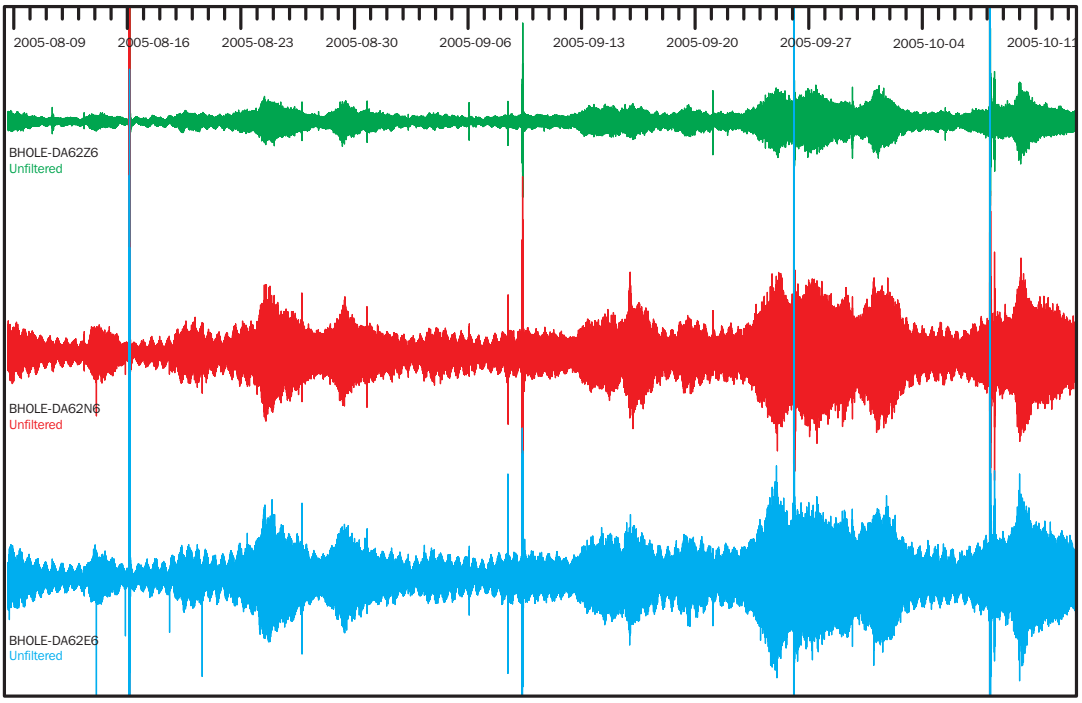
GURALP SYSTEMS

Newsletter
April 2006

CMG-3T shows world-leading long term stability

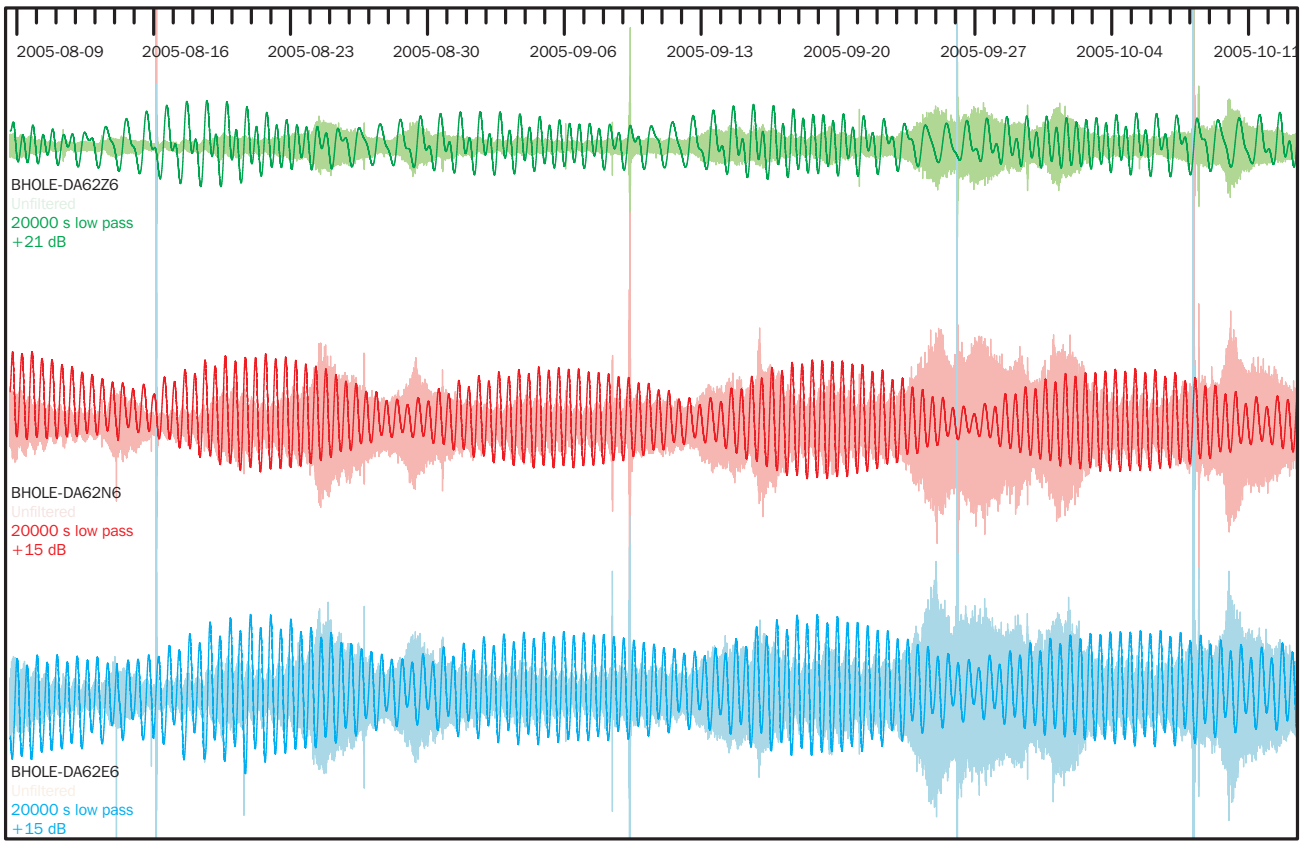
Recent research by scientists at Harvard University shows that the CMG-3T and 3TB sensors are not susceptible to long-term gain deterioration. Instruments by other manufacturers showed a decline in signal strength of over 50% over a period of 8 years in some cases (G. Ekström, C. A. Dalton, M. Nettles, *Seismological Research Letters*, 2006, **77**, 12.)

This research also has implications for the Peterson Low Noise Model, which was partly based on results from these instruments. Güralp Systems instruments have already been observed operating well below the Low Noise Model at several sites, and we continue to work to achieve the lowest possible instrument noise level through improvements in sensor design.



Güralp Systems Limited, 3 Midas House,
Calleva Park, Aldermaston, U.K. RG7 8EA
tel. +44 118 981 9056 : fax +44 118 981 9943
http://www.guralp.com/ : email sales@guralp.com

Investigating low frequencies



The data on the front page, also shown in lighter tint on this graph, is from a CMG-3TB 360 s – 100 Hz sensor installed in our test vault in Wolverton, UK. 10 weeks of continuous data streams were recorded at a rate of 1 sample/s.

The darker colour above shows the same data with a 20000 s low-pass filter applied using Güralp Systems' Scream! software.

Earth tides are clearly visible in the filtered trace, and to some extent in the raw data also. The horizontal components are dominated by two approximately sinusoidal vibrations with similar frequencies, which interfere with each other to produce beats. The vertical axis exhibits a more complex phasing pattern.

The tide pattern is clear and sharp even in times of high seismic vibration, attesting to the high linearity of the CMG-3 sensors.

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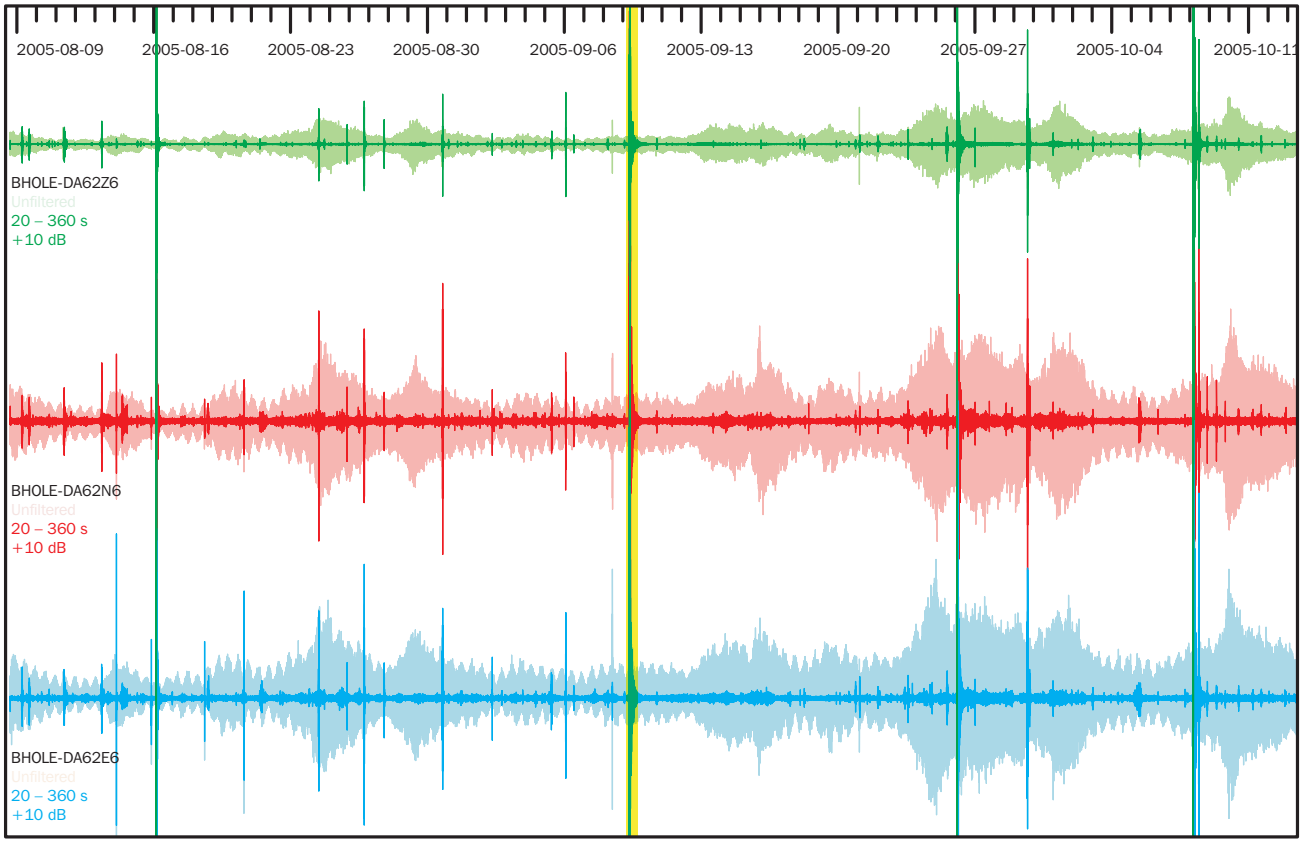
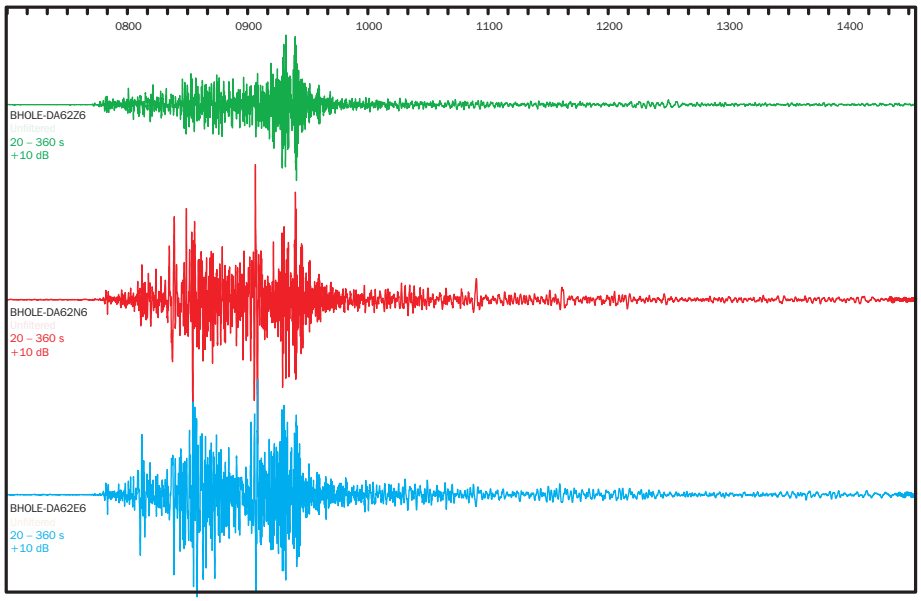
Teleseismic events



Applying a different filter to the same data allows us to examine the teleseismic events recorded during this period. In the graph above, a 20 – 360 s filter has been used. Again, the raw data is included for comparison.



We can continue using Scream! to zoom in to this data and examine particular events with the same filter applied. The region marked in yellow, above, corresponds to a M7.7 earthquake off Papua New Guinea.

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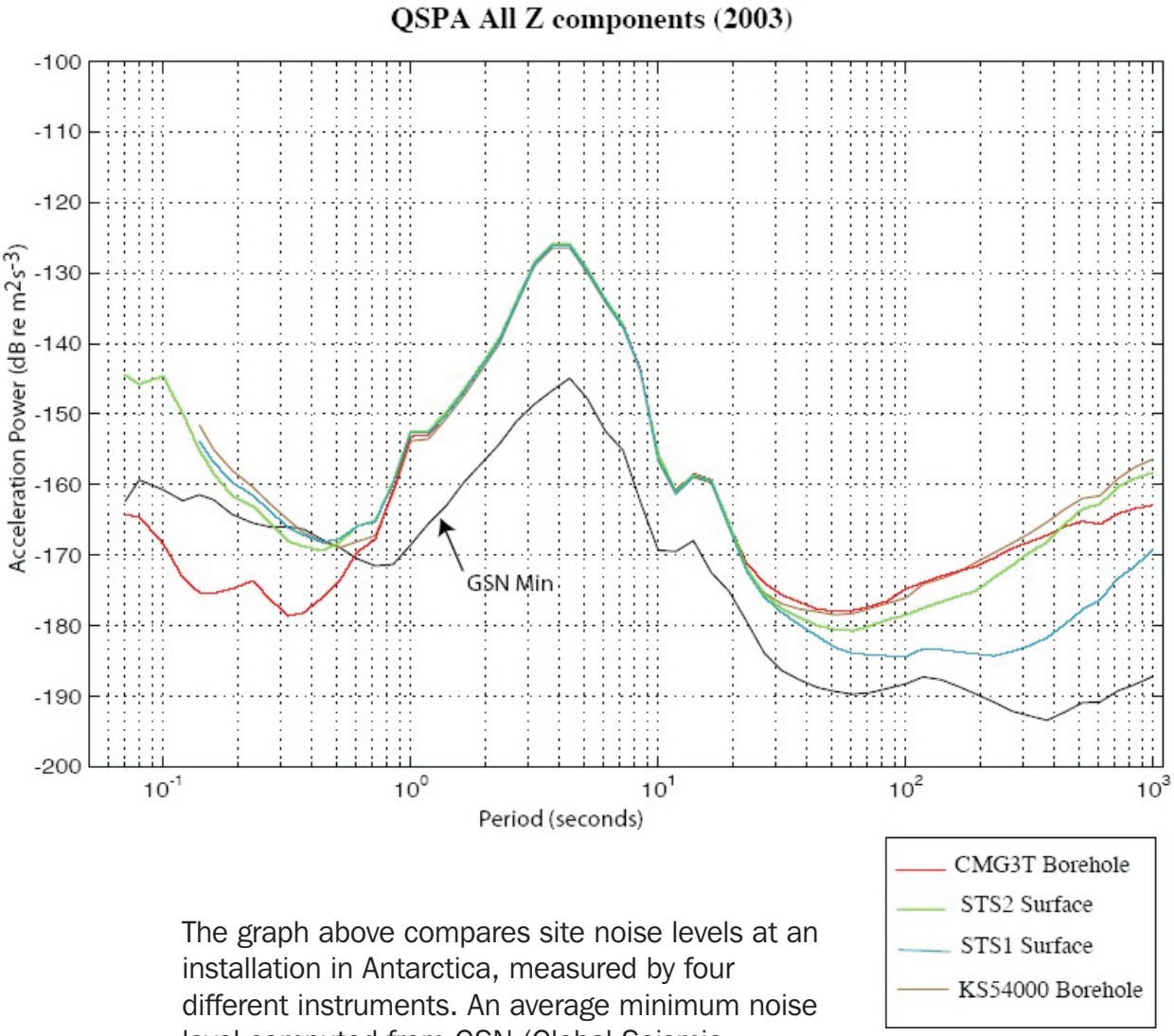
Comparative performance



The graph above compares site noise levels at an installation in Antarctica, measured by four different instruments. An average minimum noise level computed from GSN (Global Seismic Network) measurements is also shown.

The CMG-3TB shows significantly better performance at high frequency than any other instrument, reaching below −175 dB at some frequencies. (Compare the Peterson NLNM, which lies around −168 dB in this region.)

At low frequencies, the 360 s CMG-3TB again shows competitive performance, with particularly good results at very long period.

These results show Güralp Systems' CMG-3 surface and borehole instruments to be a perfect choice for long-term installations in the lowest noise sites.

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