GSN Review with LASSO
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For the purposes of the GSN Review, I have examined the last quarter (90 days) of 2014 for station quality, effectively 3 October 2014 to 1 January 2015. I examine the vertical-component of the broadband stations only (BHZ), as this component is likely representative of the rest of the instrumentation health. Furthermore, I only examine stations that are a part of the II (IRIS IDA) or IU (IRIS/USGS) networks.

I first examine the *station_completeness* metric in the 'Advanced' version of LASSO, because this should help me pick apart which stations actually have data available. This metric in conjunction with IRIS SeismiQuery shows that II.MSEY (Mahe, Seychelles) is down for the last quarter of 2014, with the last known recording on 28 October 2014. As of the write-up, station II.MSEY is still not operational (returning data). According to the IDA website (ida.ucsd.edu), there are known problems with this station.

Next, I examine the quantitative ranking of stations based on the median of the metrics only, as the median reduces the effect of outliers compared to the mean, based on the 'Basic' version of LASSO metric groupings:

Time Series Integrity (TSI): The data reporting based on the TSI shows that the GSN is in good health when it comes to the data availability and completeness. I used LASSO to examine the TSI, and then used IRIS SeismiQuery to compare for data completeness. If the data availability or quality of the time series still appeared in question, I compared it to earlier in 2014 and also the first couple of weeks for 2015.

The following stations failed in LASSO and are not found in IRIS SeismiQuery, thus there is no known last record of when these stations were operational.
 IU.KIEV – Kiev, Ukraine (political difficulties here may be problematic)
 IU.MSKU – Masuku, Gabon

The following stations are of note:
 II.ABKT (Alibek, Turkmenistan) and II.NRIL (Norilsk, Russia) still appear within MUSTANG/LASSO, yet are closed and in need of metadata updates. These metadata updates have been submitted to the IRIS DMC.

 II.ALE - Alert, Northwest Territories, Canada
  • The station is actively returning LHZ data, but not BHZ

 IU.KMBO – Kilima Mbogo, Kenya
  • spotty during 2014 Q4; last known record 10 December 2014

 IU.TRIS – Tristan de Cunha
  • last known record on 25 September 2014

Metadata Validity (MV): I consider each of the individual metrics that compose the MV bulk metric. None of the stations have any erroneous calibration pulses, and only one (**IU.ANTO** in Ankara, Turkey) has a suspect time tag and poor timing quality, which means the timing has not fixed or obtained a satellite lock since the station last powered up and that the timing accuracy is poor compared to an external GPS clock.

Signal Quality (SQ): I use the root-mean-squared variance (sample_rms), signal-to-noise ratio (sample_snr), and the percentage above the New High Noise Model (pct_above_nhnm; *Peterson et al.* [1993]) together. Since the pct_above_nhnm seems like the most robust metric to outliers, I consider a station of 'bad' quality if the median over the quarter is greater than 20%. Stations that fail this metric are:

- II.ASCN – Butt Crater, Ascension Island (82% above NHNM)
- IU.FUNA - Funafuti, Tuvalu (90% above NHNM)
- IU.LCO - Las Campanas Astronomical Observatory, Chile (64% above NHNM)
- IU.PTCN - Pitcairn Island, South Pacific (35% above NHNM)
- IU.RAO - Raoul, Kermadec Islands (31% above NHNM)
- IU.TARA – Tarawa Island, Republic of Kiribati (26% above NHNM)

Note than many of these stations are on islands and/or coastal, so that the noise is likely higher due to microseisms.

Mass Positions (MP): The MP for each channel is examined here (m1, m2, m3). I examine whether any of the channels fail (are considered 'bad') based on ±10 V. I report here the following channels considered 'bad' for a given station:

    II.RAYN.00 – Ar Rayn, Saudi Arabia
- m3 is 'bad' at -10.40 V

    IU.FUNA.00 – Funafuti, Tuvalu
- m2 and m3 are 'bad', 11.14 and -12.8 V, respectively

    IU.KBS.00 – Ny-Alesund, Spitzbergen, Norway
- m1 is 'bad' at 10.40 V

    IU.WCI.00 – Wyandotte Cave, Indiana, USA
- m3 is 'bad' at -11.90 V

Noise Power (NP): The NP metric investigates the PDF mode estimates at a range of 6 periods. Since one period measurement for a given station could be 'bad', and the rest 'good' for example, I explicitly use the Rank for these stations. No stations fail this metric.

Conclusion: The GSN Station Quality can be described through LASSO metrics. The best way to approach the GSN Station Quality however is through LASSO in combination with SeismiQuery and BUD, among other IRIS products.