RSKtools for Matlab access to RBR data

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Introduction

`RSKtools` provides some convenience functions for common data extraction (e.g., extracting profiles from a continuous dataset) and visualisation (e.g., plotting individual profiles). New in v2.0.0 are a suite of functions to perform routine processing steps to enhance the data quality (see VignettePostProcessing for more information). From this version on, we are expanding our data post-processing suite. See the Future Plans for some ideas, and please feel free to make suggestions.

Installing

The latest stable version of `RSKtools` can be found at http://www.rbr-global.com/support/matlab-tools.

- Unzip the archive (to `~/matlab/RSKtools`, for instance)
- Add the folder to your path from the command line (`addpath ~/matlab/RSKtools`) or launch the path editor gui (`pathtool`).
- type `help RSKtools` to get an overview and take a look at the examples.

Examples of use

A connection to the database must be made to work with an RSK file using `RSKtools`. This connection is made using the `RSKopen()` function. Note that `RSKopen` does not actually read the data, but reads a /thumbnail/ of the data, which is up to 4000 samples long. The structure returned after opening an RSK looks something like:

```
file = 'sample.rsk';
rsk = RSKopen(file)

rsk =
                  dbInfo: [1x1 struct]
      instrumentChannels: [7x1 struct]
                channels: [7x1 struct]
                  epochs: [1x1 struct]
               schedules: [1x1 struct]
             deployments: [1x1 struct]
             instruments: [1x1 struct]
             appSettings: [1x1 struct]
                 ranging: [7x1 struct]
              continuous: [1x1 struct]
              parameters: [1x1 struct]
           parameterKeys: [23x1 struct]
           thumbnailData: [1x1 struct]
                  region: [762x1 struct]
              regionCast: [508x1 struct]
                profiles: [1x1 struct]
                     log: {[7.3688e+05]  'sample.rsk opened using
 RSKtools v2...'}
```

To read the actual data, use the `RSKreaddata` function. If given with one input argument (the variable name of the RSK structure) it will read the entire data set. Because RSK files can store a large amount of data, it may be preferable to read a subset of the data, specified using a start and end time (in Matlab `datenum` format, which is defined as the number of days since January 0, 0000).

```
t1 = datenum(2014, 05, 03);
t2 = datenum(2014, 05, 04);
rsk = RSKreaddata(rsk, 't1', t1, 't2', t2);
```

Note that the logger data can be found in the structure at:

```
rsk.data

ans =
    tstamp: [22346x1 double]
    values: [22346x7 double]
```

In this example, because the instrument is a "CTD"-type instrument, Practical Salinity can be derived from conductivity, temperature, and pressure. `RSKderivesalinity` is a wrapper for the TEOS-10 GSW function `gsw_SP_from_C`, and it adds a new channel called `Salinity` as a column in `rsk.data.values`. The TEOS-10 GSW Matlab toolbox is freely available from http://teos-10.org/software.htm. It is good practice to derive sea pressure first in case you want a customisable atmospheric pressure.

```
rsk = RSKderiveseapressure(rsk);
rsk = RSKderivesalinity(rsk);
rsk.channels.longName

ans =
Conductivity
ans =
Temperature
ans =
Pressure
ans =
Dissolved O2
ans =
Turbidity
ans =
PAR
ans =
Chlorophyll
ans =
Sea Pressure
ans =
Salinity
```

Working with profiles

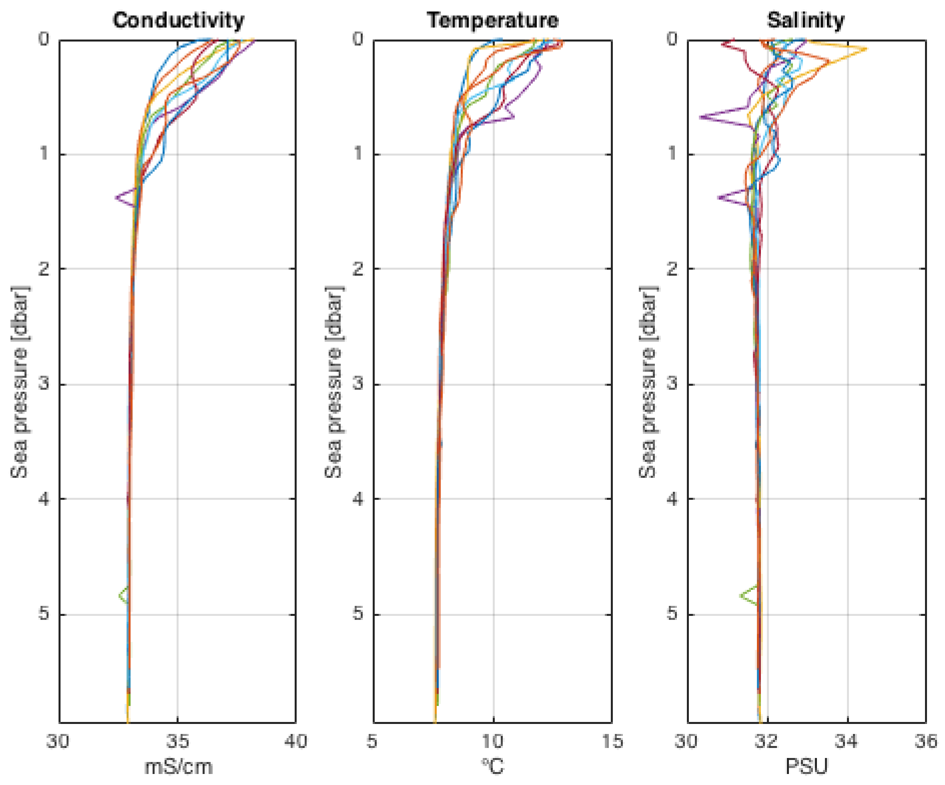
Profiling loggers with recent versions of firmware contain the ability to detect and log profile "events" automatically; these are denoted as "downcasts" and "upcasts". The function `RSKreadprofiles` extracts individual profiles from the raw data, based on the previously identified profiling events. Then, plots of the profiles can be made using the `RSKplotprofiles` function.

If profiles have not been detected by the logger or Ruskin, the function `RSKfindprofiles` can be used. The pressureThreshold argument, which determines the pressure reversal required to trigger a new profile, and the conductivityThreshold argument, which determines if the logger is out of the water, can be adjusted to improve profile detection when the profiles are very shallow, or when the water is very fresh.

Salinity and sea pressure have to be derived again because `RSKreadprofiles` replaces the data field with the newly queried values.

```
% load the second to tenth profiles in both directions (upcast and
 downcast)
rsk = RSKreadprofiles(rsk, 'profile', 2:10, 'direction', 'both');
rsk = RSKderiveseapressure(rsk);
rsk = RSKderivesalinity(rsk);

% plot the upcasts of conductivity, temperature, and salinity
handles = RSKplotprofiles(rsk, 'channel',
 {'conductivity', 'temperature','salinity'}, 'direction', 'up');
```



Customising plots

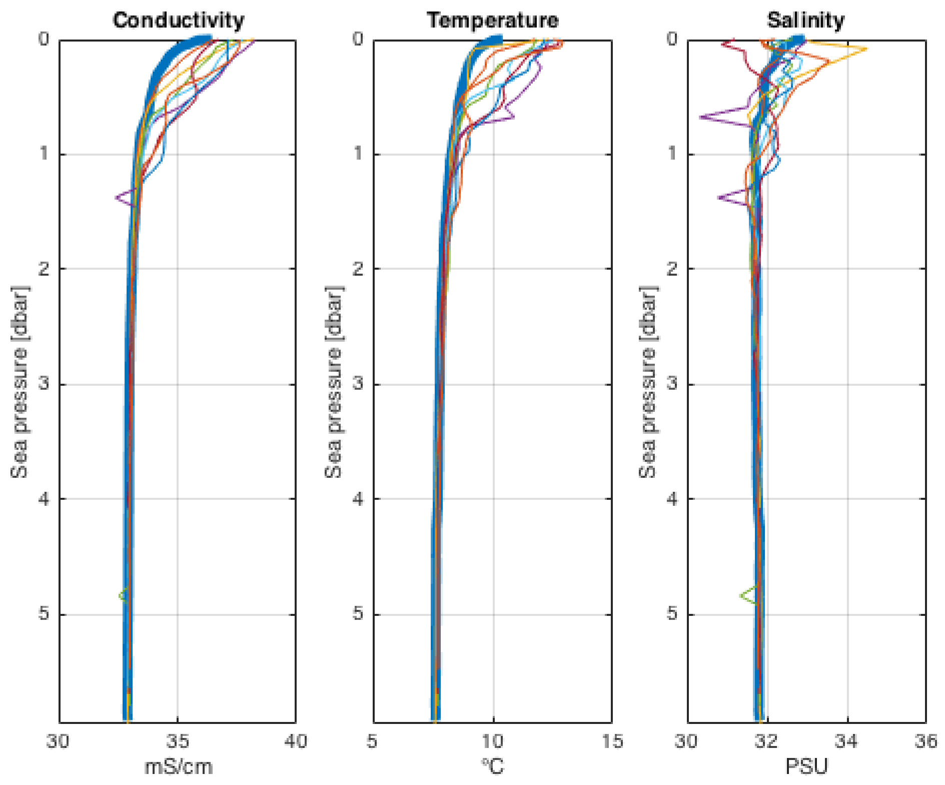
All plotting functions return a handle which enables access to the lines in the plot. The output is a matrix containing a column for each channel subplot and a row for each profile.

```
handles

% To increase the linewidth of the first profile in all subplots
set(handles(1,:),{'linewidth'},{5});
```

```
handles =
  9x3 Line array:

    Line     Line     Line
    Line     Line     Line
    Line     Line     Line
    Line     Line     Line
    Line     Line     Line
    Line     Line     Line
    Line     Line     Line
    Line     Line     Line
    Line     Line     Line
```



Other Resources

VignettePostProcessing is available for information on getting started with post-processing functions.

A User Manual for RSKtools is available.

Future plans

- Function to write metadata, log and data to a file.
- Wave processing functions.
- Function to plot temperature-salinity diagrams.

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