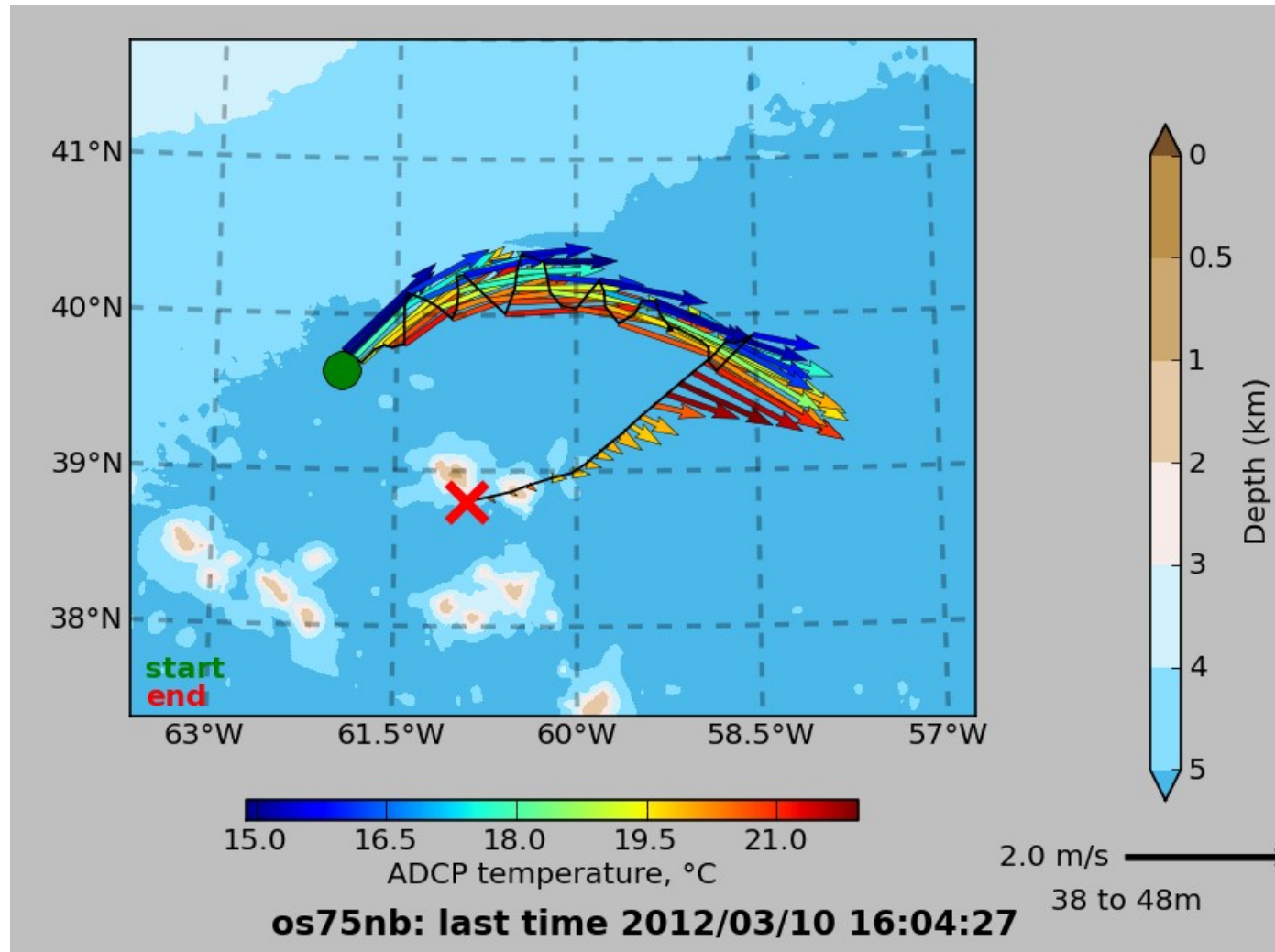
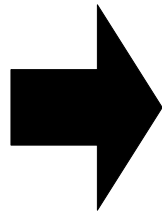


R2R Advisory Panel: ADCP+UHDAS

Time,
ADCP
Position
Attitude



primitive data

ocean velocities

ADCP: Getting Ocean Velocity

ADCP :

Acoustic (it pings along beams at a frequency)

Doppler (uses frequency shift to get velocity along the beam)

Current (include many more steps to get ocean velocity)

Profiler (listen for the return in small chunks of time to create a vertical profile)

ADCP:

Getting Ocean Currents

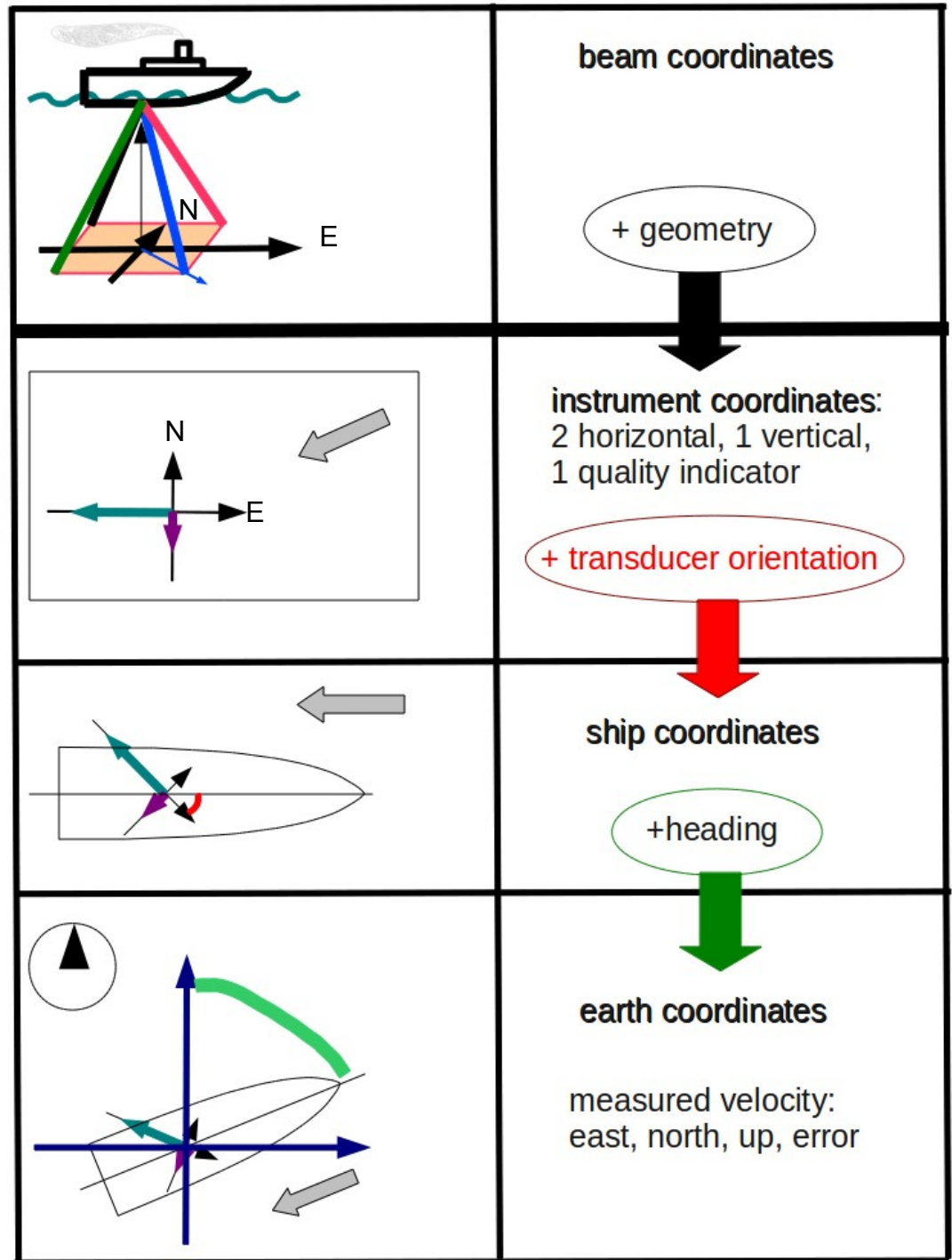
Doppler to beam
(inside the instrument)

(1) beam to instrument

(2) instrument to ship

(3) ship to earth

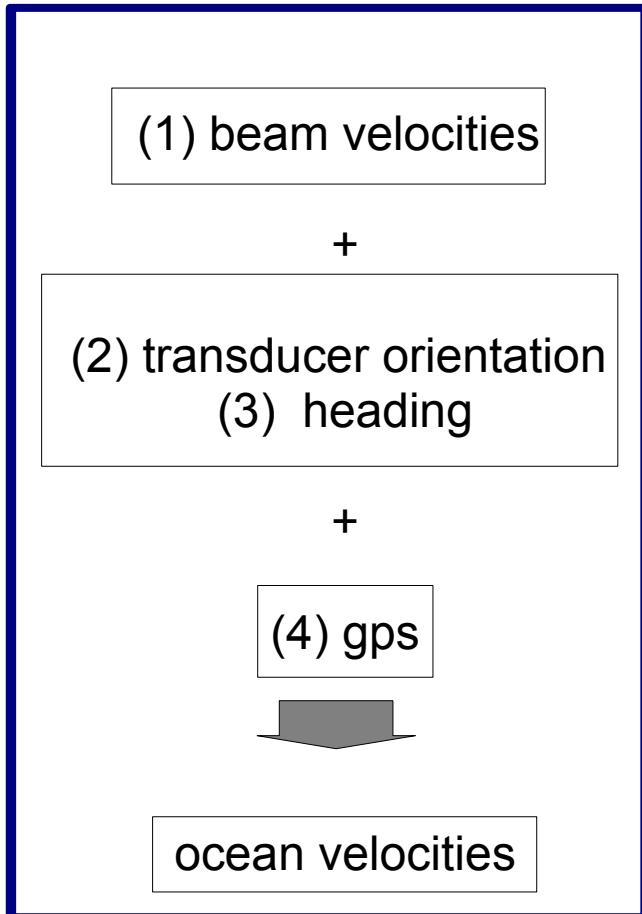
 measured velocities
in earth coordinates



ADCP:

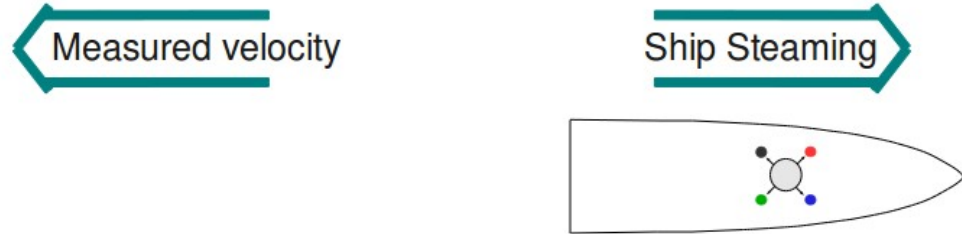
Getting Ocean Currents

Complete summary:



Earth coordinates

With Ocean current



$$\underline{U_{meas}} = -\underline{U_{ship}} + \underline{U_{ocean}}$$

$$\underline{U_{meas}} + \underline{U_{ship}} = \underline{U_{ocean}}$$

A diagram showing the components of the equation. A red oval contains the text 'beam velocities', 'geometry', 'transducer orientation', and 'heading'. To its right is a plus sign '+', followed by a blue circle containing the text 'gps'. Below this is an equals sign '=', followed by the text 'U_{ocean}'.

UHDAS: University of Hawaii Data Acquisition System

- Acquisition: reliable, robust; duplicate feeds
- Monitoring: catch problems early, fix them
- Processing: automated at-sea processing
 - goal: minimal additional processing needed for science-ready data
 - processing code is open source; runs on multiple platforms (OSX, Linux, Windows)
- Data Products: [at-sea web site](#), figures and data
 - data products are in Matlab, netCDF, CODAS database
 - figures are stored for later use

Monitoring

- 26 ships at present
- each sends a daily email with
 - text email summary of many key failure points
 - digest of additional information about
 - health of data acquisition system
 - status of logging and processing, computer health
 - last few data entries from each ascii serial instrument
 - heavily averaged processed data snippet
 - last few data entries from each ADCP

UHDAS ship table

These are automatically plotted



Monitoring

- Strategy:
 - extrapolation from yesterday
 - targeted assessment
- From the text email:
 - Is a cruise set up? Are they logging data?
 - Is the processing appropriately up-to-date?
 - Is the accurate heading device working?
 - Are there any warnings?
- From the Figures:
 - Do the data snippets (figures) look reasonable?

What can go wrong:

- instrument:
 - one beam goes bad
 - all beams go bad
- data acquisition:
 - lose power to USB-serial converter
 - lose power to ADCP
 - gyro breaks, serial feed breaks

What can go wrong:

- ocean currents are bad (visually inspect figures):
 - accurate heading failed or has glitches
 - they don't have an accurate heading device
 - bad transducer angle (
- computer:
 - external USB disk not mounted
 - time server is bad (time jumps backward)
 - processing stalled for some reason

Solutions:

After noticing a problem in the daily email, we alert the techs at sea and

(1) tech remedies a small problem; stop/start logging

- causes a little glitch, no long-term harm
- sometimes would be nice to know later but does not cause continuing damage to the dataset

(2) we remedy a larger problem; usually requires starting a new cruise segment

- causes problems with some automated backup schemes
- probably noteworthy for QA later

How good is the dataset?

- Two different aspects:
 - (1) How much work is required to make the final data the best possible with existing tools
 - (2) What is the data quality after that work?

Archiving

- At-sea datasets go to R2R
 - R2R can submit them to NCEI
 - A scientist who verifies calibration and edits the data can submit to Joint Archive for Shipboard ADCP data ([JASADCP](#) processed data)
-
- ADCP data from NCEI is submitted “as is” and should not be used for science without some kind of quality assessment.
 - At present, that requires some level of ADCP expertise, and additional software (free, requires work) to clean up the dataset.
 - Final processed data should be submitted to JASADCP so others can look there for science-ready ADCP data

Cruise Rating: work required

Must be able to automate these kinds of questions:

- How good is calibration?
 - always: transducer angle
 - modern: also need offset between GPS and transducer
- Did the accurate heading device work?
 - if not, how hard is it fix?
- Are the timestamps OK?
- How much editing is needed?
 - complicated topography or really shallow
 - bad weather can cause biases

Cruise Rating: work required

- (1) OK to use “as is”; minimal work needed for submission to JASADCP
- (2) post-processing required but steps are easy
- (3) must reprocess from scratch; then like #1 or #2
- (4) must reprocess from scratch and specialized knowledge and/or programming is required

Cruise Rating: Potential Final Quality

Must be able to automate these kinds of questions:

- Did the accurate heading device work? sometimes?
- Are there time gaps in acquisition? Was it run only occasionally?
- Is coverage poor due to bad weather, poor scattering, or ice?
- Are there biases due to bad weather, electrical noise, something else?

Cruise Rating: Potential Final Quality

Letter grade:

- **A: best possible** (accurate heading device worked, good calibrations used, no reason to expect biases)
- **B: someone might use it** (not best quality, but still can use it, with caveats about errors in ocean currents). This is a large category. eg:
 - not an accurate heading device
 - biases due to bad weather
- **C: don't use it** (electrical noise created biases, it was run too little, instrument was sync'd with a low ping rate)

UHDAS “reports” directory

- historically: UHDAS directory has these:
raw, rbin, gbin, proc
- **proc** contains processing directories for each ADCP (and pingtype if ocean surveyor)
- new: **reports** directory
 - has index.html to organize
 - attempting to consolidate information for Cruise Rating
 - it will be discoverable at NCEI starting with N.Armstrong
- Prototype **reports** directory for [Kilo Moana](#)
- **reports** directory from [N.Armstrong ar0106](#)

What is missing?

- strengthen the **reports** directory:
 - improve it
 - run it on existing cruises
 - document how to use it
- develop a meta-reports (ship):
 - leverage groups of cruises for
 - calibrations
 - Cruise Rating
- need a way to attach “comments” to a live cruise, for later, while we know what went wrong