RSKtools for Matlab processing RBR data

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RSKtools v2.0.0; RBR Ltd. Ottawa ON, Canada; support@rbr-global.com; 2017-07-06

Introduction

In order to facilitate the post-processing process of RBR data. We provide a few common processing functions. Below we will walk through the standard steps for processing CTD data.

Getting set up

If the steps below are uncommon to you, please review RSKtools_vignette.

```
file = '../rsktools/sample.rsk';
rsk = RSKopen(file);
rsk = RSKreadprofiles(rsk, 'profile', 10:55, 'direction', 'up');
```

Low-pass filtering

The first step is generally to apply a low pass filter to the pressure data; then filter the temperature and conductivity channels to smooth high frequencies. RSKtools provides a function called `RSKsmooth()`. All post-processing functions have many name-value pair input arguments to specify what values you want to process and how you want to do it. To process all data using the default parameters no name-value pair arguments are required. All the information above is available for each function using `help`, for example: `help RSKsmooth`.

```
help RSKsmooth
```

```
 RSKsmooth - Apply a low pass filter on specified channels.

  Syntax:  [RSK] = RSKsmooth(RSK, channel, [OPTIONS])
```

```
 Low-pass filter a specified channel or multiple channels with a
 running average or median.  The sample being evaluated is always in
 the centre of the filtering window to avoid phase distortion.  Edge
 effects are handled by mirroring the original time series.

 Inputs:
    [Required] - RSK - Structure containing the logger data.

                 channel - Longname of channel to filter. Can be a
                       single channel, a cell array for multiple
                       channels, or 'all' for all channels.

    [Optional] - filter - The weighting function, 'boxcar' or
'triangle'.
                       Use 'median' to compute the running median.
                       Defaults to 'boxcar.'

                 profile - Profile number. Defaults to operate on all
                       available profiles.

                 direction - 'up' for upcast, 'down' for downcast, or
                       'both' for all. Defaults to all directions
available.

                 windowLength - The total size of the filter window.
Must
                       be odd. Default is 3.

 Outputs:
    RSK - Structure with filtered values.

 Example:
    rsk = RSKopen('file.rsk');
    rsk = RSKreadprofiles(rsk, 'profile', 1:10); % read first 10
downcasts
    rsk = RSKsmooth(rsk, {'Temperature', 'Salinity'}, 'windowLength',
17);

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```

```
rsk = RSKsmooth(rsk, 'Pressure');
rsk = RSKsmooth(rsk, {'Conductivity', 'Temperature'}, 'windowLength',
 21);
```

Aligning CT

Begin by aligning temperature to pressure. This can be done in many way. For the sake of this example, we estimate a 5 sample lag for all profiles.

```
rsk = RSKalignchannel(rsk, 'Temperature', 2);
```

```
% RSKtools provides a function called |RSKcalculateCTlag| that
 suggests
% conductivity to temperature lag measurements by minimizing salinity
% spiking. See |help RSKcalculateCTlag|.
lag = RSKcalculateCTlag(rsk);
rsk = RSKalignchannel(rsk, 'Conductivity', lag);
```

```
Processing cast: 1
Processing cast: 2
Processing cast: 3
Processing cast: 4
Processing cast: 5
Processing cast: 6
Processing cast: 7
Processing cast: 8
Processing cast: 9
Processing cast: 10
Processing cast: 11
Processing cast: 12
Processing cast: 13
Processing cast: 14
Processing cast: 15
Processing cast: 16
Processing cast: 17
Processing cast: 18
Processing cast: 19
Processing cast: 20
Processing cast: 21
Processing cast: 22
Processing cast: 23
Processing cast: 24
Processing cast: 25
Processing cast: 26
Processing cast: 27
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Processing cast: 30
Processing cast: 31
Processing cast: 32
Processing cast: 33
Processing cast: 34
Processing cast: 35
Processing cast: 36
Processing cast: 37
Processing cast: 38
Processing cast: 39
Processing cast: 40
Processing cast: 41
Processing cast: 42
Processing cast: 43
Processing cast: 44
Processing cast: 45
Processing cast: 46
```

Remove loops

Profiling at sea can be very tricky. The measurements taken too slowly or during a pressure reversal should not be used for further analysis. We recommend using `RSKremoveloops()`. It uses a `treshold` value to determine the minimum profiling speed, the default is 0.25 m/s. As you can see the threshold is in m/s which means the function requires a depth channel. We have provided `RSKderivedepth()` to facilitate this.

```
rsk = RSKderivedepth(rsk);
rsk = RSKremoveloops(rsk, 'threshold', 0.3);
```

Derive

A few functions are provided to facilitate deriving sea pressure, salinity, and depth from the data. We suggesting deriving sea pressure first, in case you want to add a custom atmospheric pressure, because salinity and depth calculations use sea pressire.

```
rsk = RSKderiveseapressure(rsk);
rsk = RSKderivesalinity(rsk);
rsk = RSKderivedepth(rsk);
```

Bin data

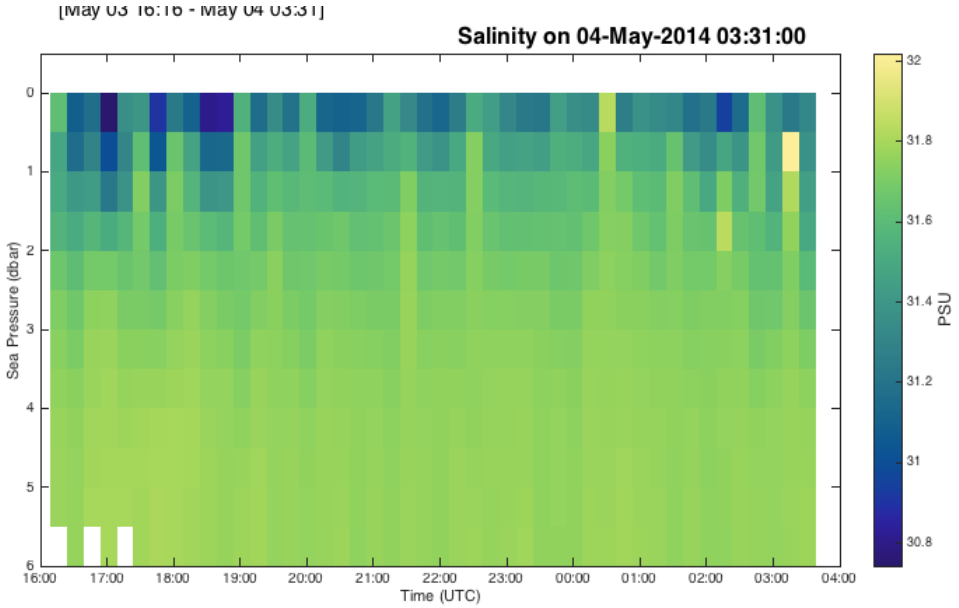
Quantize data in 0.5dbar bins. `RSKbinaverage()` requires a direction to explicitly describe in which direction the bin limits will be determined.

```
rsk = RSKbinaverage(rsk, 'binBy', 'Sea Pressure', 'binSize',
 0.5, 'direction', 'up');
```

Plot

Now we can see what the data looks like. We suggest plotting as you go to see if the changes eing applied are what you expect.

```
RSKplot2D(rsk, 'Salinity');
```



See RSKtools_vignette

A vignette is available for information on getting started with `RSKtools`.

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