Université d'avant-gar

On the eddies in the Amundsen Gulf

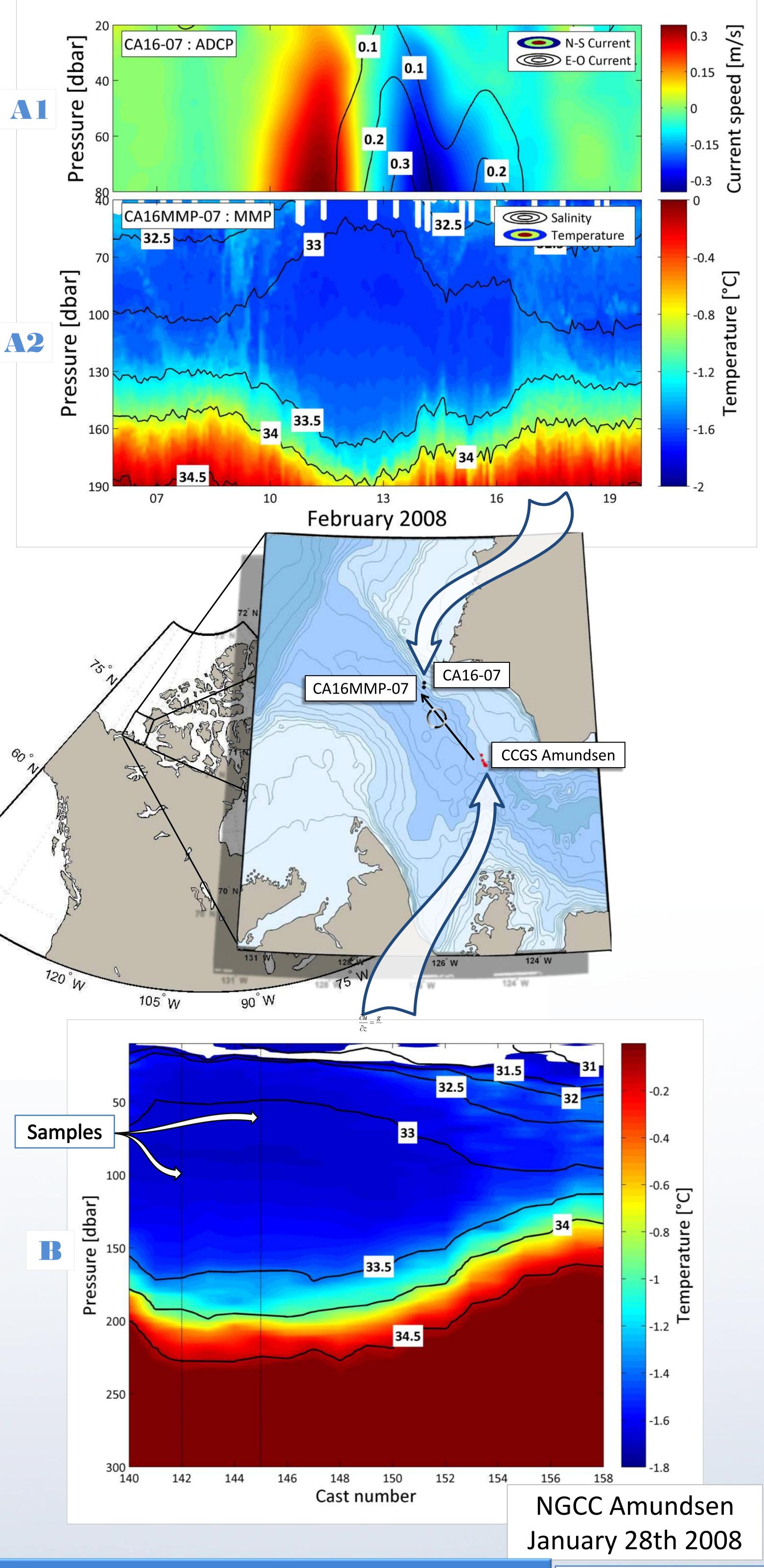
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Introduction

For the first time, eddies have been observed in the Amundsen Gulf. With a diameter of 15 km, the tangential velocity can reach 30 cm s⁻¹. Some eddies are believed to drift for more than a year in the Arctic Ocean.

Objectives

Describe these structures by using physical, chemical and biological characteristics
Are they anticyclonic eddies?
Where are they coming from? What is their origin?



Results

We choose the most important structure observed on board the CCGS Amundsen during the Circumpolar Flaw Lead Program (CFL) study, that is on January 28th 2008(B). By comparing the TS signature present inside the structure with other observed during the winter, it has been possible to identify the same structure at mooring CA16MMP-07(A2) and CA16-07(A1) on February 12th 2008. So it took the eddy 15 days to travel 60 km, which corresponds to a minimum speed of 5 cm s⁻¹.

ArcticNet

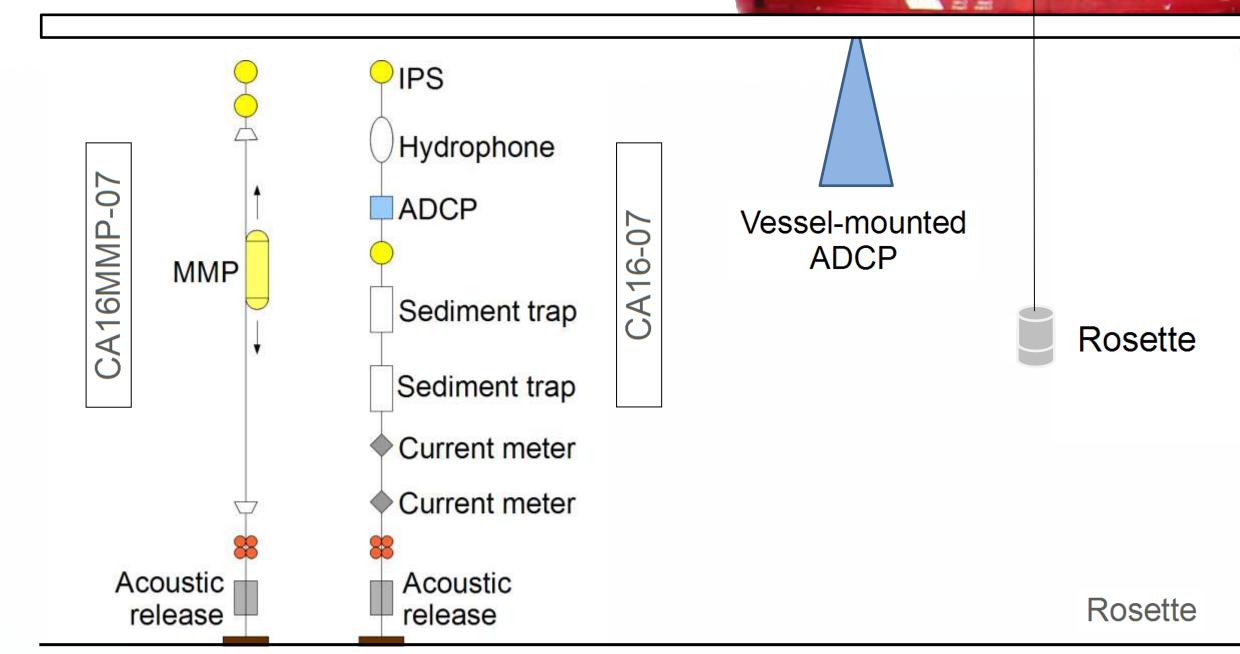
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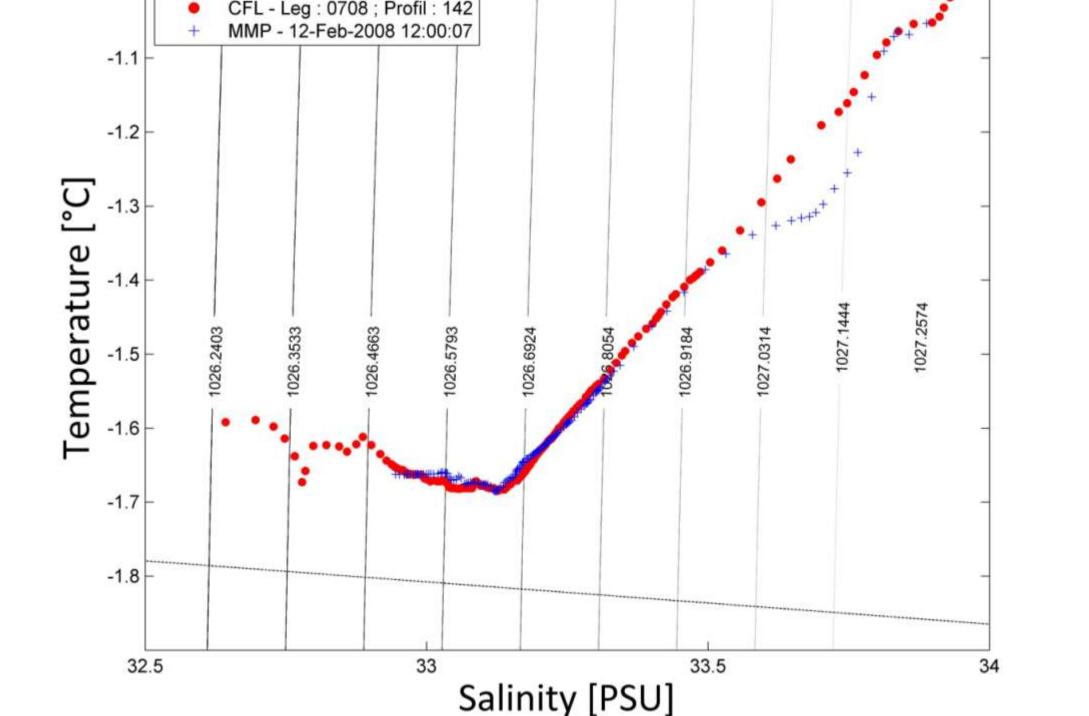
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Method

We concentrate our effort on one specific event, which happened in winter 2008. By using the Temperature-Salinity signature present inside the structure, it is possible to relate the structure to other profiles and follow its signature throughout the Amundsen Gulf.

All data used in this investigation are coming from the following instruments:





Moreover, the data acquired by the ADCP on CA16-07 reveals the presence of a circular current during the presence of the coherent structure(A1). These observations confirm that the coherent structure corresponds to a cold-core anticyclonic eddy with mean salinity of 33.1 PSU.

We still need to analyse all the measurement from the samples of the eddy (January 28th 2008). These measurements will then be compared to all the other data from CFL. We may found water with similar properties in the region. This could give us more information on the water origin.

By knowing as best as we can these structures and by using tracers, it is possible to deduce the origin of the water that is present inside them and the mechanism by which they can be generated.

Cyclonic or Anticyclonic?

How do we know the sense of rotation of an eddy? With the isodensity lines :



Origin(s)

- **Barotropic instability :** Interaction between two currents (Horizontal shear)
- Baroclinic instability : Interaction between two currents (Vertical shear)
- Ice formation : The ice formation at the surface induces brine rejection under the ice surface. This phenomenon increases the density of the water column locally. The horizontal transfer of this water can create eddies.
 Subduction of water at upper ocean fronts

hemisphere

- Why does it rotate?

Two mecanism can generate circular current :

Thermal windVorticity conservation $\frac{\partial u}{\partial z} = \frac{g}{\rho_0 f} \frac{\partial \rho}{\partial y}$ $\frac{d \zeta + f}{dt H} = 0$

Conclusion

The presence of eddies into the Beaufort Sea and the Amundsen Gulf is not well documented. These observations in the Amundsen Gulf are among the first to be documented for that region. We still need to analyse the tracers (Ba, O18, etc), this will gives us some hints on the origin of that eddy.

