Surveillance des écosystèmes Arctiques à l'aide de flotteurs autonomes

Achim Randelhoff
avec M Babin, L Lacour, C Penkerc'h, C Marec, E Leymarie, F D'Ortenzio, G Darnis, H Claustre, J Lagunas, L Fortier, M Sampei, X Xing, et les équipes Takuvik/LOV

Forum québécois en sciences de la mer
11-13 Novembre, Rimouski
Green Edge June-July 2016 aboard the CCGS Amundsen

Randelhoff et al., 2019
Observed textbook ice edge bloom: Biomass peak after ice retreat

Randelhoff et al., 2019
In-situ physical forcing cannot explain the delay of the observed bloom and stresses temporal dynamics.

Maximum mixing depth

"Isolume" (0.415 Ein/m²/d), "sufficient" PAR at depth

Randelhoff et al., 2019
Ice-tethered profilers work well but only in perennial ice

Toole et al., 2011, Oceanography
Large seasonal variation in ice extent

**Maximum ice extent**

**Minimum ice extent**

AMSR-2 data 2018, Hamburg University
... i.e. large seasonal ice zone

AMSR-2 data 2018, Hamburg University
Real-time oceanography with the Argo network
Floating profiler: PROVOR5 / PROVBIO 2

- GPS antenna & Iridium
- Internal bladder
- Floating aid
- Navigation electronics

Sensors:
- Temperature, salinity, pressure
- Dissolved oxygen
- Irradiance
- Biogeochemistry
- Nitrate

- Lithium battery
- External bladder
Low but improving winter survival rates...

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployed</td>
<td>5</td>
<td>7</td>
<td>2 (+1)</td>
</tr>
<tr>
<td>Survived winter</td>
<td>0</td>
<td>2 ½</td>
<td>2 ½</td>
</tr>
</tbody>
</table>
Successive winter nutrient replenishment

Randelhoff et al., to be submitted to Frontiers
Rare observations of annual phytoplankton biomass cycles

Fluorescence chlorophyll α
Rétrodiffusion particulaire 700 nm (particulate backscattering)

Randelhoff et al., in prep.
Polar night + sea ice/snow = little light

Sun elevation angle

Sea ice conc.

Depth of light penetration
The ice edge/spring bloom is linked to what’s happening during winter
Thank you for your attention!

poplarshift.github.io
More
(Presque) aucun broutage par le zooplancton en hiver

Data source: Circumpolar Flaw Lead project, 2007-08
Positive growth rates in mid-winter
Remote sensing doesn’t see through ice

Annually integrated chlorophyll a according to Globcolor in 1998
Ice-tethered profilers work well in perennial ice

Toole et al., 2011, Oceanography