18 October 2015

TO: HIPPO reprocessing file
FROM: Al Cooper
SUBJECT: Filtered vertical wind variable WIF

This script applies a high-pass filter to the vertical wind variable WIC and produces a new variable WIF. Another new variable called WIX is included and is set to either WIC or WIF, the former when it appears adequate and the latter when filtering leads to enough improvement to make WIF a better choice for vertical-wind variable.

This memo is for the HIPPO-5 project, flight rf02, for which the variable WIX is set to WIF. The following shows the very simple R statements that implement a 3rd-order high-pass Butterworth filter, after some protection against missing values in the original data. The result is a new variable WIF, plotted below.

```
CutoffFreq <- 600 * Rate     ## Rate is defined above,
                             ## 1 or 25 for std or high-rate file
d <- zoo::na.approx (as.vector(Data$WIC), maxgap=100*Rate, na.rm = FALSE)
d[is.na(d)] <- 0
Data$WIF <- Data$WIC - signal::filtfilt( signal::butter (3, 1/CutoffFreq), d)
plotWAC(Data[, c("Time", "WIC", "WIF")])
title(sprintf("Project %s Flight %s", Project, Flight))
```

The existing data file is then copied to a new file named [oldName]F.nc, and two variables are added to that file along with appropriate variable attributes:

- WIF, which is WIC after high-pass filtering
- WIX, which is either WIC or WIF depending on which appears to be better. The default is WIF.

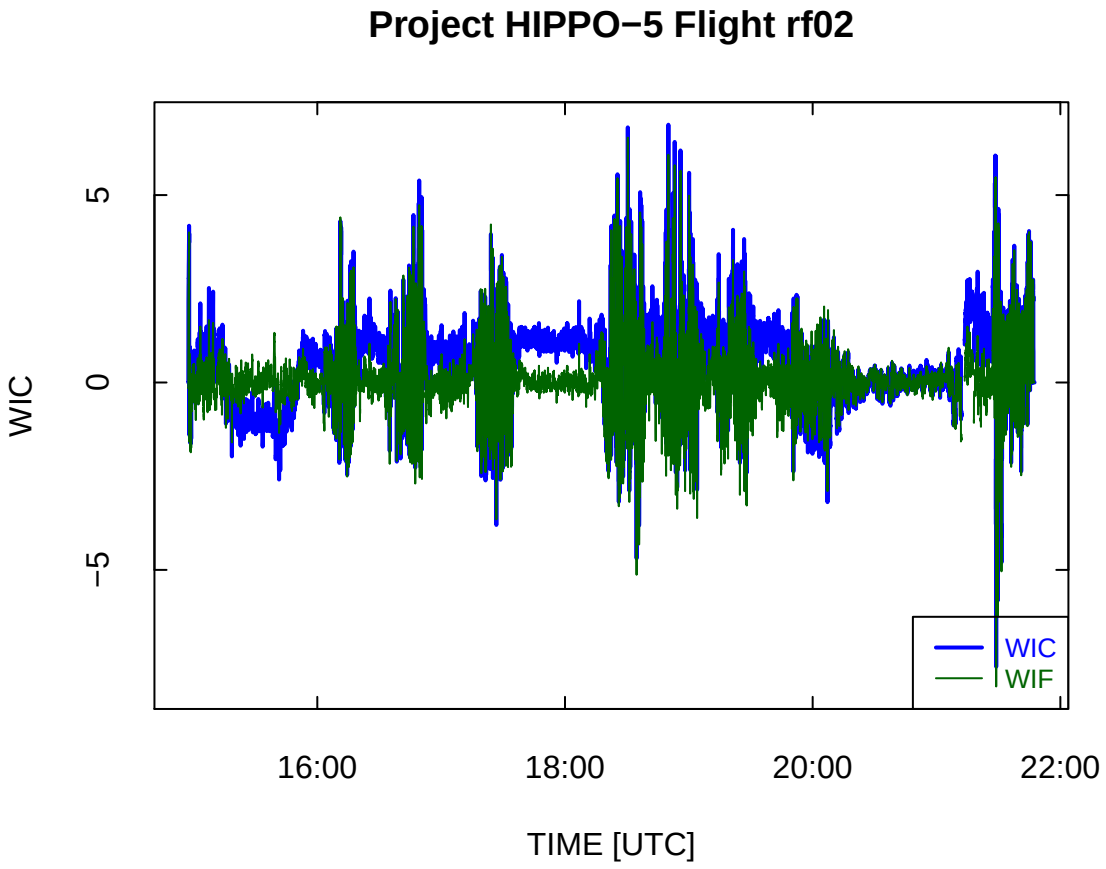

Figure 1: Comparison of unfiltered and filtered values for the vertical wind.

– End of Memo –

Reproducibility:

PROJECT:	FilterForWIC
ARCHIVE PACKAGE:	FilterForWIC.zip
CONTAINS:	attachment list below
PROGRAM:	FilterForWIC.Rnw
ORIGINAL DATA:	/scr/raf_data/HIPPO-5/rf02.nc
WORKFLOW:	WorkflowFilterForWIC.pdf
GIT:	https://github.com/WilliamCooper/Reprocessing/blob/master/FilterForWIC.zip

Attachments:
FilterForWIC.Rnw
FilterForWIC.pdf
DGF.dot
FilterForWIC.Rdata
WorkflowFilterForWIC.pdf
SessionInfo