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Absolute velocity estimates from a glider mounted ADCP

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Recent efforts to integrate Acoustic Doppler Current Profilers (ADCPs) on buoyancy driven gliders have borne successful results with sustained deployments of ADCP gliders in open ocean and shelf break environments. The capability to routinely measure velocities in the ocean from a long endurance autonomous platform can greatly improve understanding of water movement, especially in energetic regions not dominated by geostrophic currents. Gliders can survey a much larger area than isolated moorings and provide full water column measurements to their maximum depth rating with high frequency ADCPs.

We present results from a sea trial of a Kongsberg Seaglider fitted with a Nortek 1 MHz ADCP in Loch Linhe, Scotland with discussion of optimal ADCP setup and glider flight. Unlike its predecessors, the Nortek ADCP is capable of profiling currents both on the dive and climb portion of glider flight, doubling data coverage and improving reliability. During these trials the glider completed 12 dives to a depth of up to 80 m in a loch with strong tidal flows. ADCP data quality was excellent with $> 90\%$ ping correlation for bins within 10 m range and $> 80\%$ correlation for bins within 15 m range. This gives $80-90\%$ profile overlap for estimating full depth velocity shear profiles as the glider covers 1-2 m vertical distance between ADCP ping ensembles. Along loch velocities of order 0.1 ms^{-1} were observed. Methods of estimating absolute velocities from glider ADCP data are compared and a plan for an upcoming multi-month deployment in the Faroe Shetland Channel in May 2019 is presented.

At present current measurements from gliders are limited to referencing the geostrophic shear to dive average currents calculated from glider flight models. These methods cannot account for water motion out of geostrophic balance. Directly observed velocities relative to the glider can improve observations of internal waves, tidal flows, boundary layers and eddies as well as improving estimates for the motion of the glider itself through water.