# Geodetic correlation notes

Mostly, correlation of geodetic data is just as for astronomical data and uses espresso. Some additional considerations are noted below.

## Useful links

Curtin geodetic correlation records spreadsheet. To be kept up to date as experiments are observed/transferred/correlated.

### Data Transfers

Status of e-transfers from Hobart

Status of e-transfers from Warkworth

### Schedules and Logs

Field System logs, .skd and .vex files are available from:
ftp://ivs.bkg.bund.de/pub/vlbi/ivsdata/aux/{year}/{expcode}

To get all of the above files (run as corr from cuppa in the experiment directory ~/LBA/{year}/{month}/{expcode}):
wget -t45 -l1 -r -nd
`ftp://ivs.bkg.bund.de/pub/vlbi/ivsdata/aux/`{year}/{expcode}/ -A "*.*"

If necessary, run `fromdos {vexfile}` to convert to Unix format.

The IVS master schedule, which includes links to station feedback is available from:
http://lupus.gsfc.nasa.gov/sess/

A current list of Austral experiments is available on the AuScope VLBI operations wiki at UTas:
http://auscope.phys.utas.edu.au/opswiki/doku.php?id=schedules:austral2014

IVS emails ("completed" messages contain log comments with any problems noted etc.):
http://lupus.gsfc.nasa.gov/data10/sessions/{year}/{expcode}/maillist.html

Jamie McCallum sends pre-correlation summary emails noting any known problems to the auscope-correlator mailing list.

## Setting up for correlation

The following should not be necessary for recent schedules: Edit $TRACKS section of vex file for Mark5B tracks (copy from previous experiments).

Copy .v2d file from a previous experiment, update experiment name, comment out any stations not involved.

Select scans for clock searching; I usually just choose a production job that contains all stations. When sufficient data are correlated, run `difx2fits` and LBA pipeline for clock searching.

For production, DiFX default resolutions (0.5 MHz, 2s integrations) are generally OK.

# Post-correlation

After production correlation, in the output directory `/data/corr/corrdat/{expcode}`, run `difx2mark4 -d -e nnnn` where nnnn is the experiment number; we number the experiments sequentially. For the a13xx experiments, the experiment number is is 1240+xx. The experiment number (mark4 output directory) defaults to 1234 if not specified. Note that re-running difx2mark4 will add to existing directory (but overwrite a scan if it exists(?)). The raw output can be tar'ed for distribution (done automatically by archivec.py).

```
tar cvfz A1306.MARK4.tar.gz 1246
```

Also run `difx2fits` and pipeline (LBA.py) to check the output. For ease of transfer, copy the .vex and .v2d files to the pipeline output area, and create a `corr_notes.txt` file (default containing string 'none') to assist with compilation of the correlator report.

NB. As of 15/09/2014 cortex is unavailable for storing new data. The archive has been moved to iVEC's new data store. See the new notes on Archiving LBA or AuScope data products from the correlator.

~~Archive the output data and pipeline products as usual with: <code> archivedifx.py /data/corr/corrdat/{expcode}/ hbignall@cortex.ivec.org/pbstore/groupfs/astrotmp/as03/VLBI/Archive/Curtin/AuScope/{expcode} gloPut7T.sh /data/corr/pipe/{expcode}/out/ hbignall@cortex.ivec.org /pbstore/groupfs/astrotmp/astronomy/anonymous/{expcode} </code>~~

See the new page on distribution of output data to PIs/analysts.

Post-correlation processing is currently done at Hobart.

(To verify in fourfit: `fourfit [options] 1234`

Type `vhelp fourfit` for help.)

# Handling clock changes during an experiment

Example of how to account for integer second timing offset problems (as occurred at Katherine in aust25):

Unlike the .v2d file, the .vex can handle different clock offsets at different times. So appending a $CLOCK section to the vex file may be an easier way to account for clock changes, rather than having

multiple breaks and setting different clocks in .v2d files. Some useful vex syntax documentation can be found here: https://safe.nrao.edu/wiki/bin/view/VLBA/Vex2doc#A_61_36CLOCK_61_Block

**Note:** .vex and .v2d files use opposite sign conventions for clock offsets!

The three steps to fix are:

- In the .v2d file, comment out clock lines for the affected station.
- In the .vex file, add a "ref" statement to the $STATION block, within the def block for the affected station (in this case Ke):

```
ref $CLOCK = KE;
```

- Add a clock section to the vex file with the appropriate clock changes. It should look something like this:

```
*---------------------- begin $CLOCK                ---------------------*
$CLOCK;
 def KE;
*                  Valid from    clock_early  clock_early_epoch    rate
    clock_early = 2014y146d07h00m :   6.321 usec : 2014y146d07h00m : 0.0 ;
    clock_early = 2014y146d13h20m : -999993.679 usec ; *1s offset
    clock_early = 2014y146d21h01m : -1999993.679 usec ; *2s offset
 enddef;
*----------------------   end $CLOCK                ---------------------*
```

Running difx2mark4 will just put all scans in a single output directory as usual, but running difx2fits on the output will create a new FITS file for each clock change.

Sometimes these FITS files can be joined in the pipeline; just specify for `fits_file` in the pipeline input file all /paths/files separated by commas. However, if data out of time order errors are seen, it may be necessary to pipeline each FITS file separately. AIPS and the pipeline don't necessarily handle subarrays well. Also, currently the pipeline processes only the first subarray.
[Also note: possible AIPS bug found in aust31 which apparently caused INDXR to enter an infinite loop when two FITS files were combined in the pipeline, and kept writing CL entries until disk was filled. Watch out for this… if it occurs, pipelining the output FITS files separately may be necessary.]