

# 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.

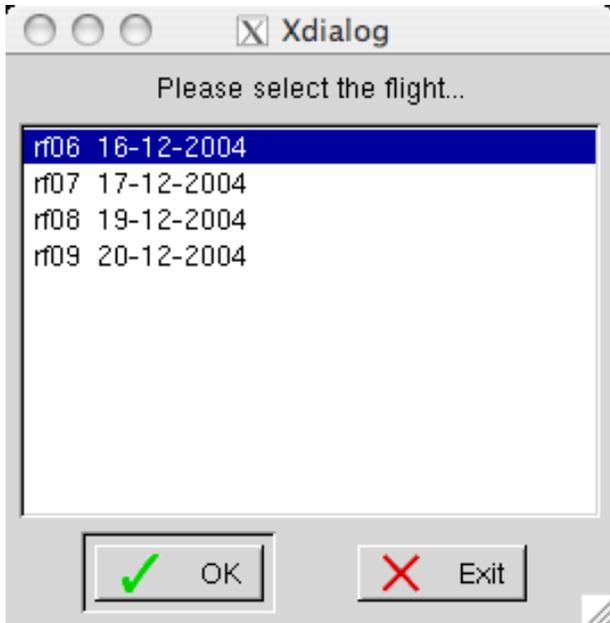


Figure 2: Flight-selection dialog-box

### 3 Input data

The  $10\text{Hz}$  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  $1\text{Hz}$  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).

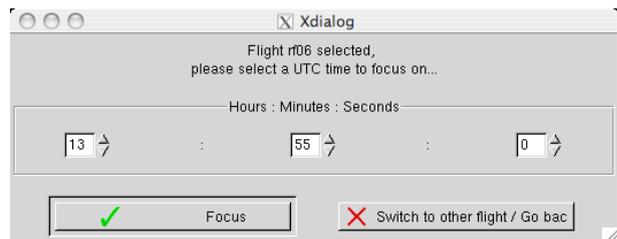


Figure 3: Time-focusing dialog-box

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

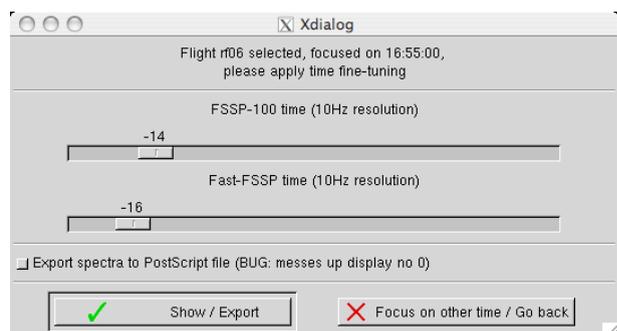


Figure 4: Time fine-tuning dialog-box

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

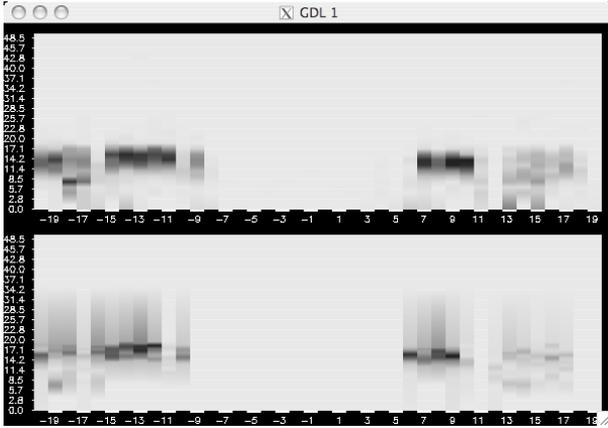


Figure 5: Plot window 1 – diameter vs. time plots with the droplet concentration density represented by a color-scale

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.

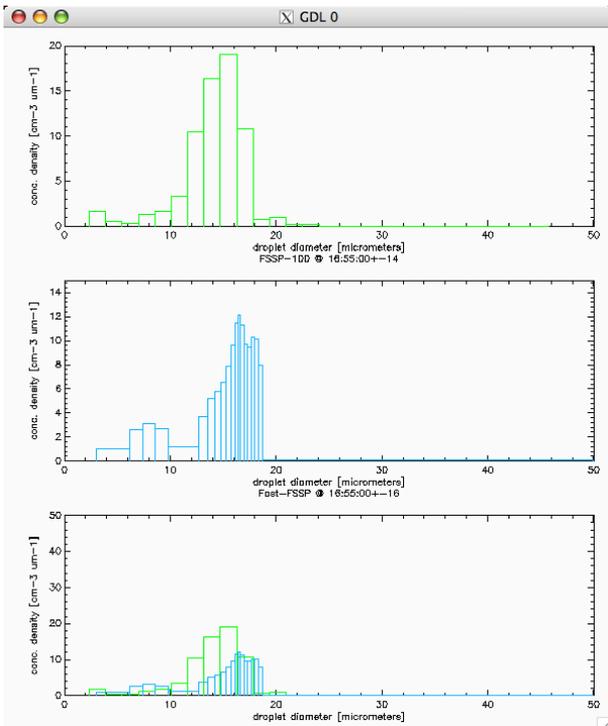


Figure 6: Plot window 0 – concentration density vs. droplet diameter plots

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.

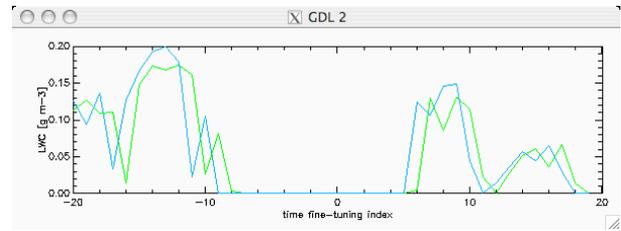


Figure 7: Plot window 2 – liquid water content (LWC) vs. time plot for both instruments

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](mailto: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.