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Reply

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To be precise, we stated in our paper that we 'do not think the theoretical extrapolations of *Veith and Clawson* [1972] survive the test against the observations presented here'. *Veith and Clawson*'s [1972] correction chart shows an almost constant high gradient for their teleseismic corrections Q_b^{VC} between 200 and 600 km, where our correction Q_b^{NKC} levels off at $h > 400$ km. We would like to emphasize that we made no statements about the accuracy of Q_b^{VC} for shallow events, only criticized the extrapolation to larger depth.

Murphy and McLaughlin [1998], hereafter called MM, test Q_b^{VC} for a bias and in their Figure 4 they find exactly what we expected: a mismatch between $\log M_0$ and m_b for deep earthquakes. We repeated this test for our own data, and compare the results in Figure 1. Not surprisingly (because Q_b^{NKC} was based on these data), our data show no appreciable bias with increasing depth. We note however that the standard errors in the mean are also smaller for our data. Since Q_b^{NKC} is almost distance-independant for $\Delta > 60°$ and $h > 400$

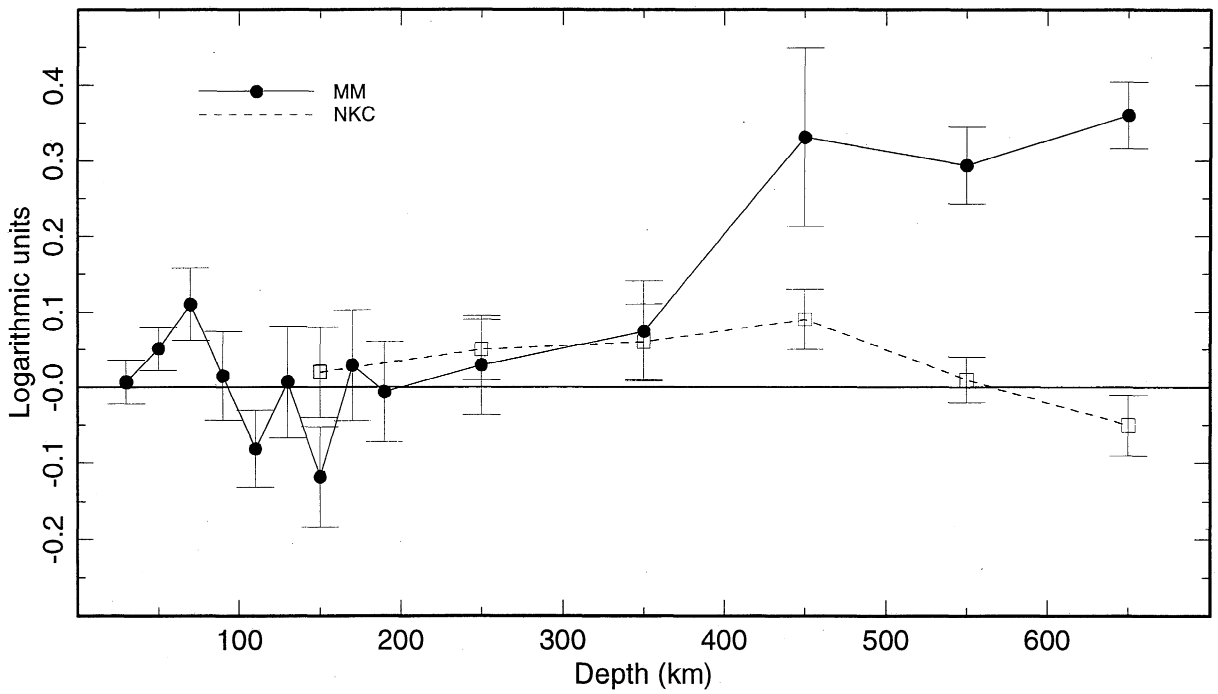

Figure 1. The filled circles denote the values of $\log M_0 - m_b(IDC)$, using Q_b^{VC} and normalized to 0 for shallow events, as taken from *Murphy and McLaughlin,* [1998], Figure 4. The open squares denote the bias in our data, after correction with Q_b^{NKC} as given in equation (5) of *Nolet et al.*, [1998]. The bars denote standard errors in the mean taken over all distances. Note the absence of bias and the smaller errors in the magnitudes corrected with Q_b^{NKC}.

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km we suspect some of the larger variance in the IDC magnitudes from MM may actually have been introduced by the Q_b^{VC} corrections.

We welcome the analysis of MM. Whereas our study aimed to provide correction factors for velocity seismograms recorded by the Global Seismograph Network, an independent appraisal of magnitude corrections for more classical measurements seems certainly in order, in view of the greatly increased knowledge of the Earth's mantle structure since the analysis by *Veith and Clawson* [1972]. Apart from the attenuation model, the fact that *Veith and Clawson* [1972] used a model without upper mantle discontinuities may have influenced the outcome of their depth extrapolations. In test calculations we studied the amplifying effect of the 410 and 660 km discontinuity. For teleseismic waves the effect is negligible, but at $\Delta < 35°$ models without the discontinuities show far larger amplitudes for most arrivals, since the triplications tend to spread the rays over a wide bundle. Since the 'deep' IDC magnitudes are too small, this would give the right sign for the bias. However, for a more quantitative conclusion, it will be necessary to analyse the variance in the (Δ, h) plane, rather than looking at the marginal distributions averaged over all Δ, as done by MM.

We are also encouraged by the consistency between $\log M_0$ and m_b, which provides support for our use of scalar moments as the ultimate standard of earthquake strength.

References

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