IOP office hours

Integrative Observational Platforms group (IOP)

iopsg@uw.edu

April 15, 2026

UNIVERSITY of WASHINGTON
Applied Physics Laboratory

A very brief PSA on documentation

One stop shopping https://iop.apl.washington.edu/iopsg/

Of note:

- Glider parameters https://iop-apl-uw.github.io/basestation3/html/Parameter_Reference_Manual.html
- Basestation https://iop-apl-uw.github.io/basestation3/
- Basestation best practices: https://docs.google.com/document/d/1UwgPj-UilhD3r_JDPcd1cM_Co6fdGiu8gpGKCcq5gNw/edit?tab=t.0

What we are going cover/who asked us questions

1. “What are good strategies for flying the glider in areas with intensified surface currents?”
2. “How to properly use the altimeter and check if everything is working fine”
3. “What causes wiggles in vertical velocity and how can I minimize them?”
4. “How might we overlay near real-time ocean current display onto the map? What products are used for estimating current impact on the glider trajectory? We operate in a strong shelf current region and often have eddies influencing the glider, but without a good idea of the upcoming changes in current strength”

Strategies for flying the glider in areas with intensified surface currents – Considerations

- Strength of upper current, strength of deeper current and the depth ranges of each
  - Is there room to get underneath for a meaningful part of the dive? Then deeper/longer is a good plan
  - If not, probably shorter/faster to get out of the problem
- Gliders tend to get pushed around
  - Think like a kayaker or swimmer - don't fight the current (perpendicular is a good direction)
  - …unless it is pushing you where you want to head
- Forward progress depends in pointing at the target/heading
  - Get your roll tuned up so you are pointing toward the target
- Keep the glider diving optimally
  - Keep targets far away from the glider (5km to 10km) and set a large target radius
  - Targets that are close will cause the glider to do steeper pitch/lower buoyancy dives
  - Sometimes a string of intermediate targets can be useful to keep things on track
    - See ExtraTargetsAlongLine.py in /usr/local/basestation3/tools to help that out.

Strategies for flying the glider in areas with intensified surface currents – Getting out of there faster

- $NAV_MODE and $HEADING (sometimes, you need to take control)
  - Often, $NAV_MODE,2 is what you want
  - …but sometime $NAV_MODE,3 to steer relative to a current
  - …and eventually, $NAV_MODE,0 and $HEADING to point in one direction
- $SM_CC - a funny parameter that can help you out
  - Value the VBD position to pump to for surfacing - expressed CCs not AD
    - max($SM_CC) = ($VBD_MIN - $C_VBD) * $VBD_CNV
  - Note - the glider may overwrite this, depending on $NOCOMM_ACTION
  - Reducing the value == less time at the surface pumping
  - https://iopbase3.apl.washington.edu/plot/div/dv/272/329/vert_vel_new?mission=NANOOS_Feb26&wrap=page
- Increasing (deepening) $D_FLARE can be used to dive down faster
- Decrease the $T_DIVE/$D_TGT ratio to ask for steeper pitch
  - Steeper pitch often improves forward velocity (and therefore, horizontal)
  - Be sure to also….
- Raising $MAX_BUOY to help forward velocity (and therefore, horizontal)
  - Limits the amount of VBD (in CCs) both up and down (the max is typically chosen by the glider for the VBD value)
  - Works best if asking for steeper pitch ($T_DIVE, $D_TGT)
  - Typical gliders are ballasted for 250cc at bottom density, but in many regions, there is more available

Strategies for flying the glider in areas with intensified surface currents
– Don’t surface every dive

- $N_NOSURFACE - when $DIVE % $N_NOSURFACE == 0, that dive will be a subsurface dive, where % is remainder of the division (negative inverts this)
  - %N_NOSURFACE ,3 means dives 3, 6, 9,...are subsurface dives.
  - %N_NOSURFACE ,-3 means dives 1, 2, 4, 5, 7, 8...are subsurface dives
- $D_FINISH - Depth at which to complete a subsurface dive
- $D_NOBLEED - needs to be lower than $D_FINISH if the glider is actually going to dive again.
- $UPLOAD_DIVES_MAX - limits the number of dives uploaded - useful if the glider has done a number of sub-surface dives
- Things to be aware of
  - DAC estimate is essentially useless
  - Potential large number of dives to upload == large surface time at some point
  - Less opportunity to adjust

How to properly use the altimeter and check if everything is working fine?

First consideration - do you need the altimeter? Is it the right tool?

- Uses power that might be used for something else
- Bathy maps are often more consistent
- $D_OFFGRID is another option
- Altimeter false positives == short dives == more energy / dive
- Altimeter lack of response == ending up on the bottom
- Altimeter is omni directional - nearest big thing is going to be the range
    - (see documentation at https://seaglider.pub/parms under $ALTIM_PING_DEPTH for how the surface is ignored)

How to properly use the altimeter and check if everything is working fine? (cont)

Pick your mode

- $ALTIM_BOTTOM_PING_RANGE, $ALTIM_BOTTOM_TURN_MARGIN
  - The range (in meters) from the presumed apogee depth (the nominal depth at which the glider will begin its apogee maneuver) to ping for the bottom. With this parameter set the altimeter will only ping a maximum of once per dive.
- $ALTIM_PING_DEPTH, $ALTIM_PING_DELTA, $ALTIM_PING_FIT
  - Depth to start pinging and frequency of pinging
  - What is that fit thing?* Well, its a multi part param that controls a linear fit routine for bottom detection
    - Ones place - number of pings to issue for the fit (Every $ALTIM_PING_DELTA meters)
    - Tens place - the R^2 threshold the fit must be exceed (defaults to 0.8)
    - Hundreds place - the slope threshold - the abs of fitted slope must be greater then this value and less then 1/this value.
    - Output of fit is reported in the $PING value in the GC table
      - $PING,depth, x1, x2, m, rsq
      - depth is current depth
      - x1,x2 are first fitted bottom depth and most recent fitted bottom depth
      - m, rsq are fitted slope (negative means bottom approaching) and fitted R^2
    - Good place to start - something like 873
    - Note - there are serious limitations in the current firmware (no up/down control)

How to properly use the altimeter and check if everything is working fine? (cont)

Other knobs:

- $ALTIM_FREQUENCY - The frequency (kHz) to use for altimeter pings. Must be an integer between 10 and 25. [15]
- $ALTIM_SENSITIVITY - Sensitivity of the envelope detector on the altimeter. Must be an integer between 0 and 5. A value of 0 disables the envelope detector, causing the altimeter to trigger on any return at the right frequency. Values between 1 and 5 require that the return signal be above that voltage for the duration of a pulse width before triggering. [1]
- $ALTIM_PULSE - Pulse width (ms) of altimeter pings. Must be an integer between 1 and 9. [5]
- Defaults should be pretty good. Sensitivity may help with quality of pings. Frequency can impact ping performance, but is also useful for getting out of the range of other sources of noise.
- If false altimeter hits: alternately *increase* $ALTIM_PULSE and $ALTIM_SENSITIVITY by one unit
- If unable to detect the bottom: alternately *decrease* $ALTIM_PULSE and $ALTIM_SENSITIVITY incrementally

What causes “wiggles” in vertical velocity and how can I minimize them?

First up - what are we talking about?

- https://seaglider.pub/plot/div/dv/267/254/vert_vel_new?mission=WHIRLS_Mission2_2026&wrap=page
  - Look at the brief periods of increased in velocity in all the modeled vertical velocity estimates

So, what’s causing those changes?

- https://seaglider.pub/plot/div/dv/267/254/diveplot?mission=WHIRLS_Mission2_2026&wrap=page
  - Its roll/pitch coupling - look at Vert Speed HDM, Pitch Up and Vehicle roll to see the coupling
  - Look at Pitch pos and Roll pos to convince yourself that roll is impacting pitch
  - In brief - its just part of the way the glider “flies” through the water when you have different angles of roll

Are these changes in model velocity output a problem?

- Not for the current basestation processing and CTD corrections.
- Is this an issue in your case?

Things that could change the number/strength of these:

- Roll less often (bigger $HEAD_ERRBAND, longer GC intervals)
- These changes are usually related to the angle of the roll - so reducing $ROLL_DEG may decrease the coupling to pitch and velocity
- Teaser alert - Turn Controller coming soon to Office hours.
- https://iopbase3.apl.washington.edu/plot/div/dv/272/329/ctw?mission=NANOOS_Feb26&wrap=page

Adding SSH contours and estimated current strength to the KML/Map

This feature has just been added for gliders on seaglider.pub - it is not a general basestation3 feature at the moment.

For any active mission glider, you can add SSH height contours and estimate current strength vectors to the glider's KML and mission plot, by specifying a "ssh box" in the sg_plot_constants.m - for example:

- ssh_lon_min = -20.0;
- ssh_lon_max = -5.0;
- ssh_lat_min = 52.0;
- ssh_lat_max = 61.0;

This will add optional SSH height contours and a vector field generated from a daily download of aviso SSH data.

Important notes:

- AVISO data is downloaded daily
- As long as the glider mission is active and a SSH box is specified, the KML and map will be updated
- This will roll out to all glider groups by the end of the week