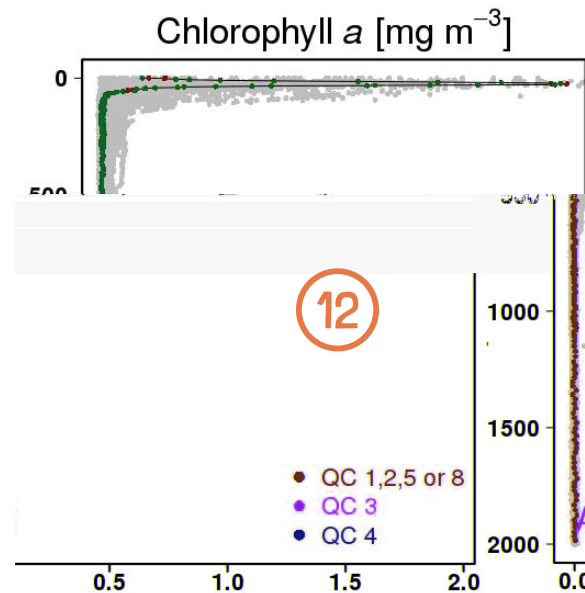
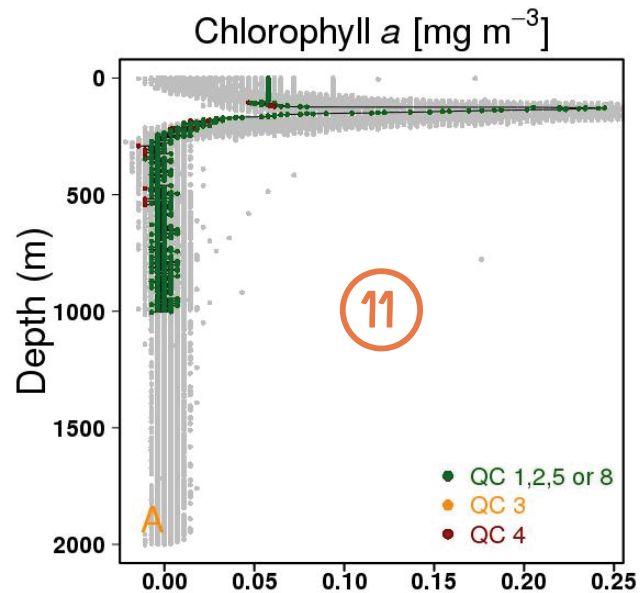
**When and where?** Situation typical of high and temperate latitudes during springtime months when phytoplankton blooms develop.



**Pay attention to the order of magnitude!** Never forget to check the order of magnitude adopted for your chosen parameter — this will have a big impact on how you interpret the data.

## Example with chlorophyll a:

- The curves in diagrams 11 and 12 look practically identical, but curve 11 describes nearly 10 times less chlorophyll a than curve 12.
- In contrast, the chlorophyll a values represented on diagram 13 are two orders of magnitude greater than those in diagram 11.





# Time series

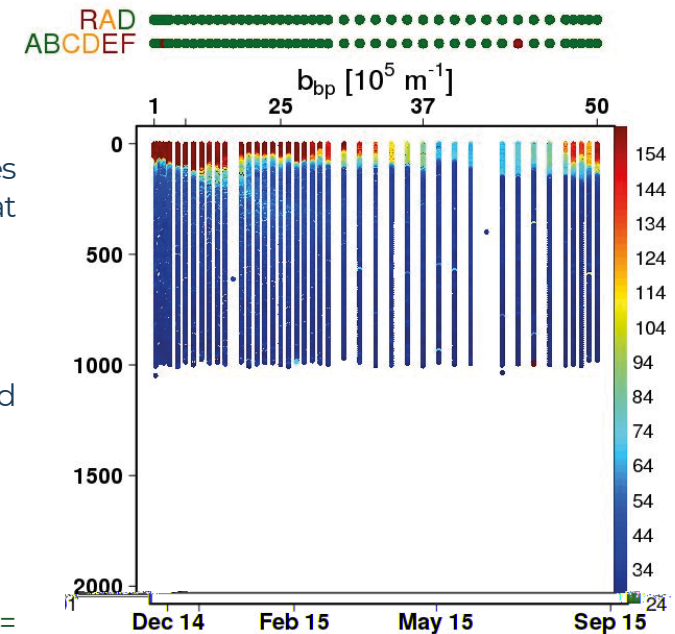
- **Time series** illustrate the more or less distinct seasonal trends of 6 parameters (out of the 9 parameters measured): chlorophyll a, particulate backscattering (bbp), dissolved oxygen, nitrate concentration, photosynthetically active radiation (PAR) and pH.

- **General graph description:**

- Each vertical line on the graph represents a profile while a gap between two vertical lines corresponds to temporal spacing between two profiles (in other words, it indicates the rhythm at which the float rises back to the surface).
- Upper horizontal axis = the profile's cycle no.;
- Lower horizontal axis = date of the profile;
- Vertical axis (on the left) = depth (m);
- Colored vertical bar (on the right) = color code representing the values of the measured parameters. Red corresponds to the highest value and blue to the lowest value.

*If necessary, above the graph:*

- RAD = Data mode for each profile (see page 11; 1 point = 1 profile);
- ABCDEF = % of good-quality points (QC 1, 2, 5 or 8 ; see page 11) making up each profile: AB = 75-100 % ; CD = 25-75% ; EF = 0-25%.



N.B.: Variations in measured parameters are generally more significant between 0 and ~400 m depth.





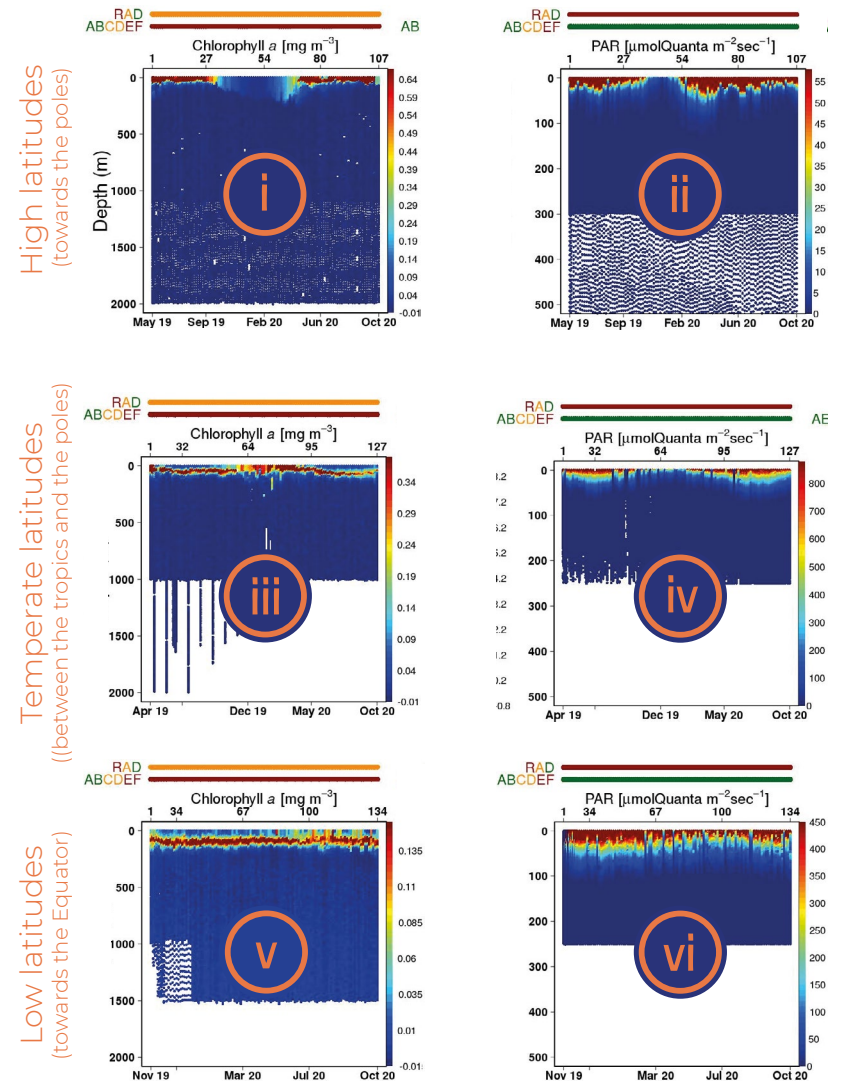
# Interpreting time series

## Seasonal tendencies: Example of chlorophyll a

- At high (diagrams **i** and **ii**) and temperate (diagrams **iii** and **iv**), latitudes, the parameters measured by floats undergo marked seasonal variations. For example, in the North Atlantic (**i**), the quantity of chlorophyll diminishes very significantly in winter, then builds up again in spring.
- At low latitudes, seasonal variations are much less striking. Diagram **v** shows constant chlorophyll a levels throughout the year.

## Chlorophyll a versus light (PAR):

- At high (diagrams **i** and **ii**) and temperate (diagrams **iii** and **iv**), latitudes, phytoplankton tend to be found in shallow layers (in the first 50-100 m depth), in order to draw maximum benefit from light. In winter, when light intensity is inadequate for the development of phytoplankton, chlorophyll a values decline.
- At low latitudes (diagrams **v** and **vi**), however, the chlorophyll a maximum is usually detected between 100-200 m depth. This is due to strong light intensity, typical of the intertropical zone, and due to nitrates (“fertilizer” for phytoplankton) being found quite deep at these latitudes. The abundance of chlorophyll a and the depth at which it reaches its maximum are heavily dependent on **seasonal cycles** of light intensity. When light is less intense, the chlorophyll a maximum tends to be recorded at the surface as phytoplankton rise up in search of more light de lumière (diagrams **iii** vs **iv** and diagrams **v** vs **vi**).



- Pay attention to the **order of magnitude**! Never forget to check the order of magnitude adopted for your chosen parameter — this will have a big impact on how you interpret the data.

**Example with PAR:** The PAR values on diagram **ii** have an order of magnitude 10 times weaker than those on diagrams **iv** and **vi**!

- Heterogeneity:** Beware of this trap! Don't forget that a float will drift with currents. During its journey, it may therefore pass through “oceanographic landscapes” that differ greatly from one another in terms of biological and physical parameters. When this occurs, time series may show extremely heterogeneous values, which can complicate the study of seasonal cycles. In order to distinguish seasonal trends (temporal scale) from variations due to the float's displacement (spatial scale), it is therefore useful to contextualize the recorded data.

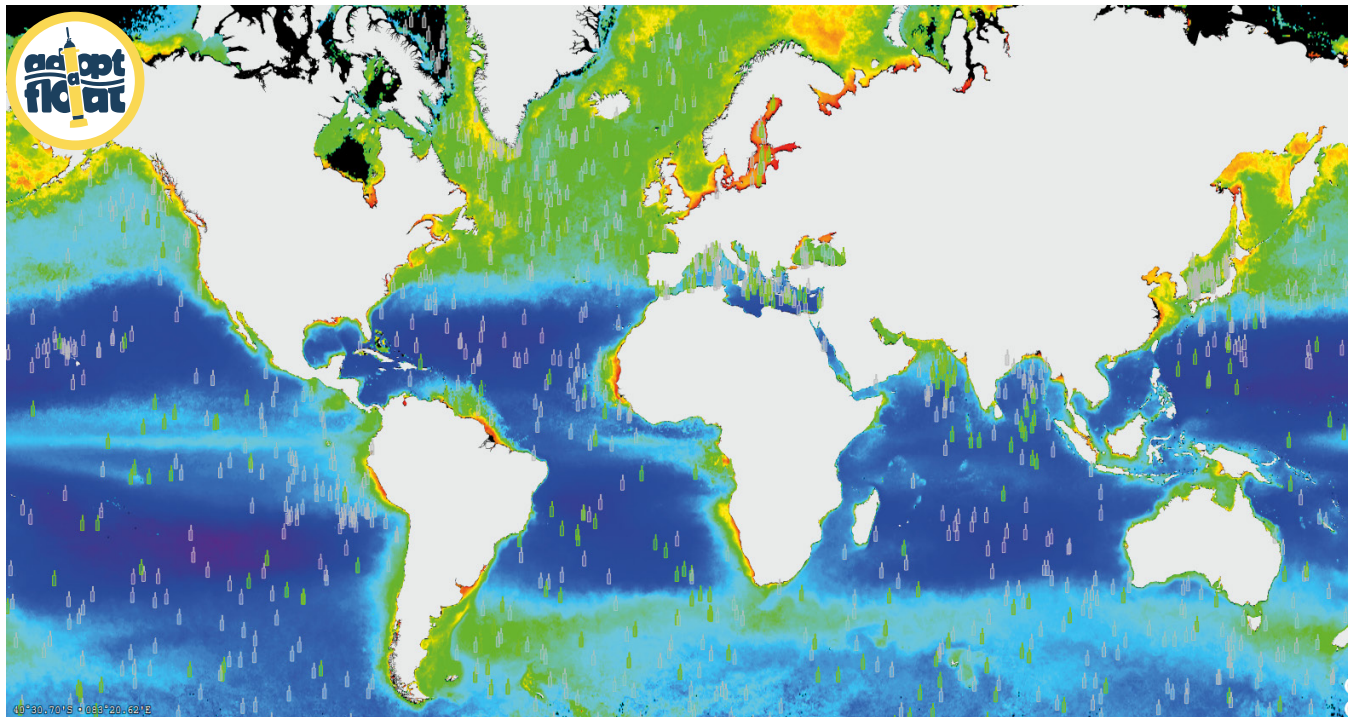
- To take “landscapes” and seasons into account on the float map go back to the general **map C**, then click on **AA** “**Additional layers**” and choose a season in the scroll-down menu: a satellite image showing the abundance of chlorophyll at the surface of the global ocean (first ten or so meters), during the chosen seasonal period, will be displayed.



## Interpreting time series

The seasons in "**Additional layers**" refer to seasons in the Northern Hemisphere. For example, "Clim Chl Spring" (diagram **vii**) corresponds to the northern spring and the southern autumn.

**SPRING (Northern Hemisphere)**



### Chlorophyll a in the Ocean surface

- very high >3 mg.m-5
- high ~1 mg.m-5
- high ~1 mg.m-5
- very low < 0.1 mg.m-5

**AUTUMN (Southern Hemisphere)**

N.B.: The intertropical zone is generally poor in phytoplankton and therefore in chlorophyll a (colored blue/purple), regardless of the season. The term "ocean desert" applies here.



# Geographical zones

## ● North Atlantic (high latitude, near the polar zone):

### Spring

- In this region near Greenland, water masses do not mix and are visibly stratified (that is, we can clearly distinguish 2 layers of water with different properties) according to their temperatures: warm above and cold below. Here, stratification is amplified by salinity as melting icecaps send to the surface light freshwater, which does not mix with the cold, salty water of the depths.
- The highest chlorophyll a values of the year are registered at the surface during this period: the phytoplankton bloom is boosted by the distinct stratification.
- Light at the surface is heavily reduced due to the bloom that prevents it from penetrating.

### Summer

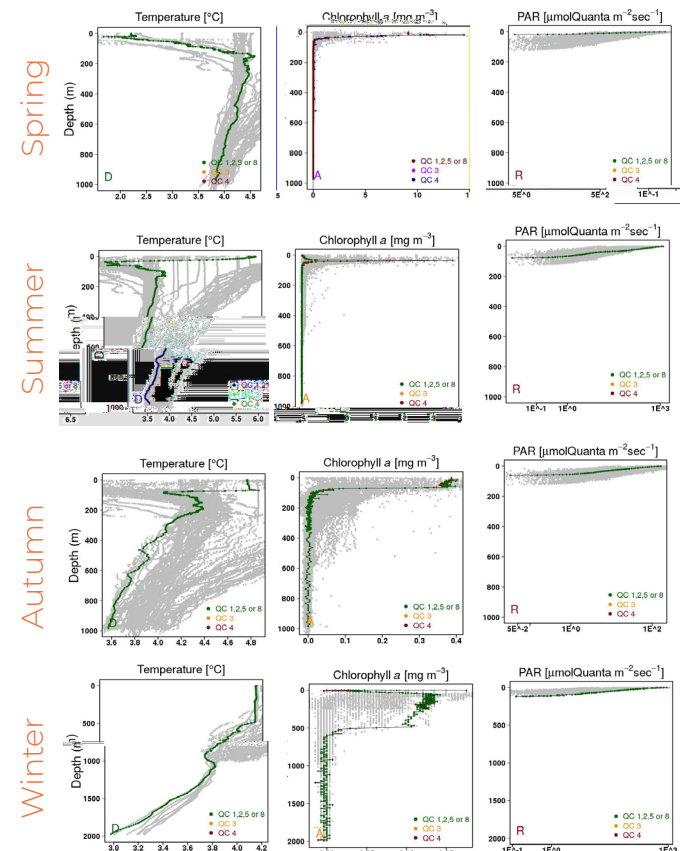
- Surface temperatures reach their yearly high, but fall in the first 100 m depth.
- Chlorophyll a peaks at around 50 m depth.
- This period is characterized by the year's highest light-intensity levels.

### Autumn

- The surface waters begin to cool and mix together (see image 3 page 12) under the influence of winds.
- Chlorophyll a values are far lower than in summer.

### Winter

- Surface temperatures drop to their lowest for the year. The mixing layer (see image 3 page 12) stretches down to 200 m depth (or more).
- The small quantity of phytoplankton (and therefore of chlorophyll a) still present is spread throughout the mixing layer.
- Light intensity falls to its lowest values for the year.



- **Mediterranean (temperate latitude, between the polar and tropical zones):**  
As a general rule, temperature and light intensity notch up **greater values here than at high latitudes towards the polar zones.**



## Spring

- Water masses are visibly stratified according to their temperatures: warm above and cold below. The temperature is higher in the first 50-100 m.
- The highest chlorophyll a values of the year are recorded during this period, with a peak in the first 50-100 m depth. This is the phytoplankton bloom period (not as pronounced as in the North Atlantic).

## Summer

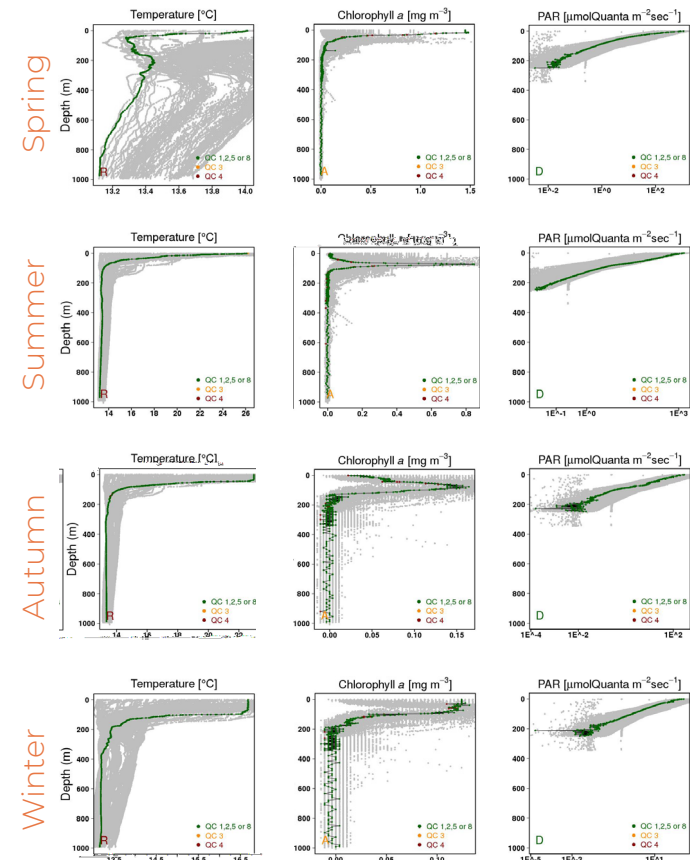
- As in the polar zones, surface temperatures reach their high for the year.
- Chlorophyll a peaks at around 100 m depth.

## Autumn

- Stratification is still visible, but a small mixing layer (see image 3 page 12) begins to appear in the first meters of depth.
- Chlorophyll a peaks at around 100 m depth as in summer, but at lower concentrations.

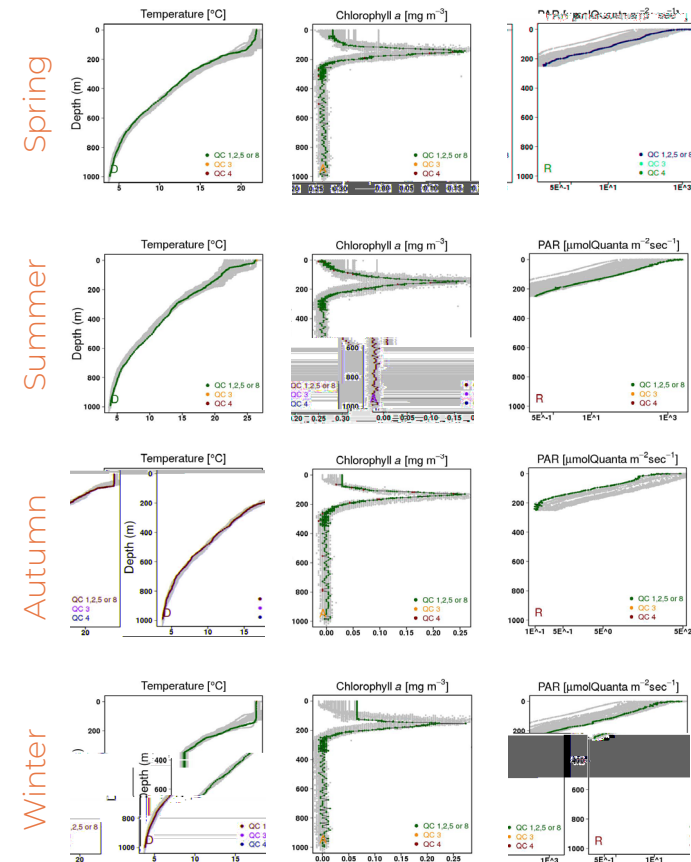
## Winter

- The mixing layer now stretches down to 200 m depth. This said, the difference in temperature between the surface and 1000 m depth is very slight.
- The phytoplankton that is present is distributed throughout the whole of the mixing layer.



- **Tropical South Atlantic Ocean (low latitude, intertropical zone):** This zone is characterized by **extremely weak seasonal cycles**.
- A great contrast exists between temperatures at the surface (warmer than at temperate latitudes in summer) and in the depths (comparable to those at high latitudes), all year round.
- In winter, the mixing layer (see image 3 page 12) can reach depths of 200 m, but may start to be visible in autumn and sometimes last through spring.
- Chlorophyll a, in very low concentrations, is found between 100 and 200 m depth throughout the year, and does not seem to be affected by the mixing of waters. However, it seems that the position of the chlorophyll maximum is in some way determined by available light.
- As phytoplankton (and particles) are found at extremely low concentrations, light can penetrate to the depths. This is why the curves reflecting PAR measurements are visibly “straight” all year long (phytoplankton, being scarce, will not attenuate the light, and any attenuation is therefore primarily due to the water).

*Careful! We are in the Southern Hemisphere here, so the seasons are inverted (with a 6-month lag) even if this is barely noticeable!*





# Graph references

Graph	WMO	Cycle no.	Link
<b>1</b>	6902969	125	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6902969_125.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6902969_125.jpeg</a>
<b>2</b>	6901182	207	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901182_207.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901182_207.jpeg</a>
<b>3</b>	6903558	032	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6903558_032.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6903558_032.jpeg</a>
<b>4</b>	6903558	032	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6903558_032.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6903558_032.jpeg</a>
<b>5</b>	5904671	031	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/5904671_031.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/5904671_031.jpeg</a>
<b>6</b>	5905135	066	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/5905135_066.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/5905135_066.jpeg</a>
<b>7</b>	6901472	204	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901472_204.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901472_204.jpeg</a>
<b>8</b>	6901472	199	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901472_199.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901472_199.jpeg</a>
<b>9</b>	6901472	200	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901472_200.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901472_200.jpeg</a>
<b>10</b>	6903240	199	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6903240_199.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6903240_199.jpeg</a>
<b>11</b>	6903550	094	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6903550_094.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6903550_094.jpeg</a>
<b>12</b>	3902124	217	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/3902124_217.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/3902124_217.jpeg</a>
<b>13</b>	5906033	030	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/5906033_030.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/5906033_030.jpeg</a>

## Graph references

Graph	WMO	Cycle no.	Link
<b>i &amp; ii</b>	6903549	107	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6903549_107.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6903549_107.jpeg</a>
<b>iii &amp; iv</b>	6902969	127	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6902969_127.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6902969_127.jpeg</a>
<b>v &amp; vi</b>	6903025	134	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6903025_134.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6903025_134.jpeg</a>
<b>North Atlantic (NA) summer</b>	6901489	074	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_074.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_074.jpeg</a>
<b>NA autumn</b>		096	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_096.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_096.jpeg</a>
<b>NA winter</b>		050	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_050.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_050.jpeg</a>
<b>NA spring</b>		064	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_064.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901489_064.jpeg</a>
<b>Mediterranean summer</b>	6901864	157	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_157.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_157.jpeg</a>
<b>Mediterranean autumn</b>		181	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_181.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_181.jpeg</a>
<b>Mediterranean winter</b>		190	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_190.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_190.jpeg</a>
<b>Mediterranean spring</b>		139	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_139.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/6901864_139.jpeg</a>
<b>Tropical South Atlantic (TSA) summer</b>	3902121	063	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_063.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_063.jpeg</a>
<b>TSA autumn</b>		018	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_018.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_018.jpeg</a>
<b>TSA winter</b>		037	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_037.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_037.jpeg</a>
<b>TSA spring</b>		049	<a href="https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_049.jpeg">https://maps.biogeochemical-argo.com/datamap/jpeg/3902121_049.jpeg</a>



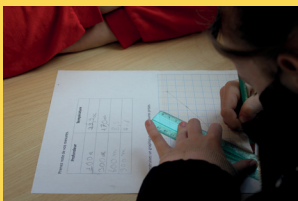
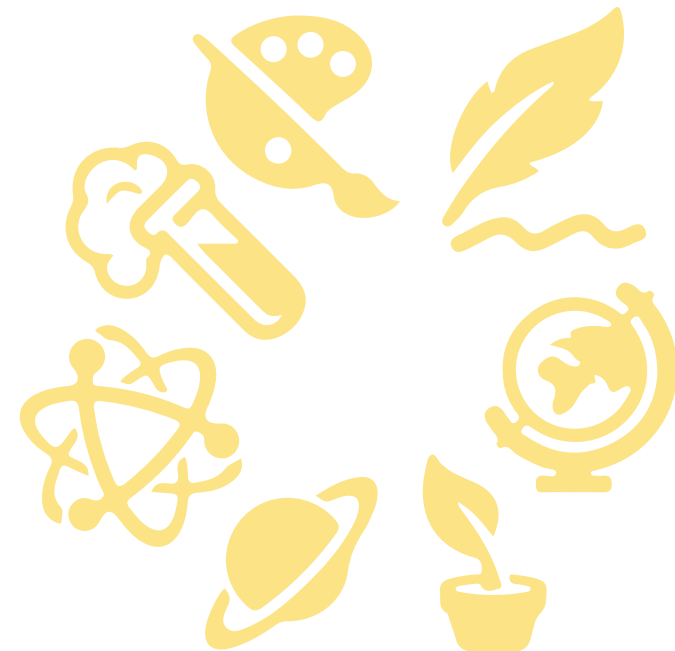


# How to use the map & its data in class

The float map and data have multidisciplinary usages: physics, biology, mathematics, or even written expression and art! Here are a few ideas for using these tools:

- **Read and interpret the graphs:** With the help of this guide and our oceanographers, interpret the different measurements of your float (and other ones!). How does temperature vary with depth? Does the concentration of chlorophyll change over the year? Is the Mediterranean Sea more or less salty than the Atlantic Ocean?...
- **Draw graphs from the raw data:** Download the data in .txt format for each profile (see page 7) and use those that interest you to draw graphs by hand or by computer!
- **Apply the scientific method:** Ask a question, put forward a hypothesis, establish a protocol based on use of the map and its data, note down the results, and analyze them!

*Example: The Year 7 Ocean Voyagers class (2020-21) from Collège Kerhallet in Brest, France, wondered if the ocean's temperature is the same year round near the Kerguelen Islands where their float was drifting.*



**Nos hypothèses :**

- la température change
- la mer est plus chaude l'été (juillet - août)
- peut être que parfois la mer est gelée
- la température doit beaucoup changer entre l'hiver et l'été

**Expérience :**

- on regarde les données du flotteur à différents moments de l'année
- on prend un chiffre par mois
- on cherche la température à 0m (en surface)

Mois de l'année 2020	Température de surface (en degré Celsius)
Janvier	4°C
Février	4,2
Mars	4,4
Avril	4,5
Mai	3,7
Juin	3,1
Juillet	2,5
Août	2,4
Septembre	2,4
Octobre	2,5
Novembre	2,8
Décembre	4

**De nouvelles questions...**

- pourquoi la mer est-elle moins chaude l'été ?
- Est ce que c'est la même chose tous les ans ?



- **Analyze the floats' tracks: measure the distances** covered by the profiling floats using the "Distance calculation" tool (see page 8) and **deduce their speeds, compare** them by season, region...
- **Keep a logbook for your float and its measurements:** where does it drift? For how long? How is its track developing? Which parameters does it measure? How does the water temperature change?...
- **What does the shape of your float's track make you think of?** Let your imagination express itself through artworks!

*Example: The Year 6 class (2022-25) from École Jean Moulin in Antibes, France, produced these artworks inspired by their float's track:*



For all questions on float data and how to use them, don't hesitate to contact our team on [adoptafloat@gmail.com](mailto:adoptafloat@gmail.com)



 [adoptafloat.com](https://adoptafloat.com)

 [@adoptafloat](https://www.instagram.com/adoptafloat)