Correction to “Multiple melt injection along a spreading segment at Askja, Iceland”

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[1] In the paper “Multiple melt injection along a spreading segment at Askja, Iceland” by Janet Key et al. (Geophysical Research Letters, 38, L05301, doi:10.1029/2010GL046264, 2011), we regret that an error was made in the calculation of the $V_p/V_s$ ratios. The correct values are presented in this revised version of Figure 2 and its caption. This change does not affect either the hypocentral locations, for which we used the correct mean $V_p/V_s$ value of 1.78, nor the overall conclusions of our paper. We still find evidence for relatively elevated $V_p/V_s$ ratios from the lower crustal earthquakes, consistent with the presence of melt in the lower crust. However the following corrections to the text should be made in light of this discovery.

[2] The final sentence of paragraph 10 should be corrected to: The mean $V_p/V_s$ ratio is 1.78 and a larger proportion of the earthquakes have a higher $V_p/V_s$ than the peak of the histogram (Figure 2b).

[3] Paragraph 14 should read: Typical $V_p/V_s$ ratios measured on seismic refraction profiles with turning points in the mid- to lower Icelandic crust are in the range 1.72–1.79 [Brandsdóttir and Menke, 2008, and references therein]. Upper crustal (0–6 km depth) $V_p/V_s$ values in the area near Askja average 1.74 ± 0.03 also calculated from Wadati plots (M. Mitchell, personal communication, 2011). As the $V_p/V_s$ ratio determined from a Wadati plot is averaged over the whole length of all source-receiver paths, the smaller $V_p/V_s$ ratios from the upper crust will have contributed to values calculated from the lower crustal earthquakes. This has the effect of reducing the averaged $V_p/V_s$ ratios determined from earthquakes in the lower crust, so the local $V_p/V_s$ ratio in the lower crust will actually be higher than the average value reported here. For example, if the $V_p/V_s$ value of 1.74 measured for the upper crust applies down to 12 km (the depth of the shallowest lower crustal seismicity), we can calculate the lower crustal $V_p/V_s$ ratio required to produce an average of 1.78 from an earthquake in the middle of the lower crustal earthquakes at 20 km depth. This gives a local lower crustal $V_p/V_s$ of 1.85. The tail of high $V_p/V_s$ ratios of 1.8–1.92 from lower crustal earthquakes (Figure 2b), is consistent with the presence a few percent of distributed melt in the lower crust [Hammond and Humphreys, 2000].

Figure 2. (a) Example Wadati plot [Wadati, 1933] for a lower crustal earthquake; dots are arrival times from seismometers, black line is best fitting slope. (b) Histogram of $V_p/V_s$ values for all earthquakes with more than 10 points on a Wadati plot. Mean is marked with black arrow, light grey shaded area is range of observed $V_p/V_s$ values for normal Icelandic crust [Brandsdóttir and Menke, 2008, and references therein]. Mean $V_p/V_s$ value of upper crust in same area is shown by broken arrow (M. Mitchell, personal communication, 2011).

References
Brandsdóttir, B., and W. Menke (2008), The seismic structure of Iceland, Jökull, 58, 17–34.