

# Sailbuoy Ocean Currents

## Low-Cost Upper Layer Ocean Current Measurements in a Large Geographical Area

### NEWSFLASH

Aanderaa, Offshore Sensing, Akvaplan NIVA, and the Norwegian Meteorological Institute recently completed a joint project to develop a low-cost solution to measure upper ocean currents in a large geographical area. Over a three-year period, these institutions have conducted local and offshore experiments with an autonomous solution, the Sailbuoy, to measure currents from surface to 85m. Supported by ConocoPhillips and the Research Council in Norway, Vestland, the consortium collaborated to arrive at a fully functional, correlated solution for ocean current measurements.

Only a tiny portion of the ocean is monitored today, and some studies refer to as little as 5%. Many areas are hard to reach. Traditional methods requiring research vessels to deploy moorings or to monitor currents directly are expensive and limited by the cost of the ship and crew. Observatories have been established in many areas and can include ocean current profilers. These can provide good ocean current data at specific depths, but the upper 6-15% of the water column is not adequately covered due to sidelobe interference.

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Current profilers are getting more advanced and able to compensate for instrument movements during operation in real-time. The Aanderaa Doppler Current Profiler Sensor has successfully been installed on many buoys worldwide and has a good track record for providing quality data. Many of the same features that have been successful in the buoy application could be extended to a moving surface platform like the Sailbuoy.

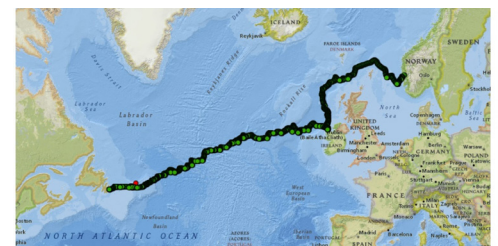
The Sailbuoy had already proven itself as a sea-worthy vessel and had successfully navigated from Canada to Norway via the Irish coast as the first unmanned surface vessel ever. It is competitively priced and has been used for various environmental studies. The central technical challenge when using a small surface vessel to measure currents is compensating for the motion due to waves and the vessel's movement through the water. For the ocean currents to be accurate, these effects must be characterized.



Current profilers mounted on small ocean-going vessels can measure currents in the upper ocean due to integrated motion compensation algorithms.



The first surface autonomous vessel to make the journey across the Atlantic



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During a three-week offshore period, the Sailbuoy Ocean Currents was exposed to a variety of conditions while sailing in an area where several bottom moored current profilers were available. The Ekofisk bottom-mounted profilers were utilized for correlation activities, and data were compared between the 3 Ekofisk stations and the Sailbuoy.

The initial correlation factor for the entire period for the profilers was:

**Correlation vs. ADCP1: 0.593**

**Correlation vs. ADCP2: 0.692**

This was considered good, taking into account different instruments' vendors and the general difference in the measurement area between the instruments.

Establishing how tilting of the Sailbuoy played a role, an additional filter of tilt over 50 degrees of the Sailbuoy was utilized. The beams will tilt over as much as 75 degrees in this condition. Filtering these events yielded a correlation factor of:

**Correlation vs. ADCP1: 0.745**

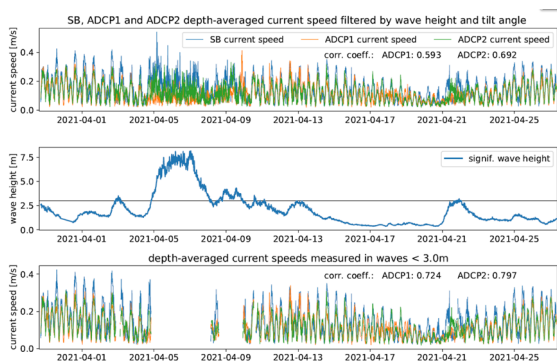
**Correlation vs. ADCP2: 0.810**

By utilizing these findings, the team established a system for quality assurance of the collected data. Data from specific periods with large waves and many dynamics could be tagged and improve the overall accuracy of the collected ocean currents data.

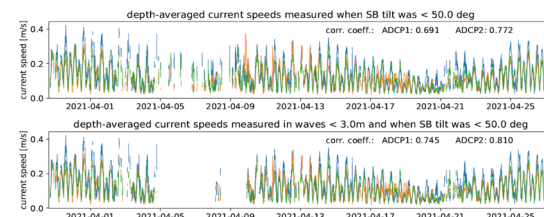
**Summary**

- The Sailbuoy Ocean Currents enable current measurements in the upper layers of the ocean with an excellent correlation to existing methods
- During storm events with high wave action, the correlation is reduced, but on-board sensors on the Current Profiler make it possible to filter these current measurements or tag them as lower quality
- The Ekofisk deployment also showed that the Sailbuoy Ocean Currents could be deployed in areas with offshore operations and frequent marine traffic
- It is also able to maneuver to the location of interest and back, enabling significant cost reductions

**Acknowledgement**



During high wave conditions, there is a lower correlation vs. in calmer weather.



When filtering events where the waves were 3 meters and the tilt was less than 50Deg, the correlation improves.



Sailbuoy Ekofisk deployment

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