Disturbance of phytoplankton biomass seasonal dynamics in a South Pacific island wake: A biogeochemical-Argo floats-based study

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The South Pacific subtropical gyre is a vast and remote area where biogeochemical in situ observations are scarce, leading to large uncertainties on phytoplankton biomass variability. The aim of this study is to investigate physical and biogeochemical observations from three Biogeochemical-Argo (BGC-Argo) profiling floats that collected data in the central South Pacific Ocean, near Tahiti (17.7°S-149.5°W) between March 2015 and early 2017. Seasonal dynamics of phytoplankton biomass is characterized both in the open ocean and in the island wake generated by Tahiti. Here, we examine if an island mass effect (i.e., biological enhancement) can be evidenced leeward Tahiti.

### Data from 3 BGC-Argo floats

<table>
<thead>
<tr>
<th>Float</th>
<th>Length of the mission</th>
<th>Temporal resolution of data acquisition</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>080b</td>
<td>20 months</td>
<td>5 days</td>
<td>CTD/radiometry/WT Labs ECO Puck, Triplet</td>
</tr>
<tr>
<td>078d</td>
<td>~3 months</td>
<td>daily</td>
<td>CTD/radiometry/WT Labs ECO Puck, Triplet/nitrate sensor/optode</td>
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</tbody>
</table>

### Seasonal dynamics

- **Open ocean (080b data):** The seasonal dynamics of phytoplankton biomass observed by the BGC-Argo float is consistent with previous descriptions of oligotrophic environments (e.g., deepening and intensification of the deep chlorophyll maximum (DCM) from winter to summer, Mignot et al., 2014).

- **Leeward side of Tahiti (078d and 070d data):** Differences from the seasonal patterns are observed, such as the decrease of the DCM in austral summer (in yellow and purple)

### Island mass effect observed from the 078d profiling float

- The DCM shallows during late austral spring (in Dec) and is associated with an increase of Chl in the upper layer. This increase of Chl is associated with a supply of nitrate, not related with an isopycnal uplift.

- For the first time, an island mass effect on phytoplankton biomass dynamics is evidenced by observations from BGC-Argo floats. We also highlight how local physical processes can strongly disrupt phytoplankton seasonal variability.

### Conclusion

- The concomitant occurrence of land drainage induced by strong precipitations and a shadow zone of current behind Tahiti shows the increase of nitrate concentration and the phytoplankton biomass enhancement in the upper layer.