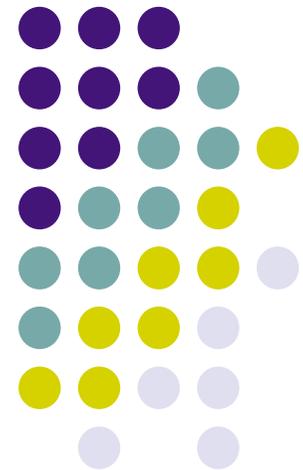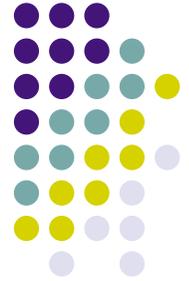# Correcting international stations dispersive delays with TEC models

Adam Deller
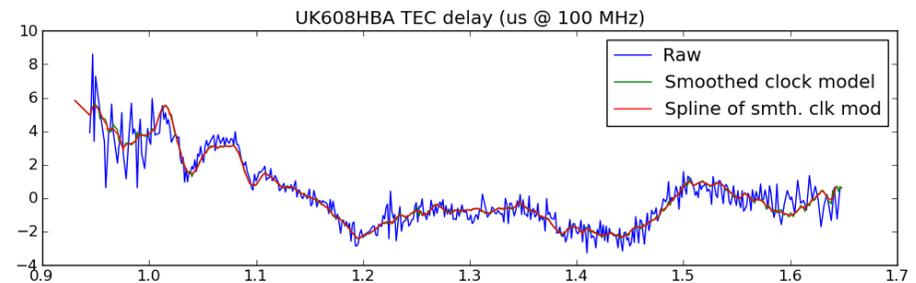
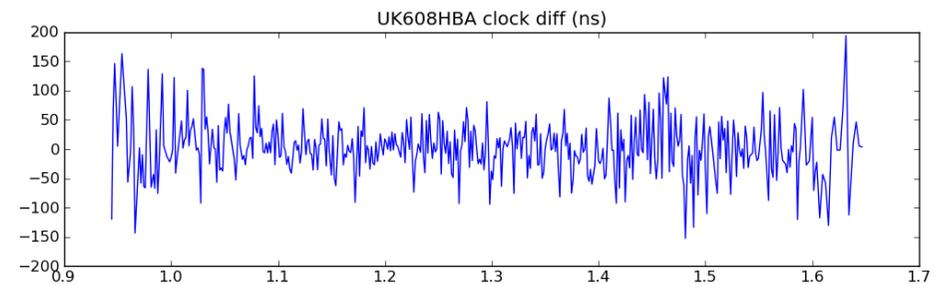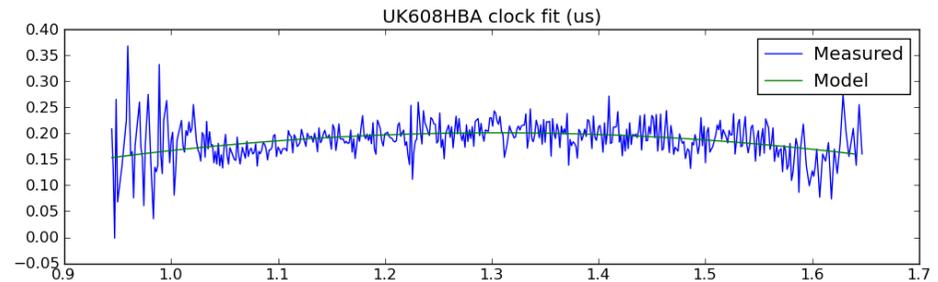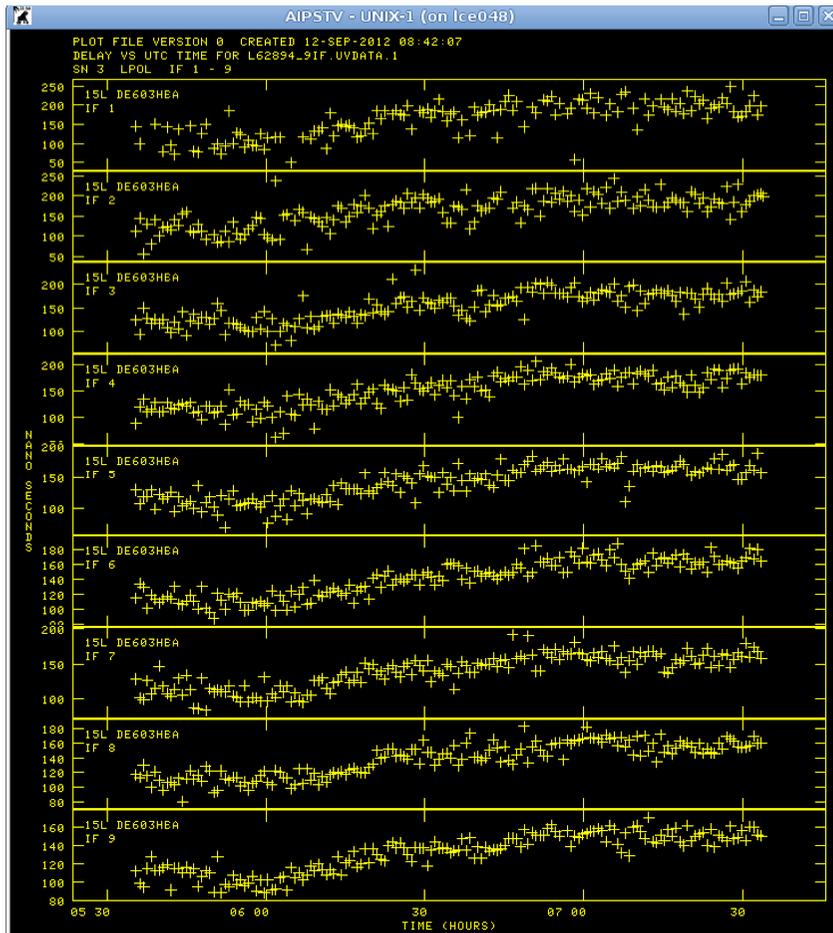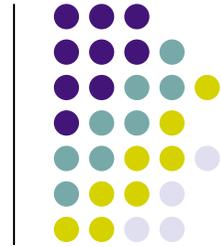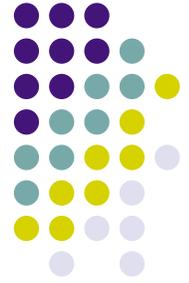# The background

- Differential ionospheric effects lead to dispersive delays of 100s (HBA) to 1000s (LBA) of ns at international stations

  - These can change by 10 ns / minute

- For sensitivity, solutions must average across MHz / minutes, but without delay correction, average is not coherent

- Can *a priori* correction with TEC models do most of the job?

Background (#2)

A priori TEC corrections

- Maaijke extended the RMwriter code to produce a parmdb containing dispersive delay corrections (the "TEC" entry)

- "createTECparmdb" code tested on L72809, a 2 hour HBA long baseline dataset

- Original data from L72809 already archived, so had to work with data that had already had an "average" delay subtracted
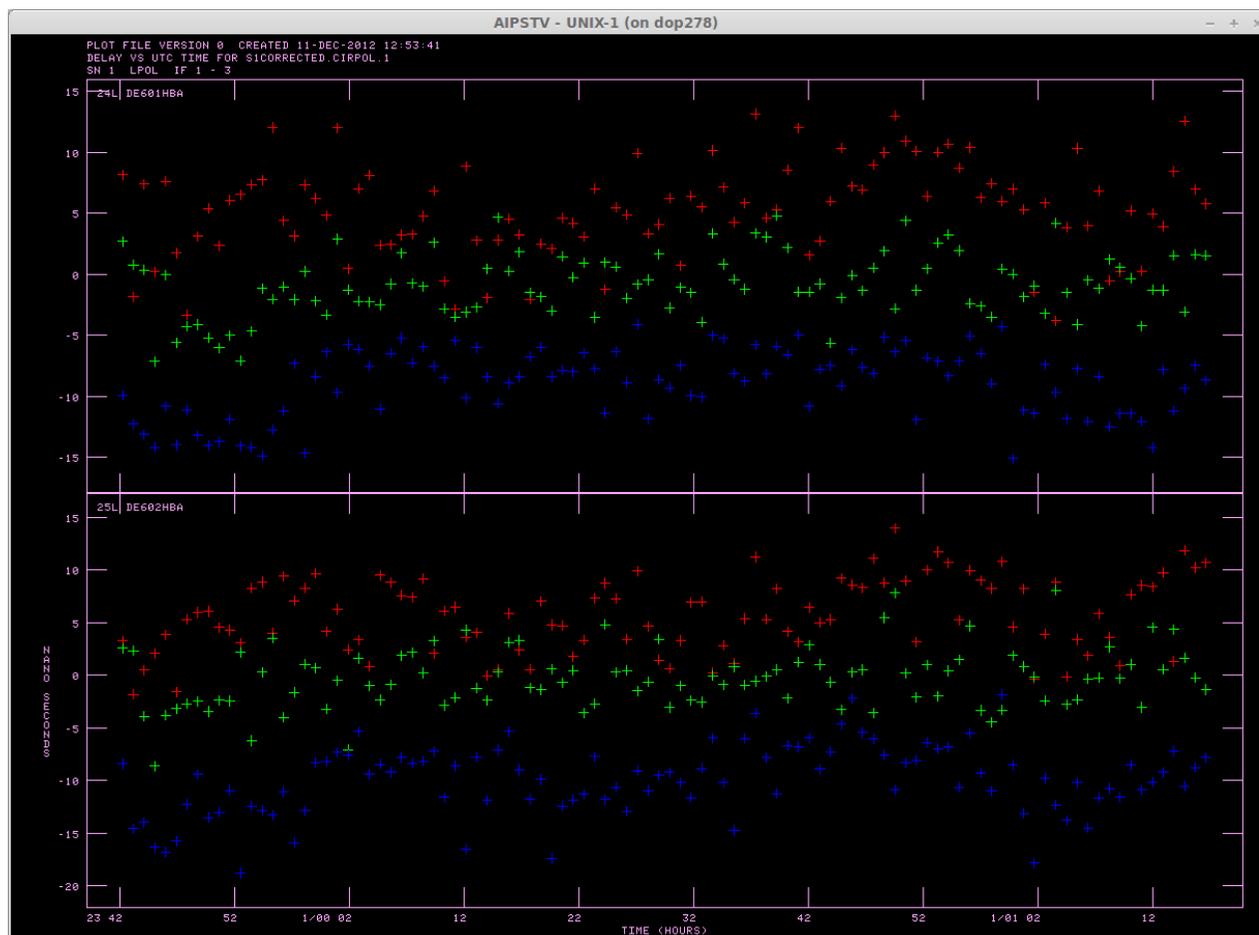
L72809 results (before TEC)
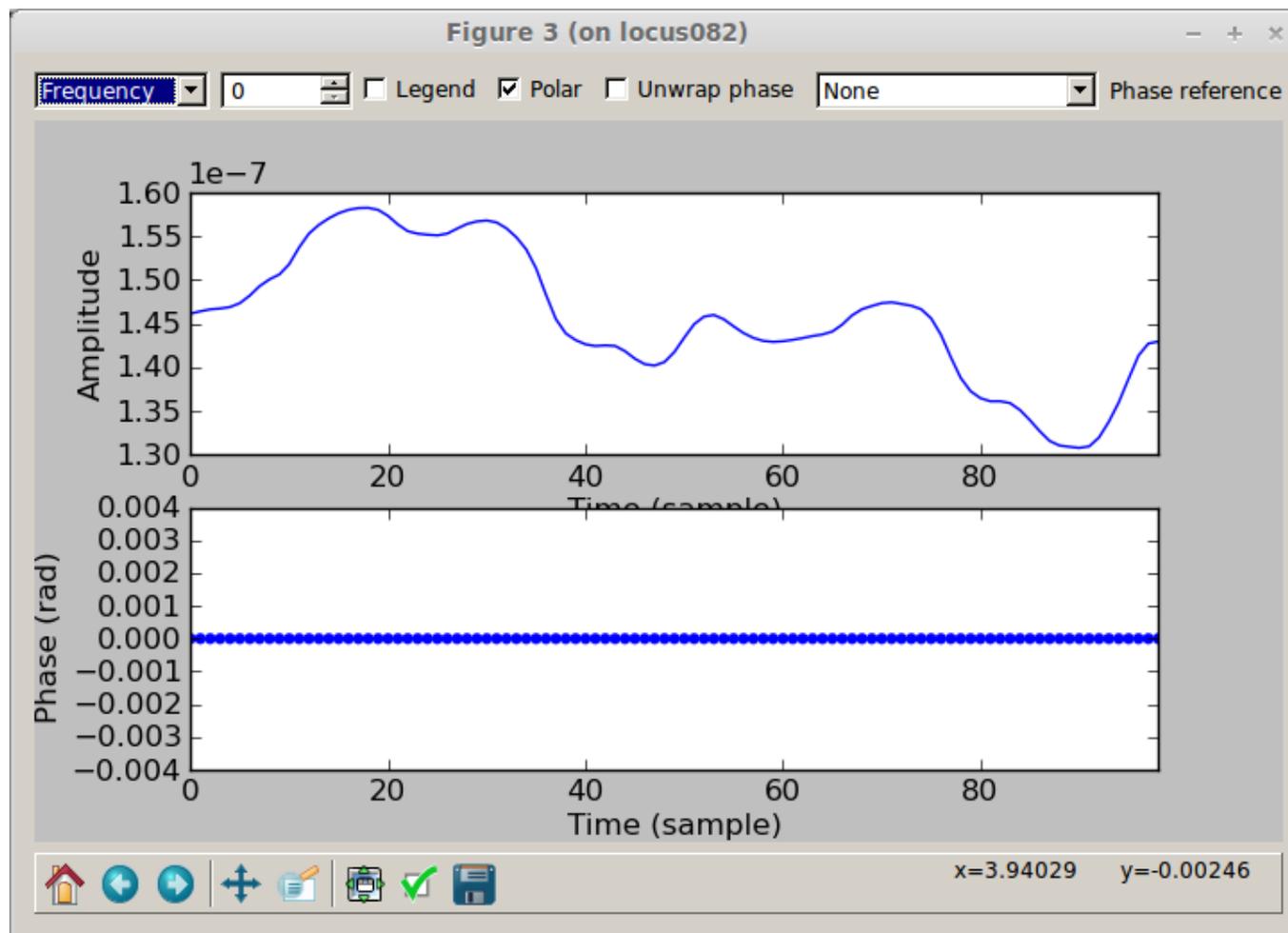
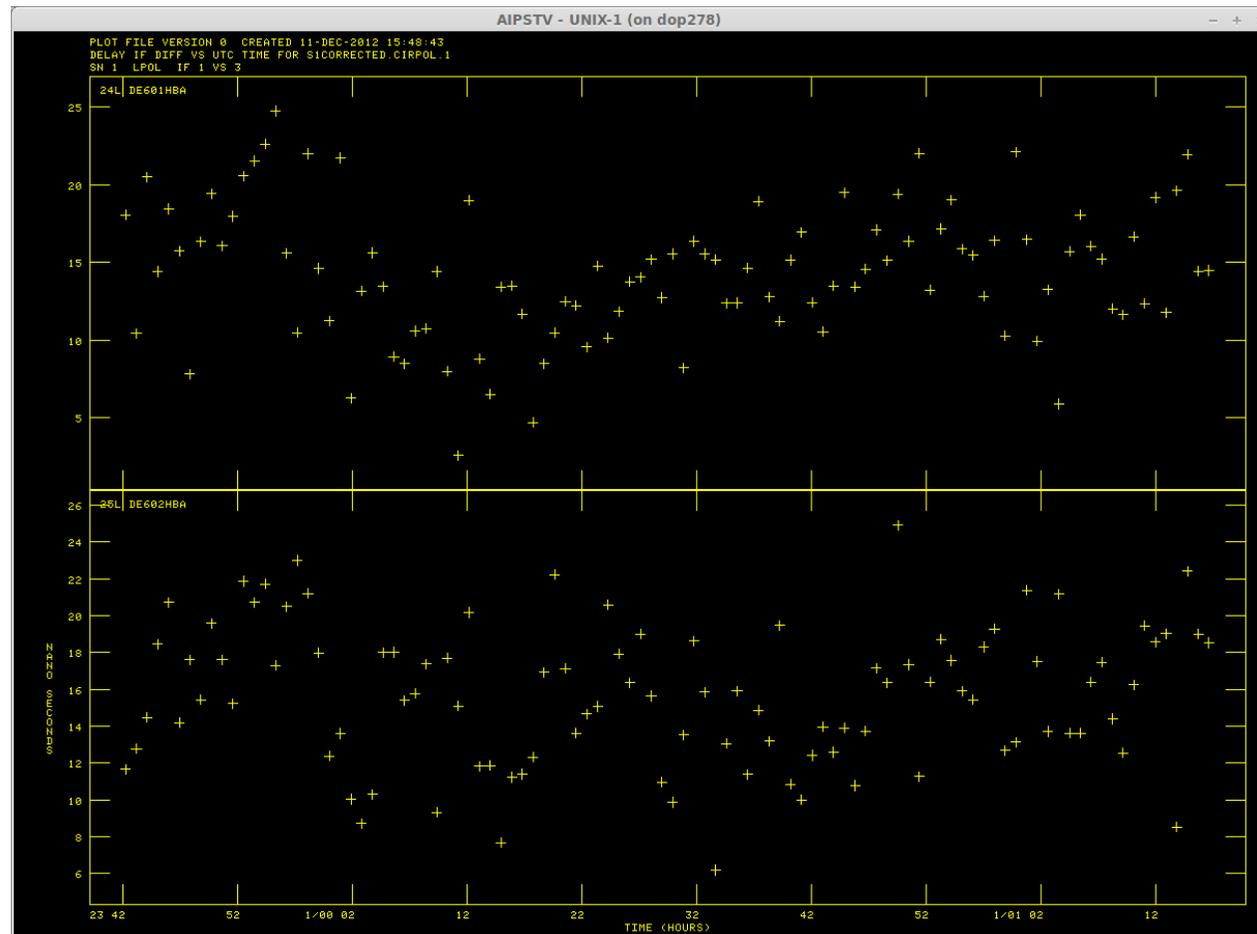**Typical "average" delay, this is for DE603**

L72809 results (before TEC)

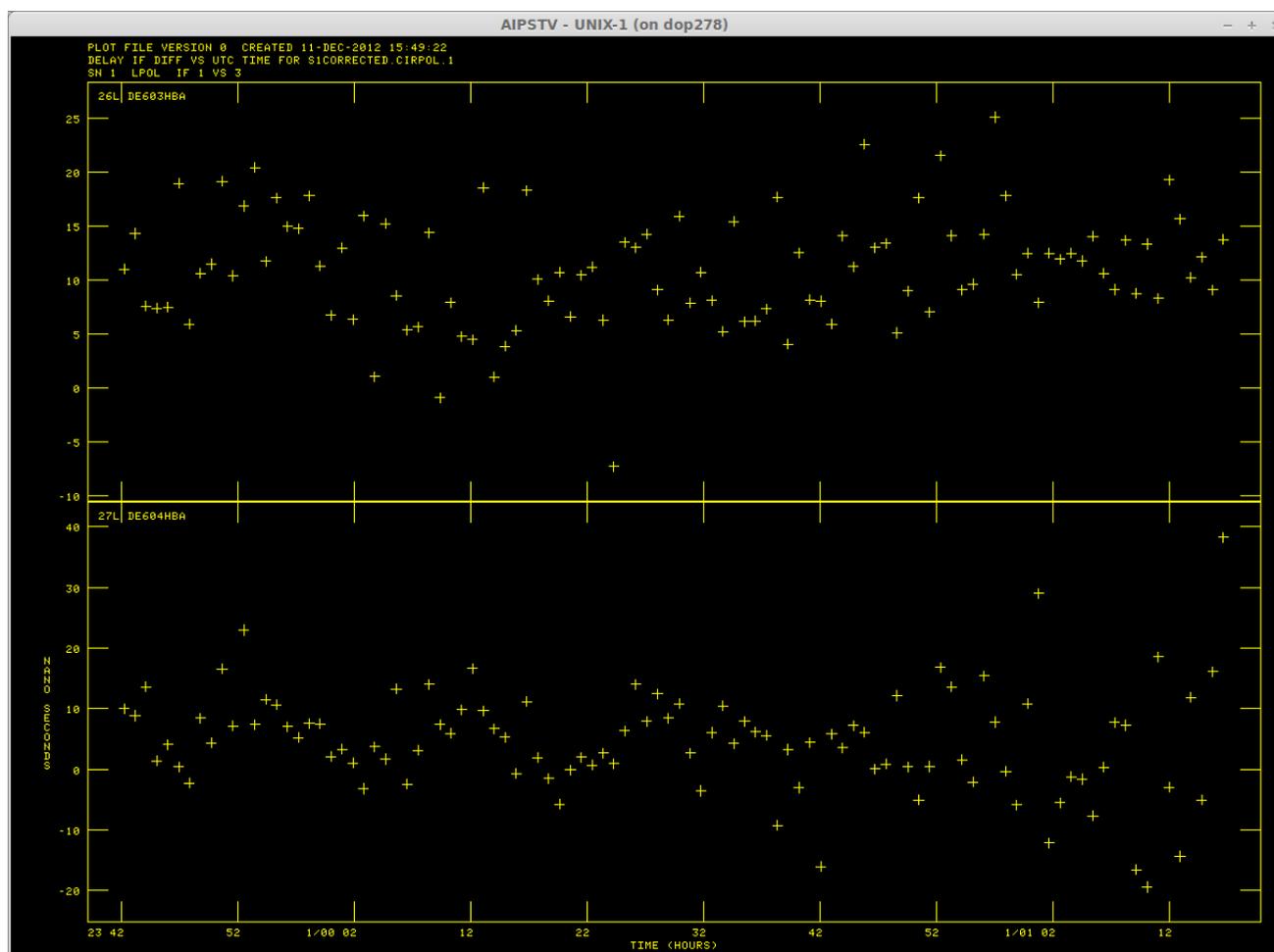**Increasing frequency: red, green, blue.
Obvious dispersive delay**

L72809 results (before TEC)

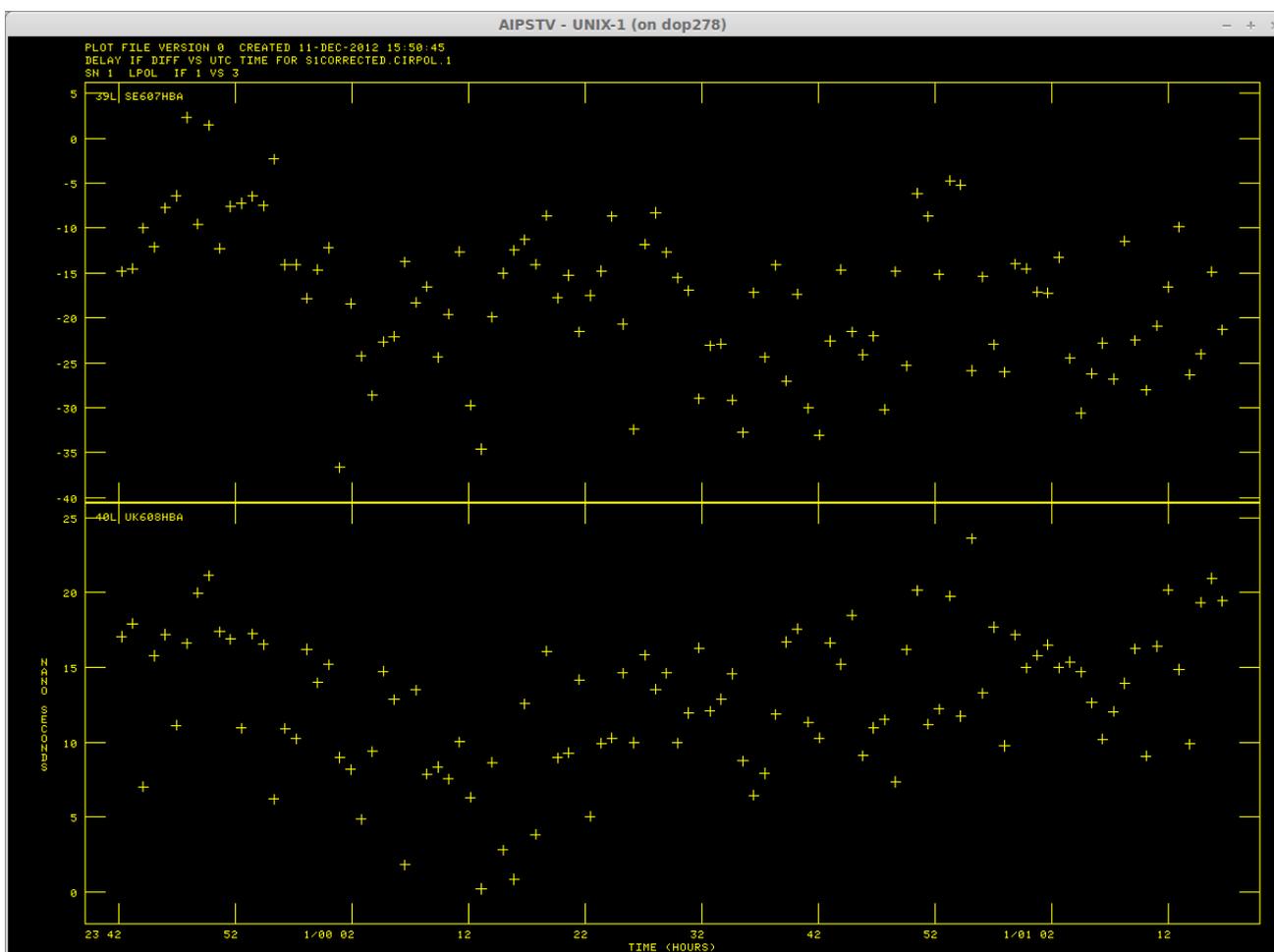**Time variability best seen plotting delay$_{high}$ - delay$_{low}$)**

L72809 results (before TEC)

Time variability best seen plotting delay$_{high}$ - delay$_{low}$)
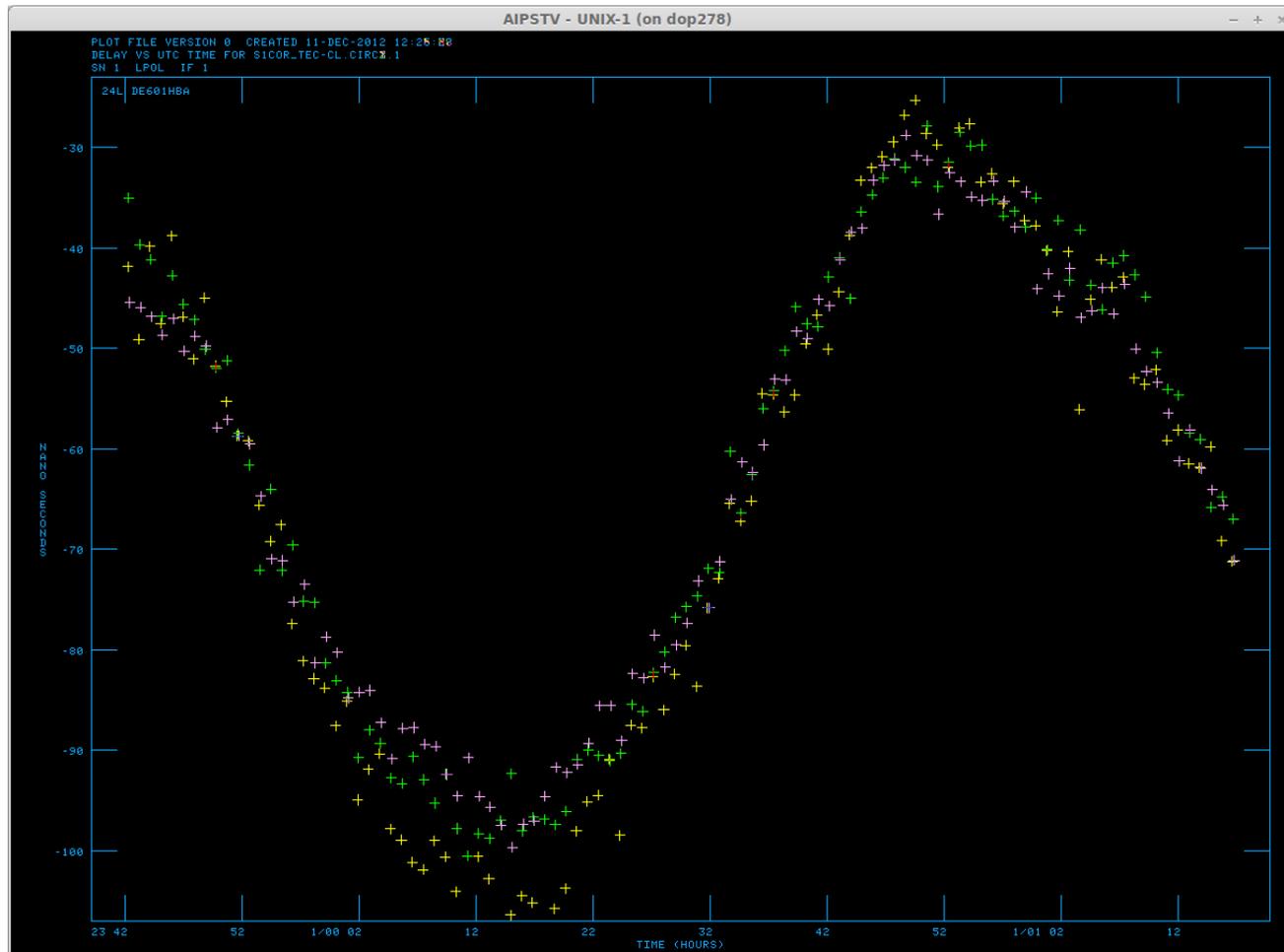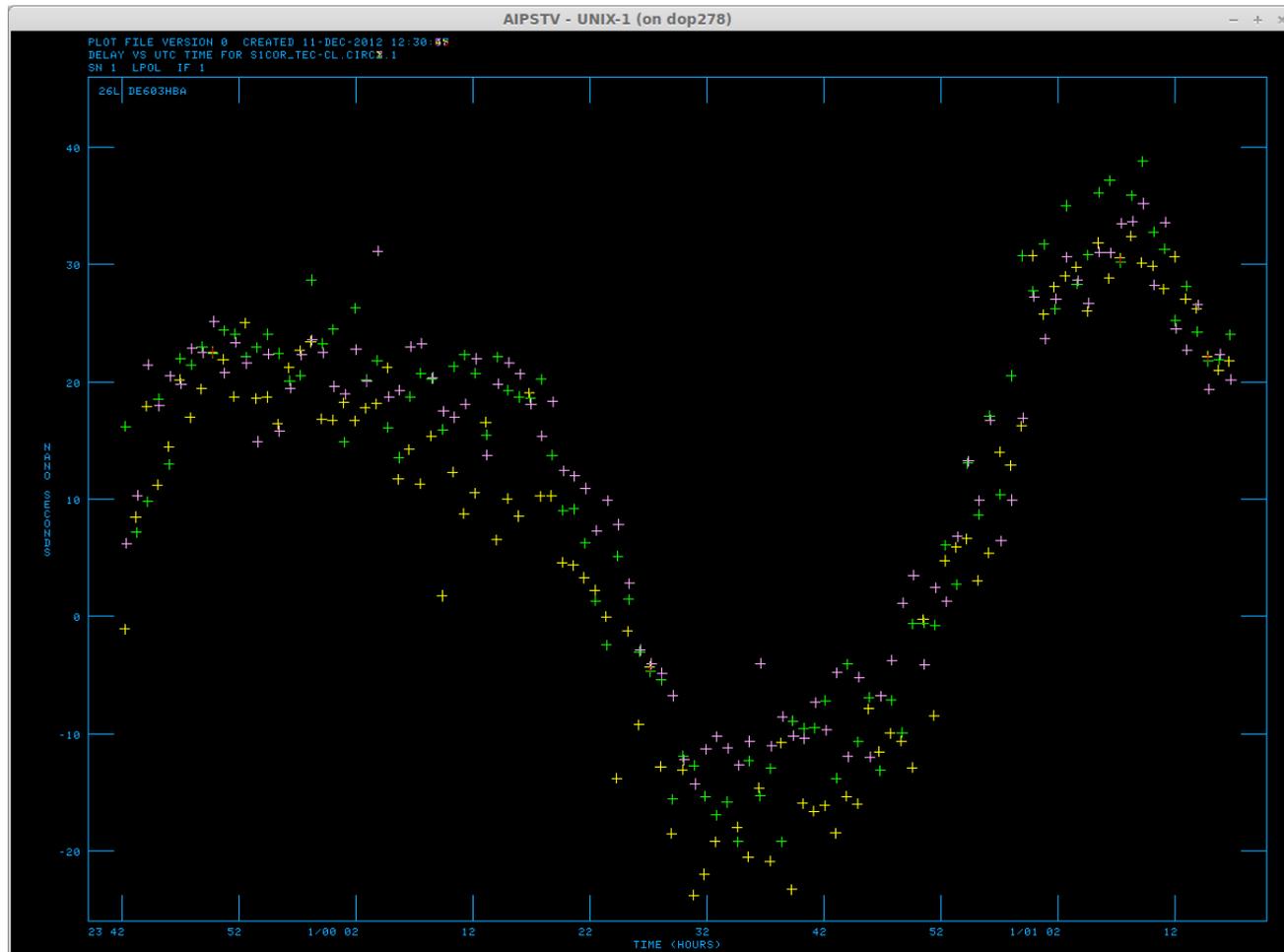
L72809 results (before TEC)

Time variability best seen plotting delay$_{high}$ - delay$_{low}$)
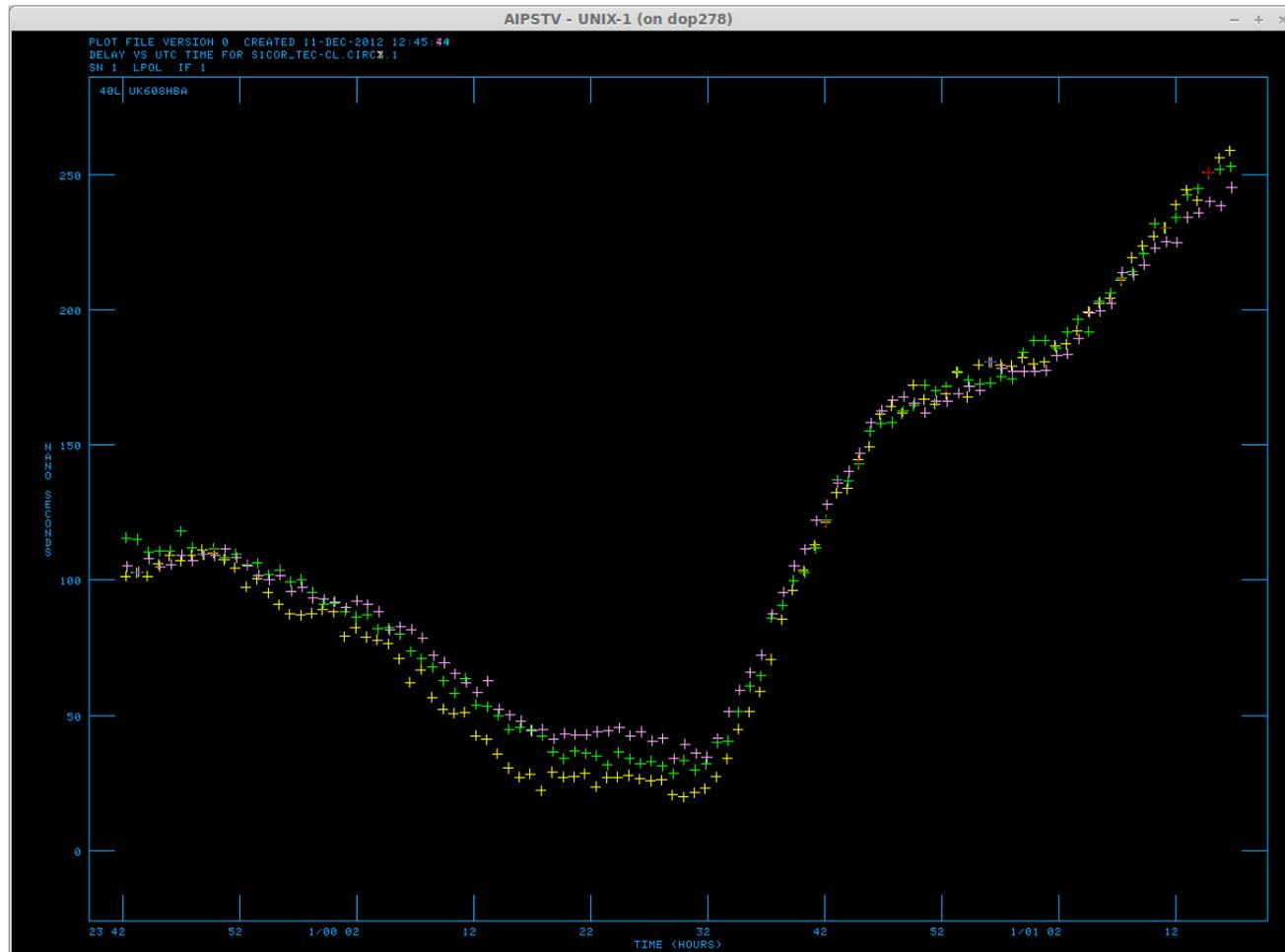
L72809 (after correction)

Now increasing frequency: yellow, green mauve

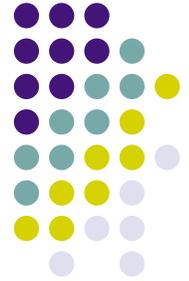# L72809 (after correction)

Now increasing frequency: yellow, green mauve

L72809 (after correction)

Now increasing frequency: yellow, green mauve

Summary:

- 7/8 antennas improved
  - Typical error ~20ns before, 5-10ns after correction
  - One antenna (UK608) had a wider spread after correction (-15 -> +20 ns) vs before (-20 -> 0 ns)
  - However, residual phase rates increase
- Application of *a priori* TEC corrections results in a net improvement in data quality, probably sufficient to allow desired averaging in HBA
  - But, fringe fitting still required (clocks, correlator)
  - Need to improve rate behaviour (smoothing?)