Evaluation of the underwater glider flight model using the electromagnetic current sensor

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Turbulence measurement by underwater gliders has become more common in recent years. For the accurate estimation of energy dissipation rates, the accurate measurement of the fall rate and gliding path angle is necessary. The gliding path angle should take the angle of attack (AOA) into account, which is the difference between the gliding path angle and the pitch angle. AOA calculation has been done by using the so-called flight model assuming dynamical force balance in the quasi-steady state. Due to the difficulty in measuring AOA directly, the validity of AOA derived from the flight model and the flight model itself has not been adequately evaluated so far. In this study, we put the electromagnetic current sensor (EM sensor) on the turbulence package to obtain AOA directly and to compare the AOA from EM sensor with that from the flight model. Using the dataset obtained by a Slocum glider in Jul. - Aug. 2017, we found that AOA from the EM sensor during descent and ascent has a mean (standard deviation) of 0.7 (1.2) deg. and -0.7 (1.1) deg., respectively, while AOA from the flight model is 4.9 (0.4) deg. and -4.5 (0.5) deg., respectively. In order to know what cause this difference, we discuss the validity of parameters given in the flight model. It is suggested that a drag coefficient due to parasite drag given in the flight model may be somewhat larger than that calculated using the EM sensor.

Keywords: underwater glider, flight model, electromagnetic current sensor, angle of attack

