Status:  ☒  In progress      ☐  Completed

Question from the Community

| Name | Andy Frassetto/OMO | |
|---|---|---|
| Date of Contact | 2/9/17 | |
| Date of Contact | 2/9/17 | Completion date |
| Experiment | Cascadia | |
| IIC Affected & Contact | LDEO – Andrew Barclay | |
| Stations Affected | G19D, G02D | |
| Contact Information | Andy Frassetto, andyf@iris.edu | |

Summary:

In the process of calculating the horizontal orientations of stations and confirming that the polarity reversals had been completed correctly, it was noted there were two issues. First, the polarity of G02D and G19D were identified as stations that did not need to be reversed.  Second, it was noted that the components appear to be wrongly named with the H*1 components having signal and noise characteristics of a vertical channel and H*Z components characteristics of a horizontal component.

Steps Taken:

| Date | Action |
|---|---|
| 2/9 | Discussed previous flagged issue (polarities of horizontals) with Andy Frassetto after working on horizontal orientations. |
| 2/10 | Summarized findings so far and evidence of unintended polarity flip for horizontals of G02D and G19D, in addition to noise plots showing possibility of mis-named channels in station G19D. |
| 4/19 | E-mail sent to Andrew about open issue. |
| 5/1 | Further summary of horizontal orientation analysis and email sent. |
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The upload verification responding to Community Question about polarity reversals (Form #3) confirmed that the vertical channels of these stations were not corrected like the rest of the stations, but the horizontals channels presumably should not have been reversed either. This is not the case. Shown in Figure 1, the reversal corrections did not correct H*Z seismic channels but did correct the H*1 and H*2 channels.

Figure 1. Seismograms of event on March 23, 2015 recorded on station G19D. Left is seismograms requested on 22 May 2016 and right is seismograms requested on 8 January 2017. Seismograms are ordered from the top HH1, HH2, HHZ, HX1, HX2, HXZ on both sides. Note the polarity does not reverse for H*Z components but does reverse for H*1 and H*2 components.
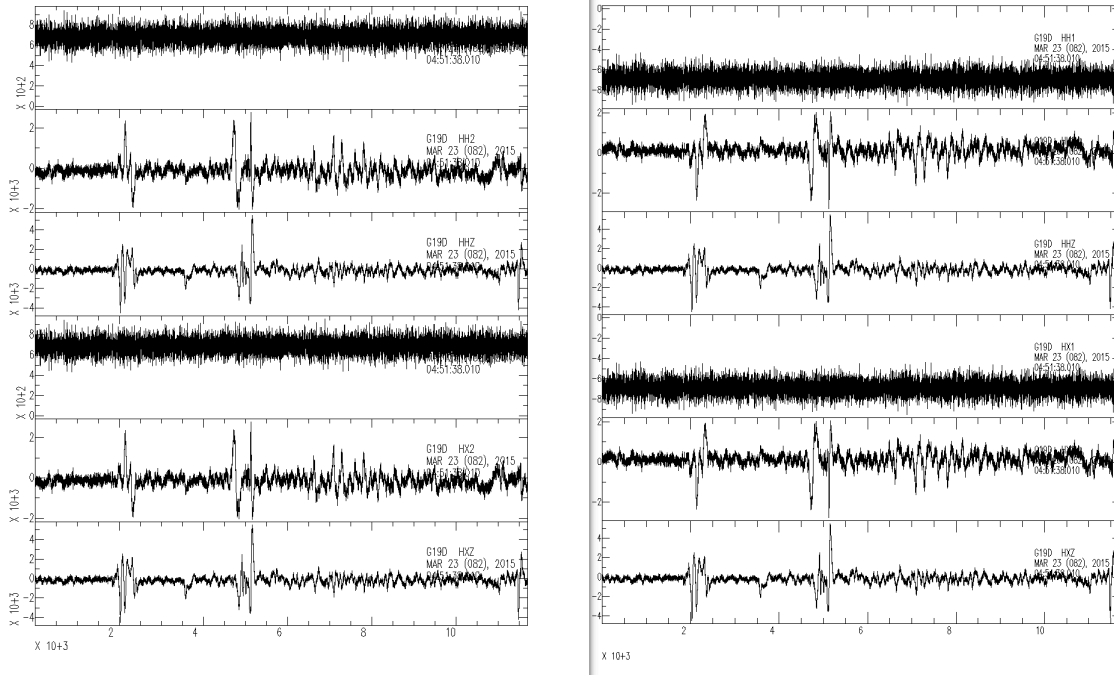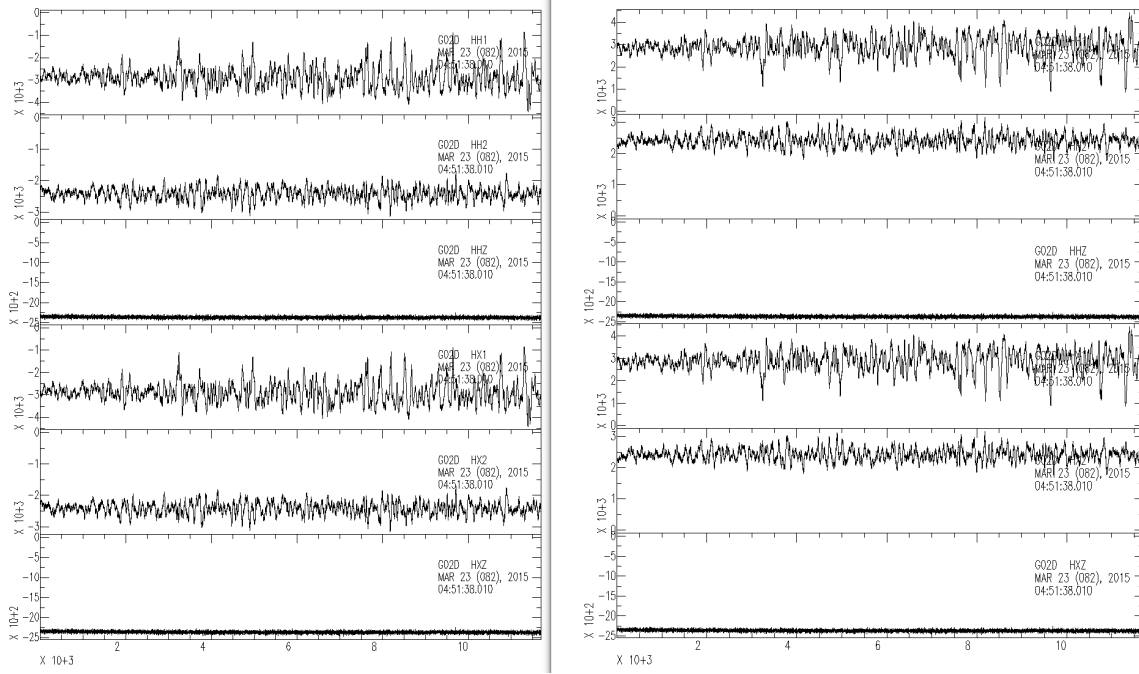
Figure 2. Seismograms of event on March 23, 2015 recorded on station G02D. Left is seismograms requested on 22 May 2016 and right is seismograms requested on 8 January 2017. Seismograms are ordered from the top HH1, HH2, HHZ, HX1, HX2, HXZ on both sides. Note the polarity does not reverse for H*Z components but does reverse for H*1 and H*2 components

Figure 3. Seismograms of event on March 23, 2015 recorded on station J17D (top) and G18D (bottom) strictly for comparison to a station where all channels were flipped in polarity. Left is seismograms requested on 22 May 2016 and right is seismograms requested on 8 January 2017. Seismograms are ordered from the top HH1, HH2, HHZ, HX1, HX2, HXZ on both sides. Note the polarity reverses for all components.
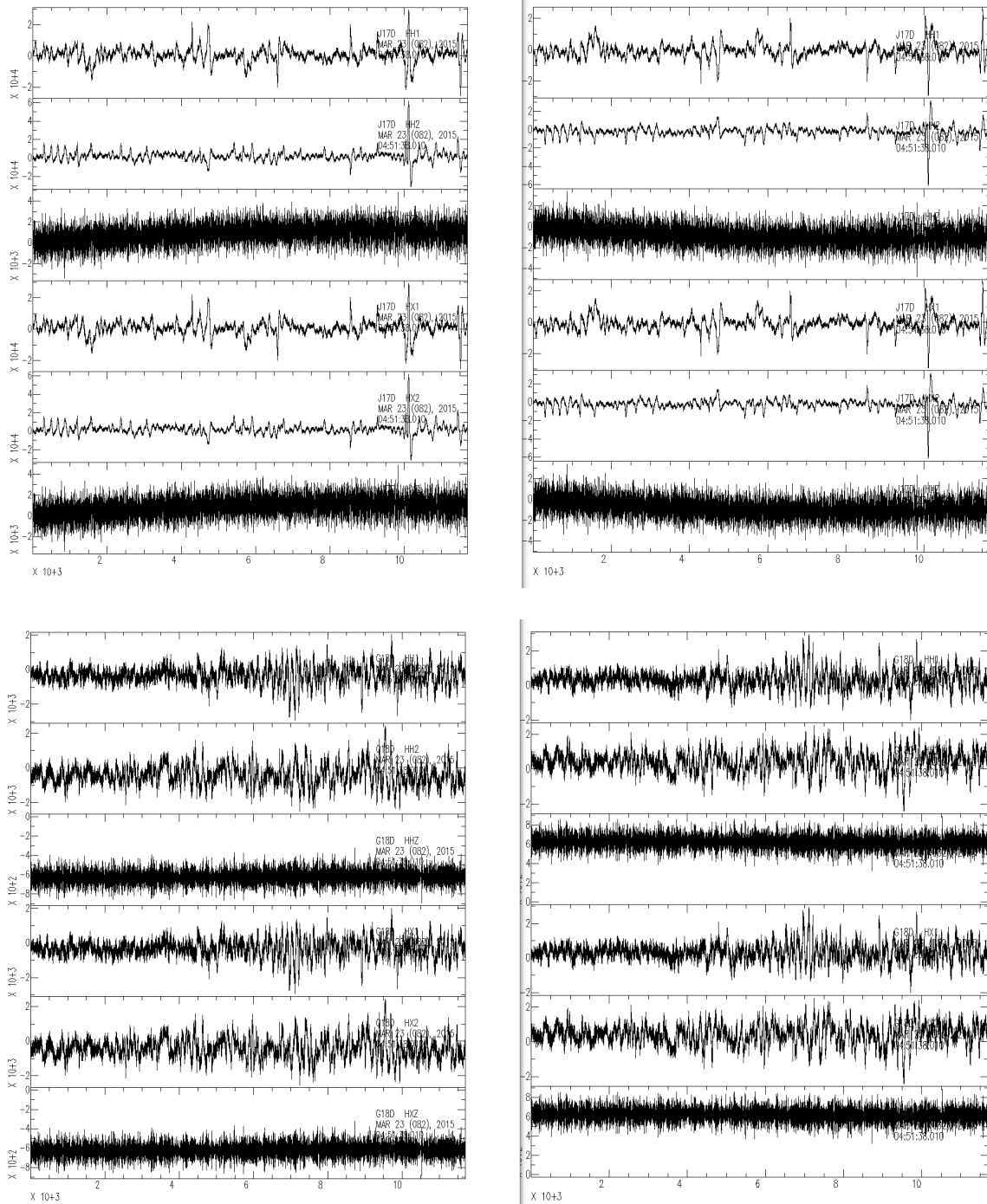
Figure 4. PDF from IRIS DMC MUSTANG webservices for full deployment, left is 2014 and right is 2015 of station G19D. Note that HH2 and HHZ components have similar characteristics and look more like horizontals than HH1, which looks like a vertical component.

http://service.iris.edu/mustang/noise-pdf-browser/1/gallery?target=7D.G19D..*.M
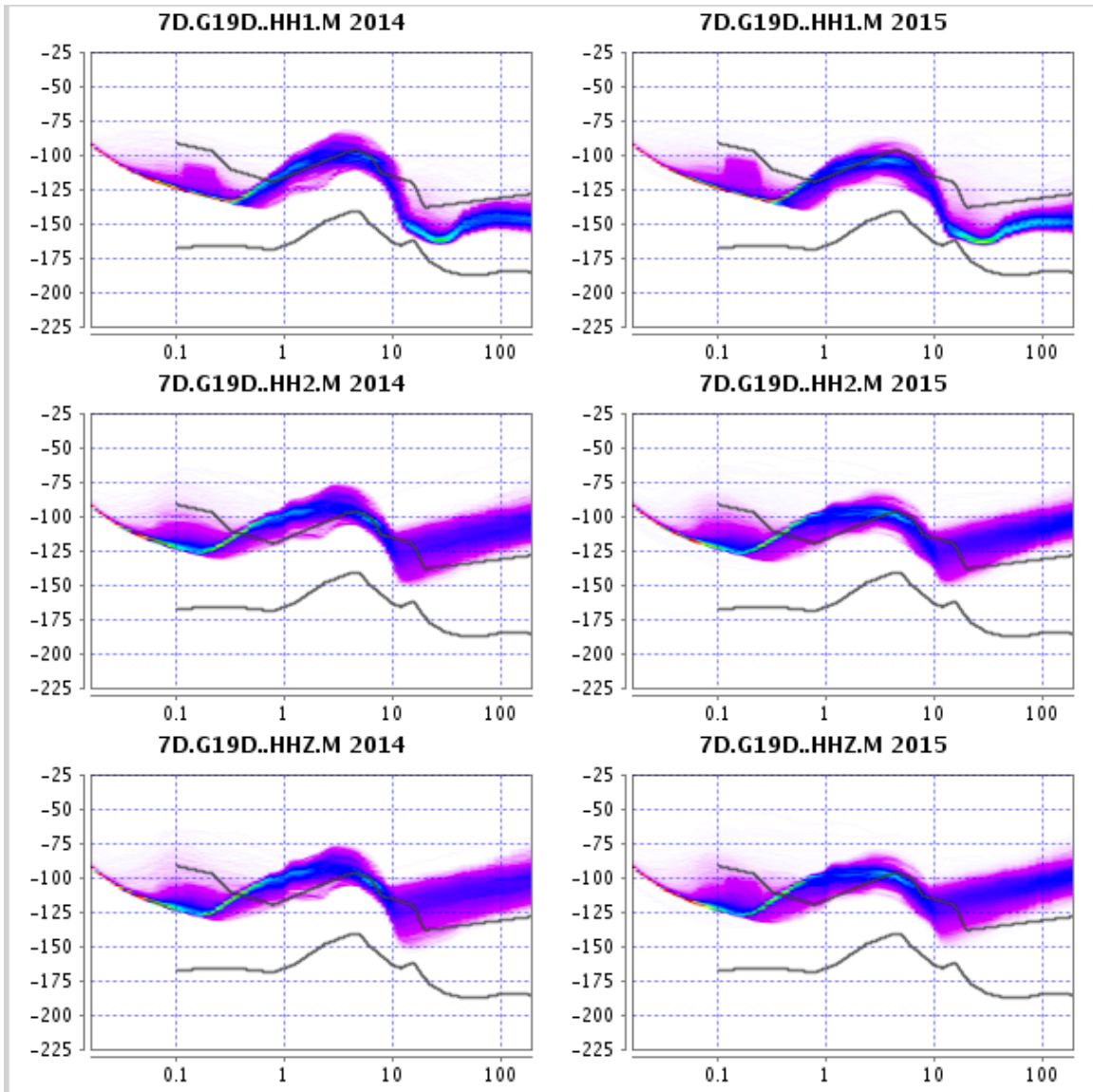
Figure 5. PDF from IRIS DMC MUSTANG webservices for full deployment, left is 2014 and right is 2015 of station G02D. Note that the station flatlined in 2015 but the similarities in HH1 and HH2 relative to HHZ are still evident.

http://service.iris.edu/mustang/noise-pdf-browser/1/gallery?target=7D.G02D..*.M
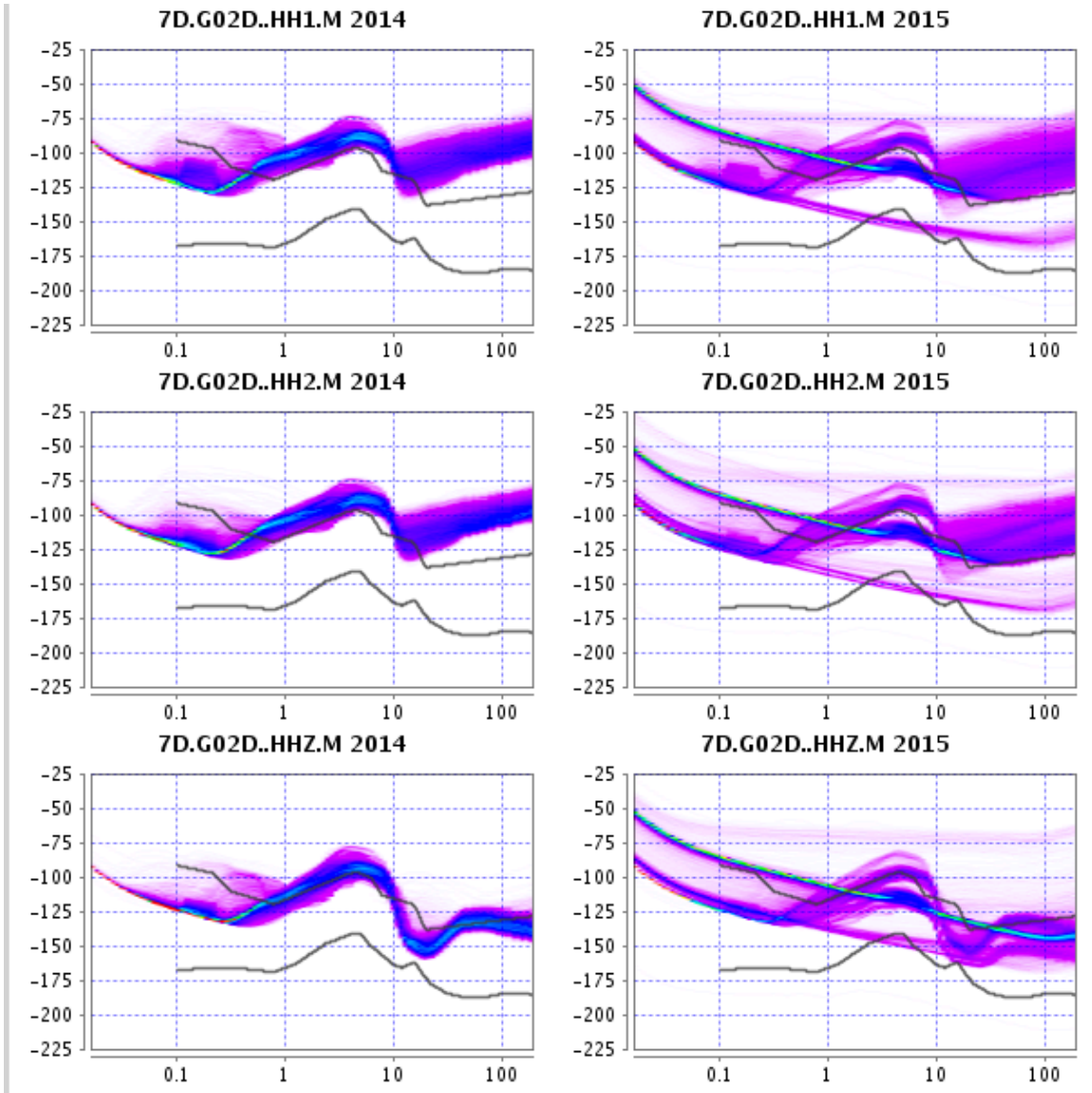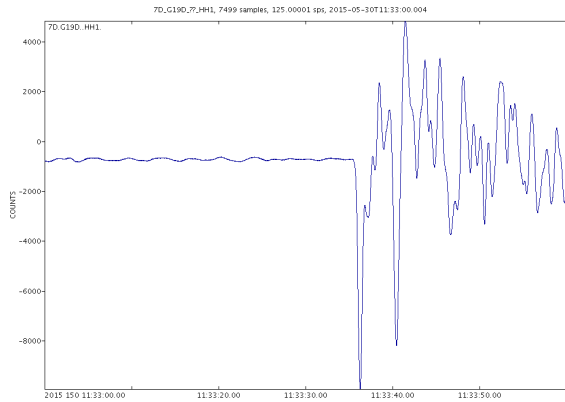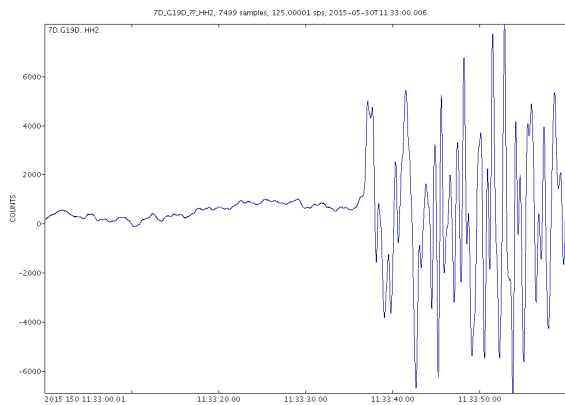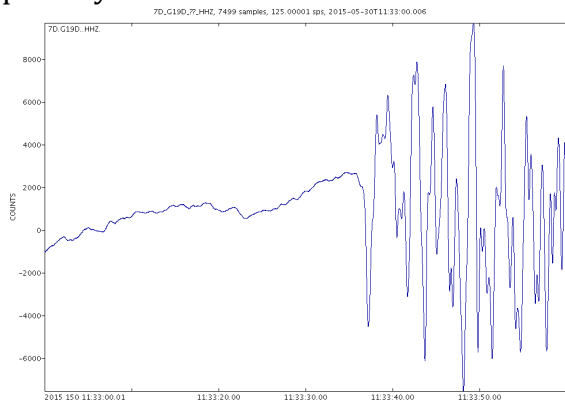
Figure 6. First arrival from earthquake on 30 May 2015 as requested from DMC on 5/1/17.



Archived as HH1, then flipped & rearchived. Should be HHZ, maintain same polarity



Archived as HH2, then flipped & rearchived. Should be HH1/2, maintain same polarity.



Archived as HHZ, not flipped & rearchived Should be HH1/2, then flip.

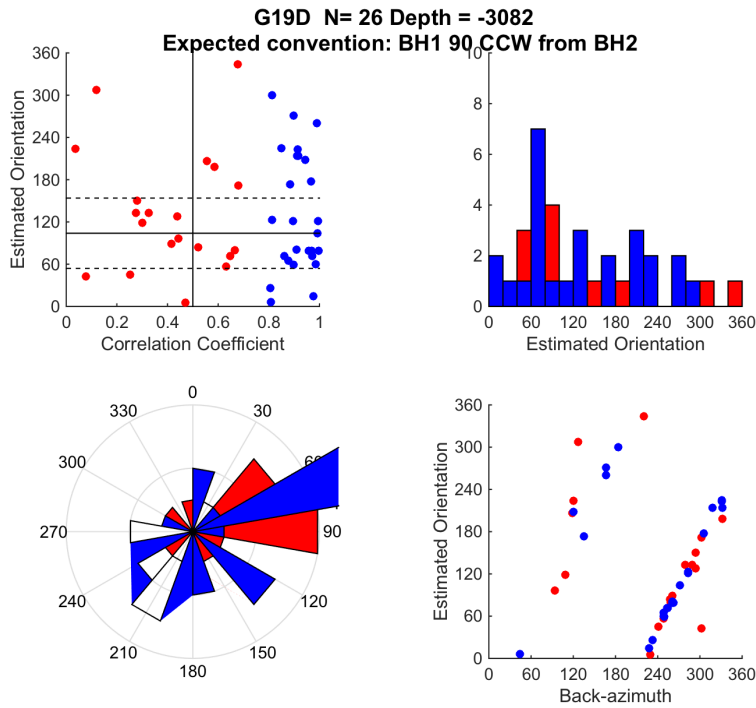Figure 7.  Horizontal orientation results with HH1 and HHZ swapped.



Figure 8.  Horizontal orientation results with HH1 and HHZ swapped, then HH1 and HH2 swapped. (Currently archived HH1 renamed to HHZ, Currently archived HH2 renamed to HH1, Currently archived HHZ renamed to HH2.)
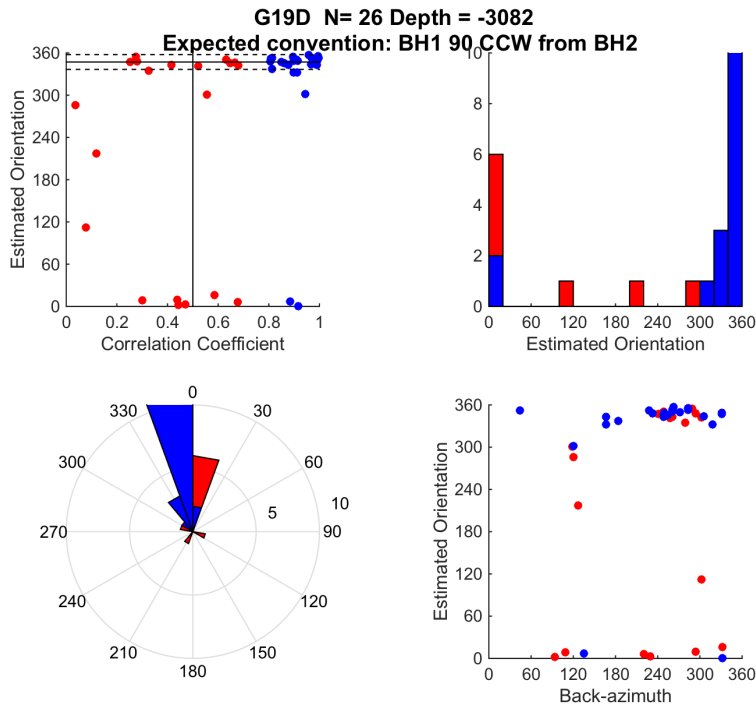
Table 1.

| Currently Archived | Should Be Archived As | Flipped from original? | Should be flipped again? | Notes |
|---|---|---|---|---|
| HH1 | HHZ | Yes | No | |
| HH2 | HH1* | Yes | No | |
| HHZ | HH2* | No | Yes* | * |

* Would the uneven polarity flip change orientation results, such that if the data in HHZ had been flipped as it would have been then the channels would have been archived under the proper names for the orientation results with currently archived HH2 keeping the HH2 name and currently archived HHZ being rearchived as HH1?