

This README file describes the file contents and processing steps for each file of levell mooring adcp data for the Long Bay Wintertime (2012) Project.

History of upload

June 20, 2012 (SH) initial parsing, format and upload

July 11, 2012 (SH) QC'd data using range tests and sensor health and signal strength

July 23, 2012 (SH) lb2 and lb3 depth replaced by CTD data and used for surface mask

Dec 17, 2014 (SH) after reviewing previous QC tolerances were too aggressive.

The error velocity tolerances and percent good were relaxed.

Also modified lb3 surface mask to account for tilt on slope shelf.

1. Files

/data/long_bay/levell1/

lb1

|-- lb1_adcp.mat

lb2

|-- lb2_adcp.mat

lb3

|-- lb3_adcp.mat

2. File Contents

Three structures contain data pertaining to the deployment and sensor configuration

 platform: [1x1 struct] -- deployment location and depth info about bottom frame

 config: [1x1 struct] -- sensor configuration info and parameters

 qc: [1x1 struct] -- added structure that contains tolerances and flagged

data for various qc tests

For example LB1 platform structure contains the following

```

            id: 'lb1'
            loc: 'Long Bay, NC, Shelf Bottom Frame'
    mean_water_depth: 30
mean_water_depth_units: 'm'
            lat: 33.1695
            lon: -78.3334
            mvar: -8.7000
    start_dn: 7.3489e+005
            last_dn: 7.3496e+005

```

The distance or range in meters of each profile depth cell above the ADCP is stored in config structure called config.ranges

```
>> config.ranges
```

The cell array in config structure called config.units stores the units of each variable

```
>> config.units
```

```

'mtime'          'days since 0000-01-01T00:00'
'pitch'          'deg'
'roll'           'deg'
'heading'        'deg'
'depth'          'm'
'temperature'    'deg C'
'salinity'       'psu'
'pressure'       'dbar'
'east_vel'       'm s-1' -- relative to True N
'north_vel'      'm s-1' -- relative to True N
'vert_vel'       'm s-1'
'error_vel'      'm s-1'
'corr_mag'       ''
'echo_intensity' 'count'
'percent_good'   '%'

```

Each file contains measured and derived parameters-one variable for each parameter. The variable index corresponds to same index of mtime (or matlab time) for time of each sample.

```

    mtime: [1x21575 double]
    pitch: [1x21575 double]
    roll: [1x21575 double]
    heading: [1x21575 double]

```

```
        depth: [1x21575 double]
temperature: [1x21575 double]
        salinity: [1x21575 double]
        pressure: [1x21575 double]
        east_vel: [29x21575 double]
        north_vel: [29x21575 double]
        vert_vel: [29x21575 double]
        error_vel: [29x21575 double]
        corr_mag: [29x21575 double]
echo_intensity: [29x21575 double]
        percent_good: [29x21575 double]
```

3. Processing Steps

The following scripts are used to process level0 raw data to level1.

More detailed information regarding the processing steps can be obtained from the MATLAB scripts and the summary below.

proc_adcp_raw.m -- reads data from RDI ADCP binary format downloaded from each ADCP and stored in level0

proc_adcp_qc.m -- quality control steps applied to adcp data to eliminate data not associated or out tolerances specified.

1. remove data when bottom frame not at deployment depth (trim beginning and end values)
2. evaluate sensor health (pitch, roll, heading, water temperature with tolerances)
3. quality and strength of returned signal used for acoustic doppler shift

echoIntensityTest
rangeTest of Correlation Magnitude
rangeTest of Error Velocity
rangeTest of Percent Good

4. evaluate a surface mask for ADCP within range of the surface. There are two ways of doing this. One is to define echo Intensity threshold for surface reflection. The second method uses certain distance below water level determined from pressure sensor on or near ADCP. The second method is the preferred method for this project.

LB2 ADCP did not have a pressure sensor, and LB3 ADCP pressure did not function properly. Pressure records from the CTDs were used to form the surface mask in profile data.

5. The horizontal velocity components were rotated to be relative to True North based on magnetic variation of the deployment location.

For example LB1 ADCP quality control tolerances are provided in the qc structure:

qc =

```
    echoIntensityTest_tol: 20
      rangeTest_cm_tol: 90
rangeTest_error_vel_tol: 0.2500
  rangeTest_heading_tol: 5
  rangeTest_mag_vel_tol: 2
    rangeTest_pg_tol: 50
  rangeTest_pitch_tol: 2
  rangeTest_roll_tol: 2
  rangeTest_salinity_tol: [30 40]
rangeTest_temperature_tol: [0 35]
  rangeTest_vert_vel_tol: 0.1000
    corr_mag_flag: [29x21575 double]
  echo_intensity_flag: [29x21575 double]
    error_vel_flag: [29x21575 double]
    horiz_vel_flag: [29x21575 double]
  percent_good_flag: [29x21575 double]
  sensor_health_flag: [29x21575 double]
  surface_mask_flag: [29x21575 double]
    vert_vel_flag: [29x21575 double]
    PASS_all: [29x21575 double]
```

Name - Definition

rangeTest - The check to ensure that a measurement or value or set of values (x) fall within established upper (max) and lower (min) limits, min < x < max. If the value or set of values are less than the upper and greater than the lower, then the test passes.

echoIntensityTest - The check to determine the lowest or closest range where echo intensity exceeds a maximum allowed value for each measured profile.

Correlation Magnitude - This parameter is a measure of the pulse-to-pulse correlation in a ping for each depth cell. Correlation magnitude data give the magnitude of the normalized echo autocorrelation at the lag used for estimating the Doppler phase change. As the correlation magnitude value decreases, so does the data accuracy.

Error Velocity - This parameter is the difference between the two independent estimates of vertical velocity at given range bin derived from each beam pair at that range.

Percent Good - This data quality indicator reports the percentage of good data collected at each depth cell of the velocity profile. Rejection criteria of the instrument include low correlation, large error velocity and fish detection.

Echo Intensity - This parameter provides a measure of the intensity or strength of the returned backscattered echo for each depth cell.

[1] D.R. Symonds, "QA/QC Parameters for Acoustic Doppler Current Profilers," Teledyne RDI Application Note, June, 2006.