

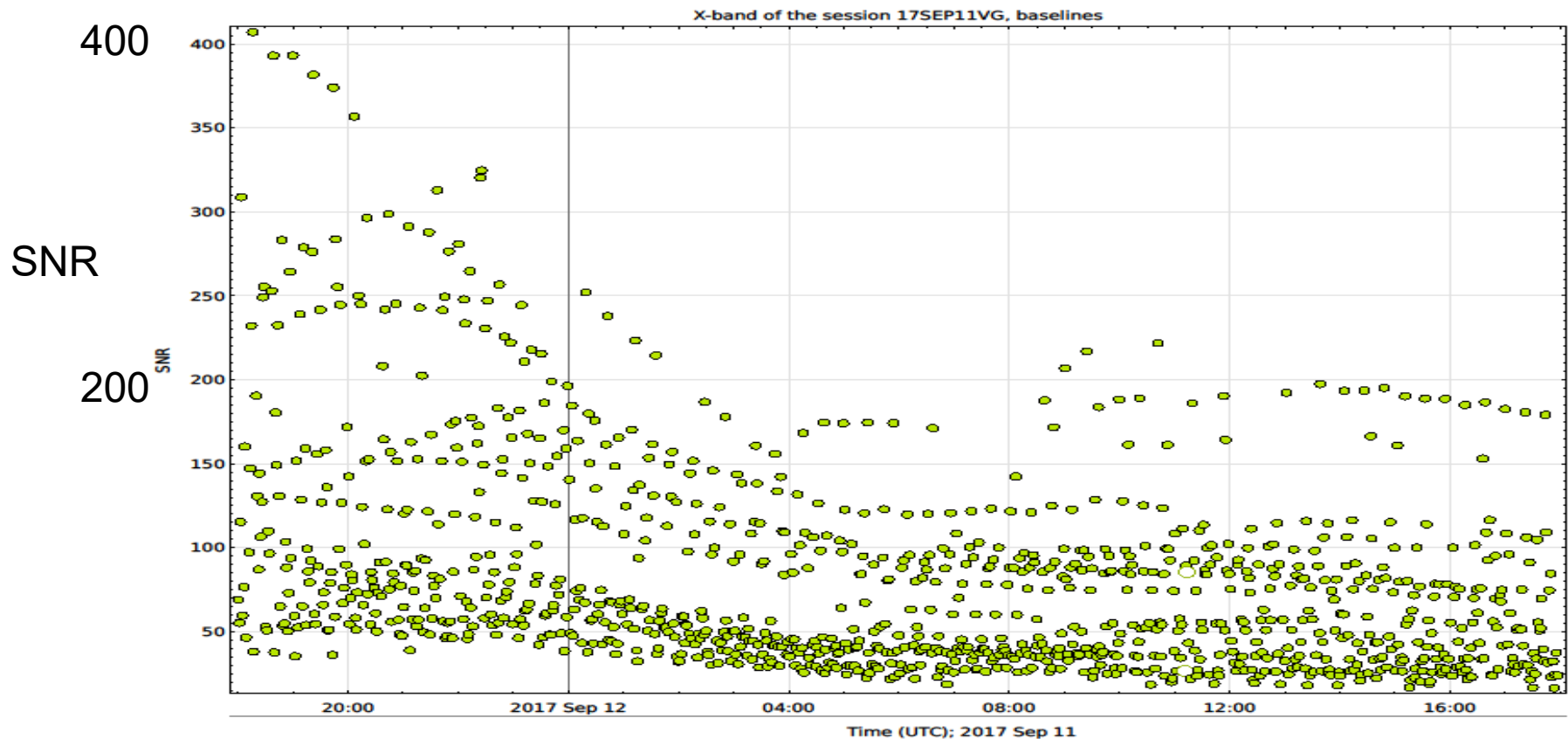
VGOS weak or bad band: to correlate or not

What to do when band is weak or missing?

- Weak band
 - BBDmemo 045
Effect of warm dewar on system temperature and on geodetic results for GGAO-Westford baseline in session vt7254 (2017/09/11)
https://www.haystack.mit.edu/geo/vlbi_td/BB/045.pdf
- Missing band
 - BBDmemo 046
The effect on VGOS broadband group delay of losing one or more bands: example: vt7170 (2017/06/19) GGAO12M-Westford
https://www.haystack.mit.edu/geo/vlbi_td/BB/046.pdf

Weak band

In vt7254 the dewar at GGAO warmed up due to a helium leak. The total system temperatures increased to ~ 170 K for Bands A-C and to 340 K for Band D.



Weak band

Recommendations (based on GGAO-Wfrd bsIn)

2. The system temperature began rising sharply as soon as the helium leak occurred. The maximum value was reached in about six hours.
3. Loss of SNR for the IXY amplitude (combined bands and polarizations) was a factor of approximately 0.5.
4. There was almost no loss of data because of high minimum SNR (40) and minimum scan length of 30 seconds.

Therefore, a station with a warm receiver should still be processed
(if current scheduling parameters are user).

5. STATIONS: if the dewar begins to warm, continue observing until the end of the session, then correct the problem as soon as possible.

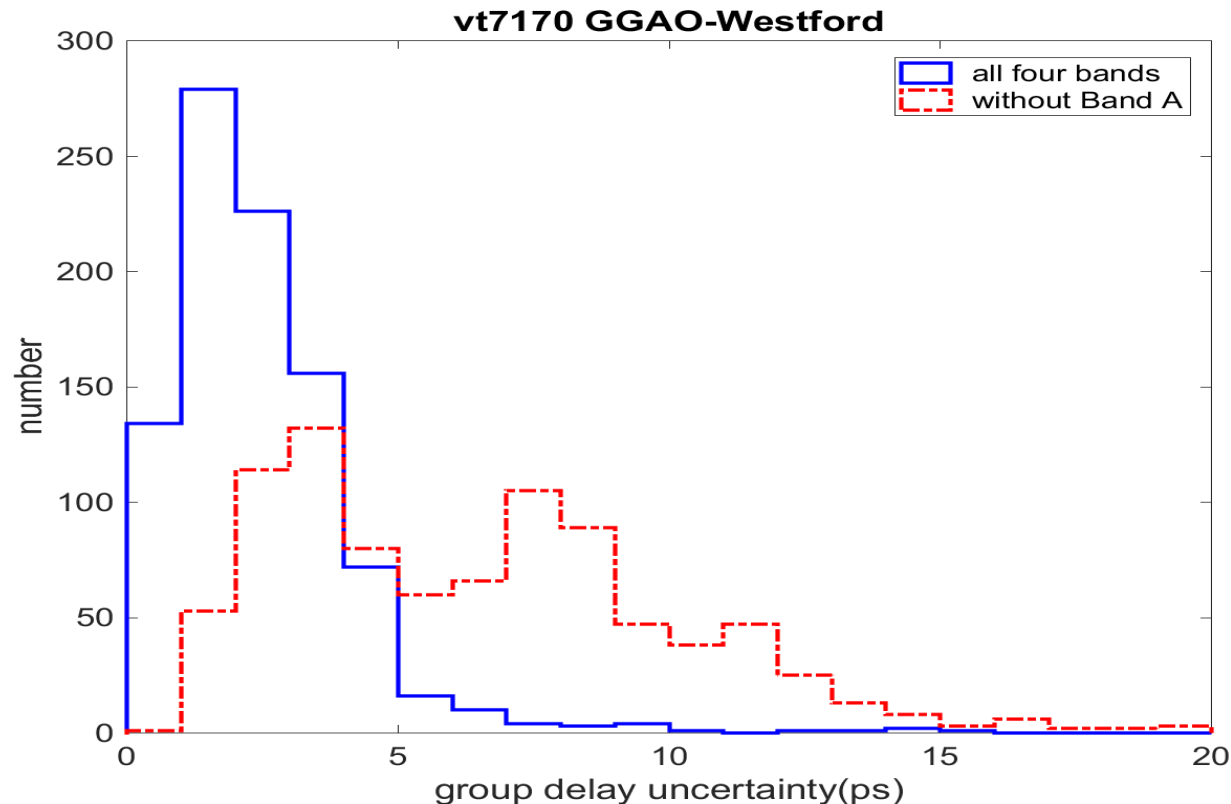
Missing band

Bad or missing data from one band (examples):

1. Failed DBE
2. Corrupt data for some reason
3. Bad cable affecting only one band or polarization
e.g. the connector on an RF cable from receiver to control room

Missing band

For vt7170 the effect of losing an entire band was simulated by re-fourfitting the entire session leaving out Band A. The data were then processed through *nuSolve* to compare with the four-band solution.



Missing band

Recommendations (based on GGAO-Wfrd bsIn)

1. The loss of Band A increased the median group delay uncertainty from 2.2 ps to over 6 ps, which is well outside the VGOS goal. Thus it is clear that all four bands are needed to meet the goal for delay precision per scan.

HOWEVER, because of the delay noise added to achieve chi square per degree of freedom of 1.0, the solution is not significantly degraded.

2. Losing Band D is worse; losing Band B or C is less bad.

Therefore, a station with a MISSING BAND should still be processed.

4. These results should not be taken as a justification to routinely observe with only three bands.

It is expected that future improvements in modeling of physical effects that contribute to the delay (e.g. the atmosphere) will reduce the added delay noise, thus increasing the value of the smaller group delay uncertainty.

5. These assessments have been made for a baseline length of only 600 km.
6. The process SHOULD BE REPEATED FOR LONGER BASELINES as well.

Weak or Missing band

SUMMARY (for current observing conditions):

If only one band is affected, correlate anyway.

Weak band

- Recommendations (based on GGAO-Wfrd bsln)
 - 1. When the dewar at GGAO warmed up due to a helium leak, the total system temperatures increased to ~ 170 K for Bands A-C and to 340 K for Band D.
 - 2. The loss of SNR for the IXY amplitude (combined bands and polarizations) was a factor of approximately 0.5, consistent with the average system temperature increase over the four bands.
 - 3. There was almost no loss of data for the GGAO-Westford baseline because of the conservative scheduling practice that utilized both a high minimum SNR of approximately 40 and a minimum scan length of 30 seconds.
 - 4. The system temperature began rising sharply as soon as the helium leak occurred. The maximum value was reached in about six hours.
 - 5. Before the scheduling parameters are changed to increase the temporal density of observations, either by reducing the minimum scan length or minimum SNR, thought should be given to the impact of a warming receiver.
 - 6. For the current scheduling algorithm and isolated 24-hour sessions, the recommendation for action if the dewar begins to warm is to continue observing until the end of the session, then correct the problem as soon as possible.
 - 7. For the CONT sessions, my recommendation is, if the problem occurs before the last 24 hours, stop observing as soon as the problem is detected and assess the possibility of repair. Further action will depend on the assessment of the probability of repair time. If the assessed repair time is long compared to the end 6/6 2017-10-19 01:05 PM of the CONT, resume observing. Also, resume observing while waiting for parts. (These recommendations should be discussed more generally.)

Missing band

Recommendations (based on GGAO-Wfrd bsIn)

1. The loss of Band A increases the median group delay uncertainty from 2.2 ps to over 6 ps for the session vt7107, which is well outside the VGOS goal. Thus it is clear that all four bands are needed to meet the goal.
2. If a band is known to be lost, e.g due to a failed UDC or digital backend, the band to be sacrificed, in order, should be C, B, A, D.
3. The lengths and length uncertainties of the re-weighted delay solutions for the 4-band and for the 3- band geodetic solutions agree seemingly too well, but this is due to the large commonality of the data used. The 3-band solution is based on seventy-five percent of the 4-band data with no other independent data.
4. While the WRMS post-fit delay residual is increased by less than approximately 1% after re-weighting of the delays to achieve chi square per degree of freedom of 1.0, this should not be taken as a justification to routinely observe with only three bands. It is hoped that future improvements in modeling of physical 4/4 effects that contribute to the delay (e.g. the atmosphere) will reduce the added delay noise, thus increasing the value of the smaller group delay uncertainty.
5. These assessments are made for a baseline length of only 600 km and should be evaluated for longer baselines as well