

RICO FSSP Compare

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Abstract

Rain In Cumulus over the Ocean (RICO) is an atmospheric research related measurement campaign that was carried out in 2004 and 2005 in the Caribbean region. The campaign involved numerous research flights aimed at measuring cloud-microphysics parameters. The *NCAR C-130* research aircraft was deployed during the campaign. The *RICO FSSP Compare* application is designed to facilitate the comparison between high time-resolution data ($10Hz$) obtained using two droplet-spectrum probes: *FSSP-100* and *Fast-FSSP* - both mounted on the *C-130*. The application is free software (GPL licence) designed to run in a UNIX-like environment.

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1 Requirements

The *RICO FSSP Compare* (*fssp_compare*) is written in the *IDL* language with some help of bash shell scripting. The GUI features are implemented using the *Xdialog* package. Besides the input data (described in the next section), *fssp_compare* requires:



Figure 1: The splash screen

- an *IDL* compiler, e.g.
 - The *GNU Data Language (GDL)* – an open-source *IDL* implementation
version: any newer than the CVS-2007.08.08
www: <http://gnudatalanguage.sf.net/>
 - The *IDL* – a proprietary *IDL* implementation
version: above 5.4
www: <http://www.ittvis.com/>
- the *Xdialog* package
www: <http://thgodef.nerim.net/>
- *bash* shell, an *X11* server and the *tee* UNIX command-line tool

The application should run on any UNIX-like platform equipped with the *X Window System* and the *bash* shell, capable of compiling the GDL and *Xdialog* open-source packages.

During development *fssp_compare* was tested on the following two configurations:

- Mac OS X / GDL 0.9 / *Xdialog* 2.3.1
- Linux / *IDL* 5.4 / *Xdialog* 2.1.2

2 Installation

After downloading the tarball with *fssp_compare*, please extract it, e.g.:

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```
$ tar xvzf fss_compare-200708151055.tar.gz
```

Please point the program to a location in which the datafiles are stored by assigning a valid file-system path to the *datadir* variable in one of the first lines of the *src/fssp_compare.pro* file. The expected layout of directories in the *datadir* is described in the next section.

Installation of GDL and Xdialog is not covered here, however it boils down to the *configure / make all install* procedure.

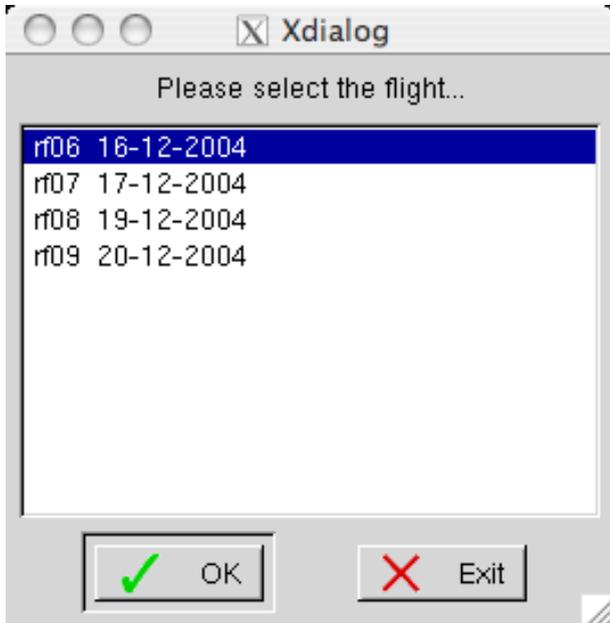


Figure 2: Flight-selection dialog-box

3 Input data

The 10Hz time-series of *FSSP-100* spectra is included in the NetCDF files prepared by *NCAR RAF* for the *RICO* campaign. They can be obtained, together with archives of 1Hz forward-looking camera photos, via the web on: <http://www.eol.ucar.edu/raf/Projects/RICO/>

To obtain *Fast-FSSP* data, please contact the *Meteo France* team.

fssp_compare expects the data to be uncompressed (it is normally distributed gzipped) and laid out as in the following example:

```
$ ls -lR rf06 | head -20
rf06:
2004_RICO_C130_N130AR_HRT_RF06_20041216_135500_220759.PNI.nc
RF06_hc0407_162400.0R0010
camera

rf06/camera:
041216_13
041216_14
041216_15
041216_16
041216_17
041216_18
041216_19
041216_20
041216_21
```

```
rf06/camera/041216_13:
c130_fwd_041216_135900.jpg
c130_fwd_041216_135901.jpg
c130_fwd_041216_135902.jpg
c130_fwd_041216_135903.jpg
```

4 Usage

The program is run by executing the *src/fssp_compare* bash script. The output should resemble somehow the following:

```
$ cd fssp_compare/src/
$ ./fssp_compare
GDL - GNU Data Language, Version 0.9
For basic information type HELP,/INFO
% Compiled module: FSSP_COMPARE.
```

After that a splash screen should show-up (fig. 1). After clicking on the *Run RICO FSSP Compare* button, a flight-selection dialog box (fig. 2) is shown together with four windows that will be used for displaying various plots (numbered 0, 1 and 2) and photos (number 3).

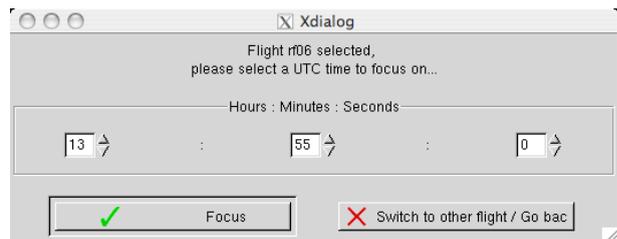


Figure 3: Time-focusing dialog-box

The next dialog box (fig. 3) is used to specify the time (in 1Hz resolution) to focus on, i.e. load a number of spectra around the specified time.

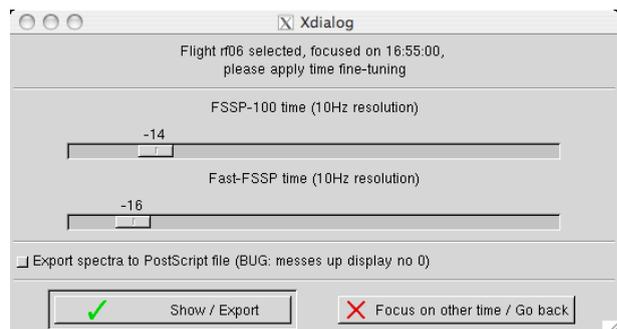


Figure 4: Time fine-tuning dialog-box

After focusing the *fssp_compare*, the *time fine-tuning* dialog box (fig. 4) appear and the plot windows get filled with data.

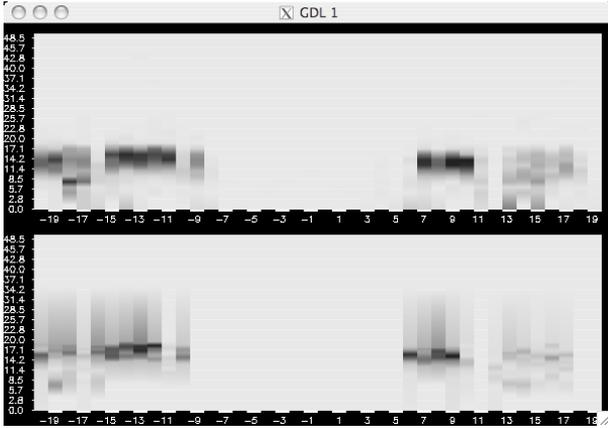


Figure 5: Plot window 1 – diameter vs. time plots with the droplet concentration density represented by a color-scale

The window 1 (fig. 5) presents two diameter vs. time plots with the droplet concentration density represented by a color-scale (same scale for all spectra within one plot, different scale for the two plots). The window 2 (fig. 7) presents a plot of liquid water content (LWC) vs. time for both instruments. Both windows use the *time fine-tuning index* as a measure of time, which represent the sample number around the focused time in $1Hz$ resolution, e.g. time-index value of -12 represents the focused time minus 1.2 seconds.

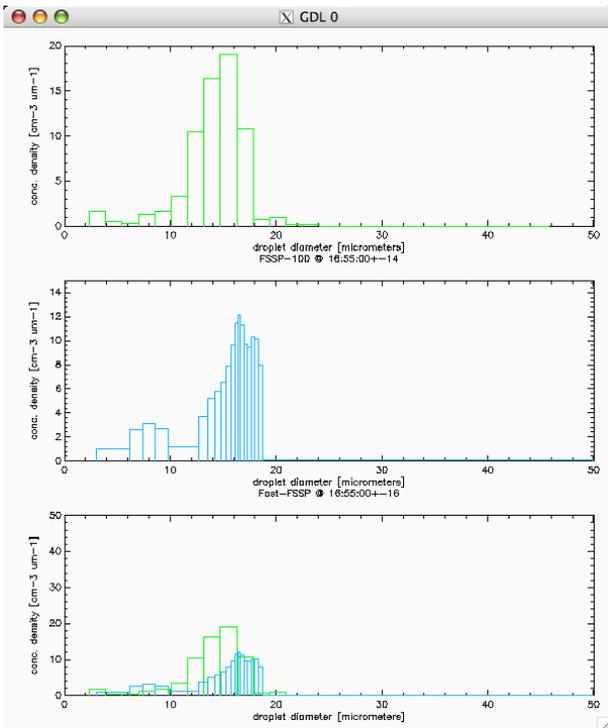


Figure 6: Plot window 0 – concentration density vs. droplet diameter plots

The window 0 presents three droplet spectra histograms, i.e. concentration density vs. droplet diameter plots with data represented by variable-size (in case of Fast-FSSP) bins. The first plot shows the *FSSP-100* data, the second is representing *Fast-FSSP* spectrum. Both plots have a fixed $0 - 50\mu m$ diameter range and an auto-scaled concentration density range. The third plot presents both spectra together and has a fixed concentration density range ($0 - 50cm^{-3}\mu m^{-1}$). Colour-distinction between the two instruments is coherent with the LWC plot.

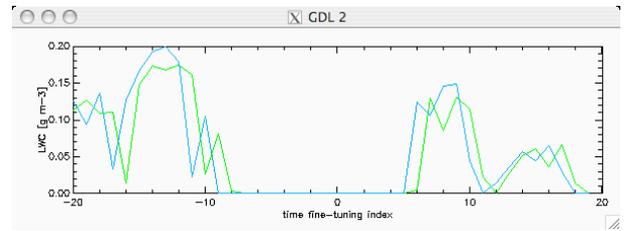


Figure 7: Plot window 2 – liquid water content (LWC) vs. time plot for both instruments

The *time fine-tuning* dialog box (fig. 4) enables the user to change the contents of the window 0 according to the $10Hz$ resolution sample choice.

All dialog windows are equipped with a *go back* button directing user to a previous dialog box, thus making it possible to chose another time to focus on, chose another flight or exit the program.

The *time fine-tuning* dialog box (fig. 4) contains a check-box used for instructing the application to save the two spectra to a PostScript file. After checking it and clicking on the *Show / Export* button a file-selection dialog box appear.

5 Support and feedback

All users are encouraged to send any questions, comments, bug-reports, feature-requests or improvements by email to slayoo@igf.fuw.edu.pl.

6 Acknowledgements

RICO FSSP Compare was written and tested in the Institute of Geophysics, University of Warsaw, Poland.

I appreciate the efforts of *GDL* development team for bringing the power of IDL to the open software community.