Using PQL for RT130 and Q330 Seismic Waveform Data Review

Start the program **PQL II** by selecting the icon from the tool bar or type **pql** in a terminal window. If using a laptop, consider starting PQL using the –l flag. Typing <mark>pql –l</mark> will start PQL in low-resolution mode which better interprets the size of the screen. For help in PQL refer to the mouse tips or select Controls and refer to the help for each of the tabs in controls. For some tips on using PQL II see the PQL II – Data Vewing Program document.

## Reviewing seismic waveform data for RT130s & Q330s with PQL

Start the program PQL. Load the LH? channels using either the command line (pql *LH?) or by selecting the **Traces** button from the sidebar and using the GUI.

Magnify a small section of the LH? channels by selecting the traces (individually or with the **Select All** tab), picking a time window, and then clicking the **Magnify** tab. Continue to magnify, avoiding spikes in the data, until you can clearly see signals. On a good signal all three channels should show a response. Scroll backward through the data (if keep this sentence then put the (most recent data) back into the first sentence. I found the first sentence confusing so modified it).

Use filters to focus on different bandwidths. First, filter for moderate-sized teleseisms (0.03 - 0.08 Hz). This filter should already be set up in the **Filters** pull down menu within PASSCAL laptops. If no 'signal' is seen above the background noise in a couple of weeks of data, there could be something wrong. Turn the filter on and off by using the **On** and **Off** radio buttons just below the **Filters** pull down menu.

Check to see if there is energy in the microseism bandwidth (0.1-0.5Hz in LH? data). To do this, make sure the filter settings are turned off and look at the spectra by clicking the **Spectra** tab. Click **Overlay on** to overlay the spectra for the 3 seismometer channels (Z,N,E) and you should see a broad peak of energy in the bandwidth 0.1-0.5Hz. If the sensors are broadband, you are likely to see higher long-period amplitudes on the horizontal channels compared to the vertical channel.
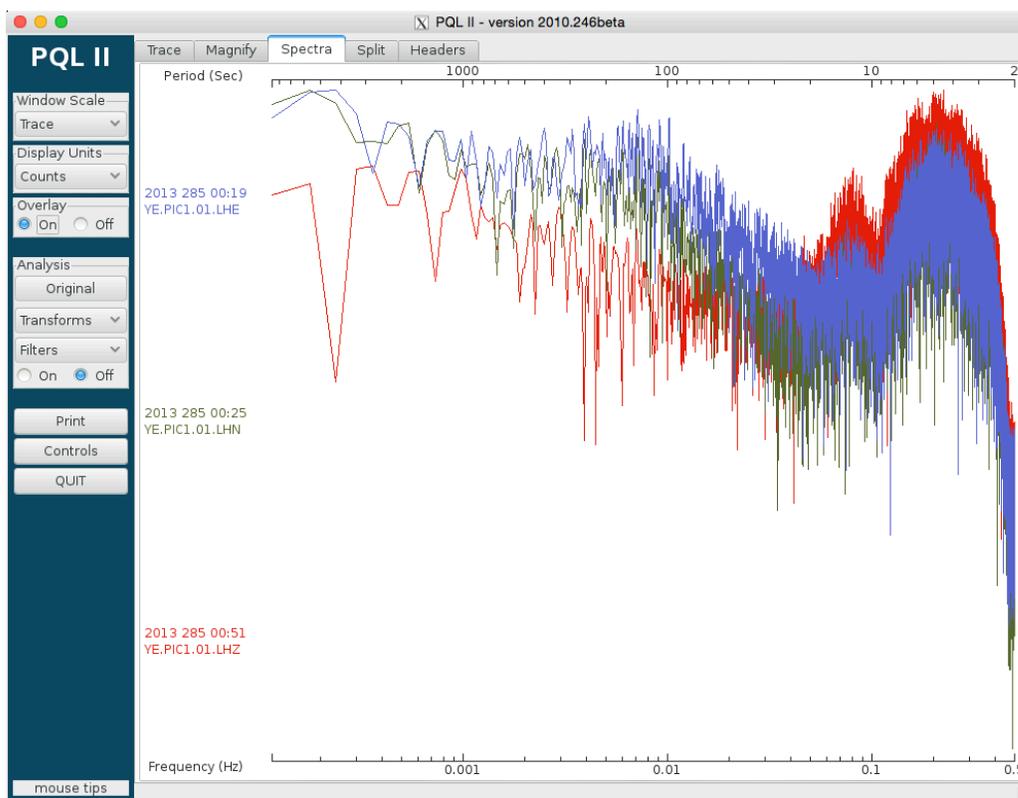
Using PQL for Q330 State of Health Review

Start the program **PQL II** by selecting the icon from the tool bar or type **pql** in a terminal window. If using a laptop, consider starting PQL using the –l flag. Typing pql –l will start PQL in low-resolution mode which better interprets the size of the screen. For help in PQL refer to the mouse tips or select Controls and refer to the help for each of the tabs in controls. For some tips on using PQL II see the PQL II – Data Vewing Program document.

Reviewing Q330 SOH data with PQL

In **PQL II** select the **Traces** button.
In trace selection screen, select the directory containing the SOH data to be viewed and then select all the files except the LOG file and the original .SOH file for the station under evaluation, and then select open.

When pql is started from the terminal window it will accept standard command line input for the traces desired or traces can be loaded from the **Traces** button once the program has started.

For descriptions of the state of health channels refer to DescriptionSOHCannels_v2.pdf. Look for anomalies in the SOH data. In particular look at the following:

Packet buffer (VPB) should look like a regular triangular saw tooth pattern that reduces to zero counts every cycle with no gaps.

Mass positions (VM?) check for mass recenters, masses stuck high or low, curves look fairly smooth.

System voltage (VEP) should be a regular saw tooth pattern, if the batteries are solar-charged (and the latitude is not extremely high). VEP, on a daily basis, should rise briefly to approximately 100 (bulk charge), then drop to approximately 90 (trickle charge) for a longer period, and then drop down and have a steady decay (nighttime discharge). The nighttime discharge should not drop below 80. If the bulk charge portion is not reaching close to 100 on a regular basis, check that the solar panel is clean and properly oriented. If daytime charging appears normal but the nighttime discharge is dropping below 80, check the battery with it disconnected from the solar. Check all power cable connections.

Seismic signals (LH?) should show some signal. If there are any large spikes in the seismic signal the rest of the trace may appear flat. Use PQL II to look at data in between any large spikes; verify broad spectral signature of microseism peak (0.1-0.5Hz) and review the waveforms as suggested in the "Using PQL for RT130 and Q330 Seismic Waveform Data Review" document.

Clock quality (LCQ) If the GPS is set for cycled power this should appear as a fence pattern, spiking to 100 every x hours, e.g. 3 (depends on how the Q330 is programmed). If the GPS is set for continuous power this appear as flat line with no dips and a value of 100. If this is not correct then check the GPS antenna and cable.

System temperature (VKI) Look to see if the values are within safe operating temperatures for sensor/datalogger location particularly in extreme environments.

Select all the traces and magnify a small portion of data in the Magnify window. Scroll through the traces looking for irregularities.
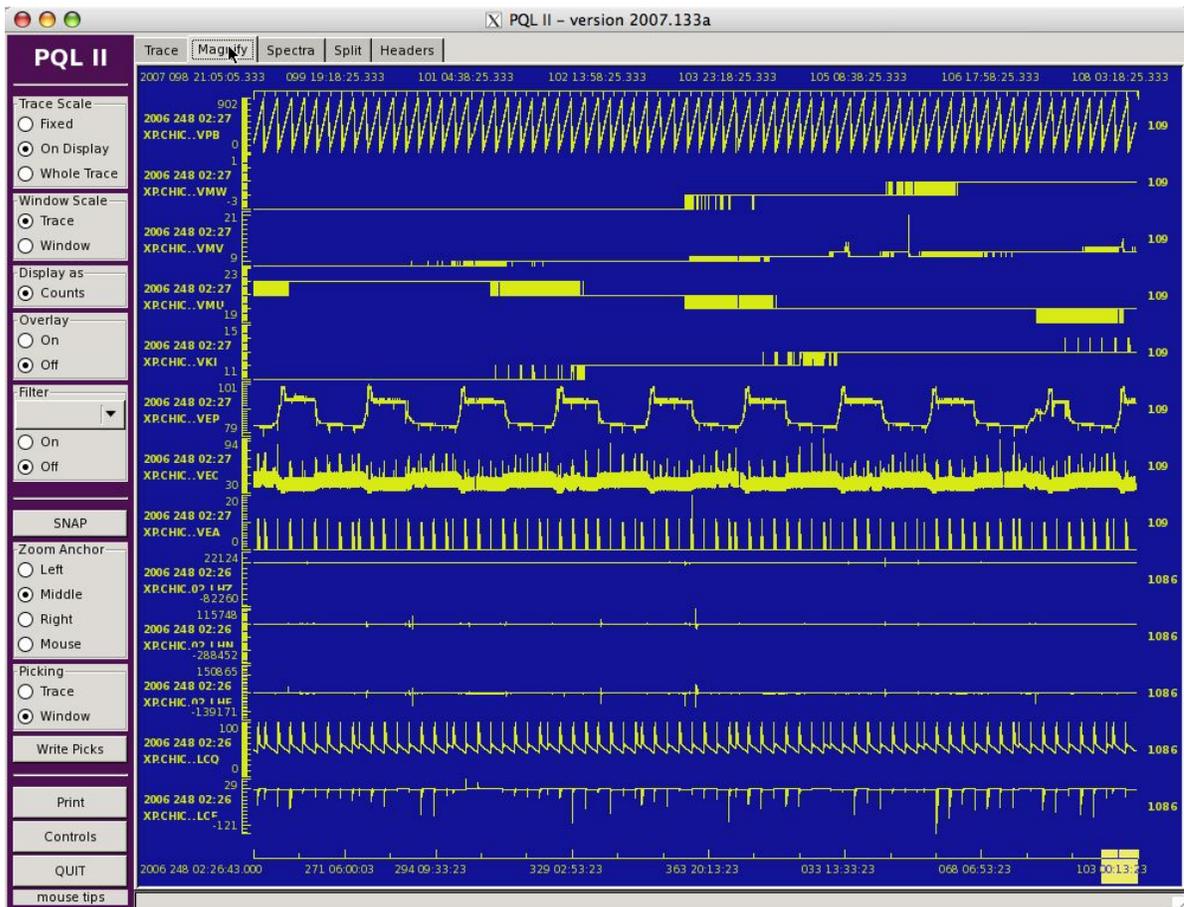
If PQL chokes on the multiplexed .SOH files:

Open an Xterm terminal window.

Create a directory called splits and navigate to the splits directory. Run **sdrsplit** in the splits directory pointed at the .SOH file(s). Sdrsplit can be run on one file at a time or a batch script can be written. The program called **sdrsplit** (run with no options) will split the file into the individual channels, one file per channel per station. (Please ignore the sdrsplit message: ***Warning: unable to open leap second file: /usr/local/lib/leapseconds***). Make sure that the file names for the .SOH (or .ALL) files are not the same.