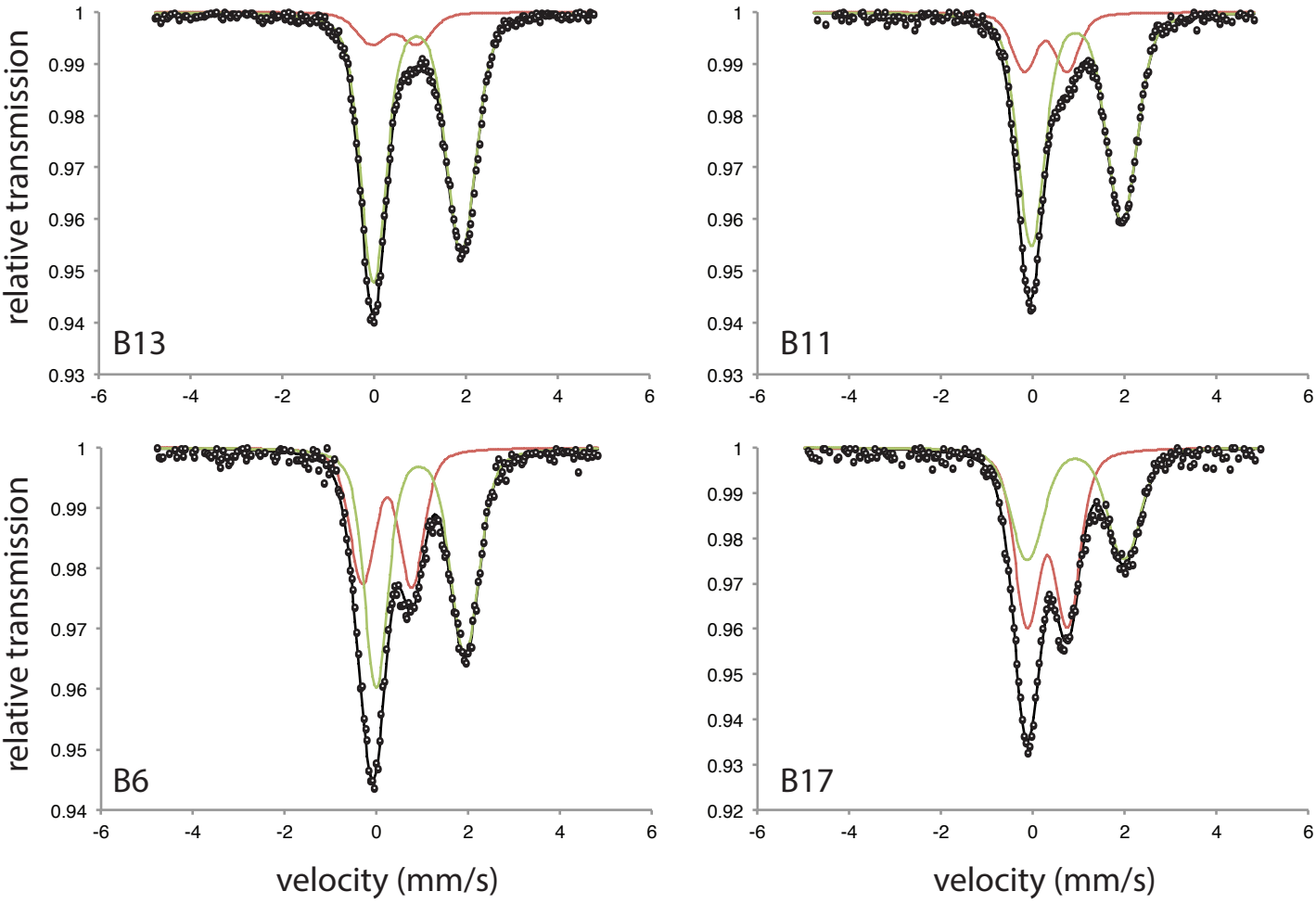

Figure S1. Mössbauer spectra of 4 representative hydrous basalt glasses (B glasses) spanning the full range of $Fe^{3+}/\Sigma Fe$ ratios in this study. Raw spectra (open cirlces), published by Botcharnikov et al. (2005), were generously provided by Catherine McCammon, and fit in this study using methods of Alberto et al., (1996) described in the main text (black line = best fit; red line = ferric doublet; green line = ferrous doublet). The raw data and fits for all spectra used in this study, and plots of all spectra, are provided in the supplementary materials (MS Excel workbook S1).

Figure S1

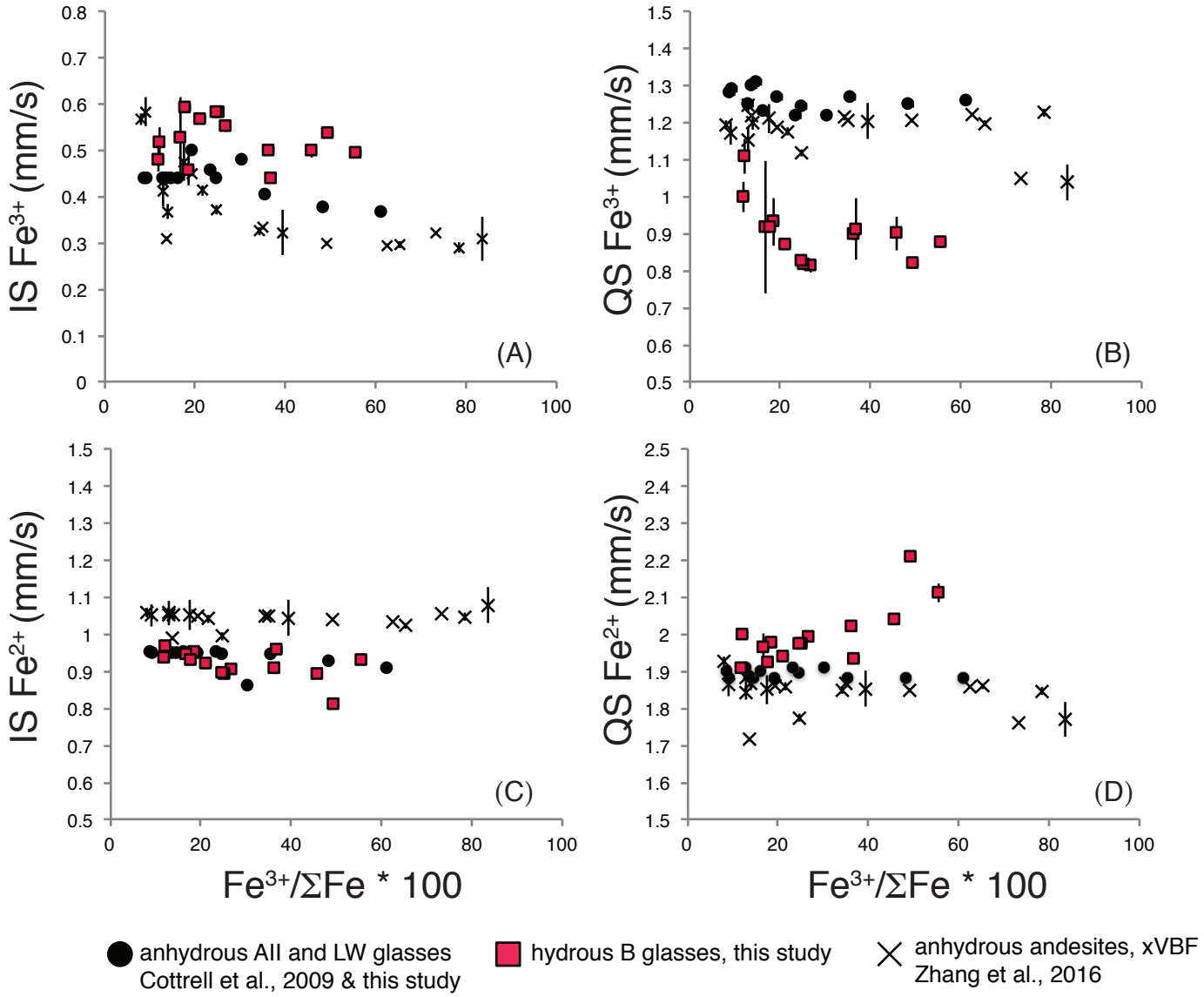

Figure S2. Hyperfine parameters of anhydrous AII and LW glasses and hydrous B glasses determined in this study using the method of Alberto et al. (1996). (A) Isomer shift of ferric iron (B) quadrupole splitting of ferric iron (C) isomer shift of ferrous iron and (D) quadrupole splitting of ferrous iron as a function of $Fe^{3+}/\Sigma Fe$ ratio. Data for anhydrous andesites from Zhang et al., 2016, fit using the RECOIL software package, are shown for comparison.

Figure S2

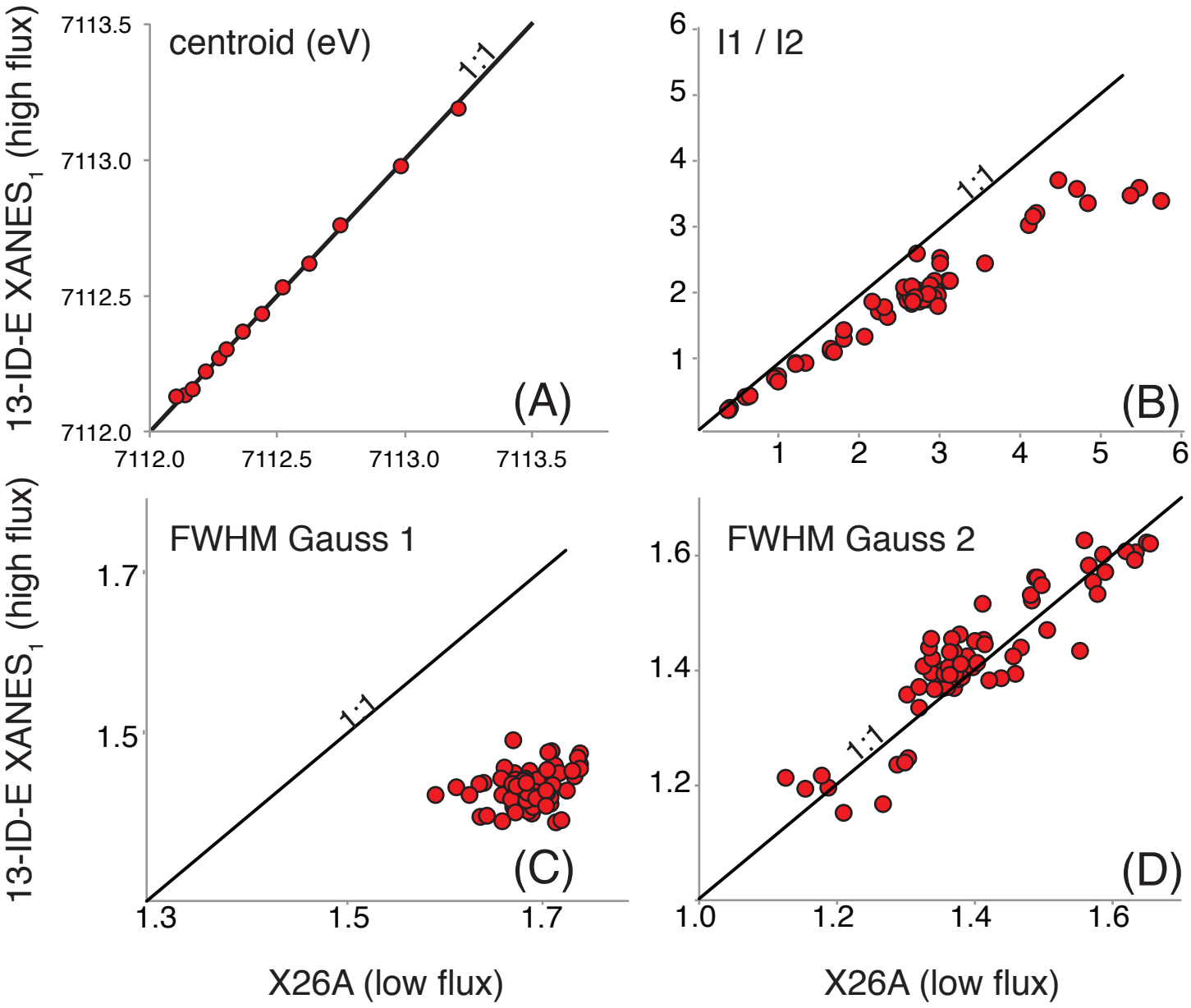

Figure S3. Modelled pre-edge spectral features of anhydrous glasses obtained at low radiation dose at station X26A compared to the same features extracted from spectra obtained at high radiation dose (condition XANES1) at station 13-ID-E. Centroids of anhydrous glasses are indistinguishable outside of analytical error between the two facilities (A) though spectral features vary considerably between facilities: (B) Ratio of intensities (areas) of the pre-edge multiplets; (C) Full Width Half Max (FWHM) of the Gaussian model of the first pre-edge multiplet; (D) Full Width Half Max (FWHM) of the Gaussian model of the second pre-edge multiplet.

Figure S3

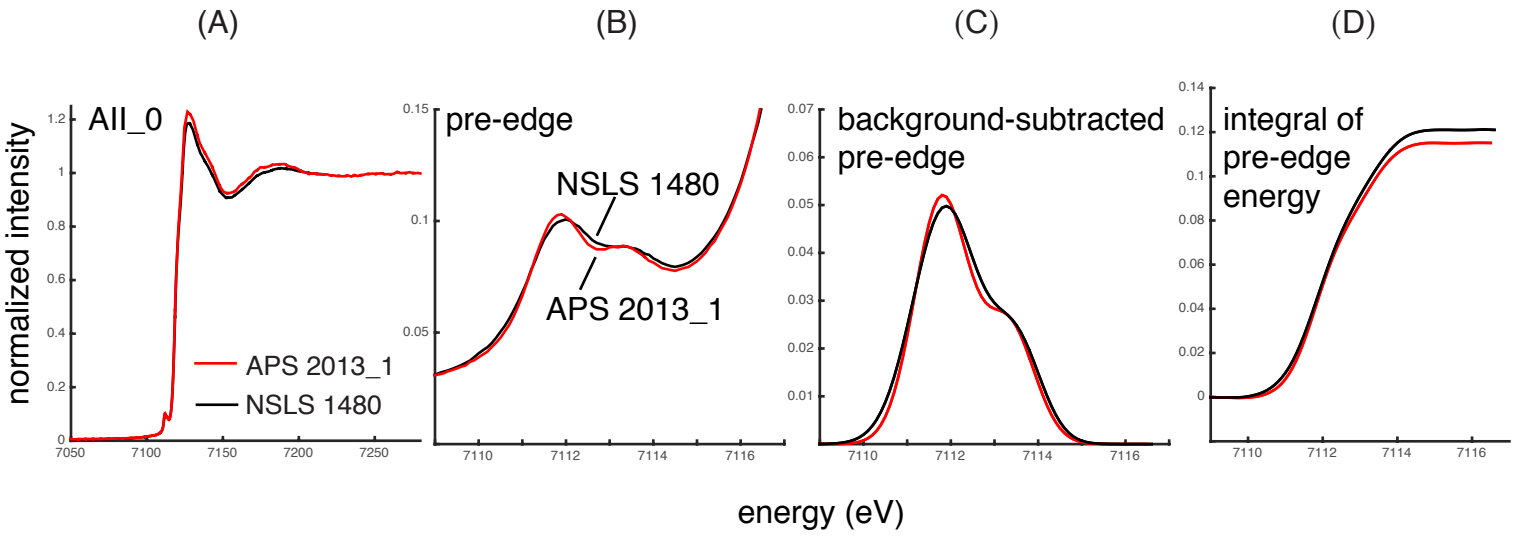

Figure S4. Normalized intensity of XANES spectra of anhydrous glass AII_0 as a function of energy acquired at sector 13-ID-E of APS (red) and sector X26A of NSLS (black). (A) full spectra (B) preedge (C) background subtracted pre-edge (D) integral of pre-edge energy (trapezoidal approximation of integral beneath discrete (x,y) points in the scan from 7107 eV to the value on the energy axis).

Figure S4

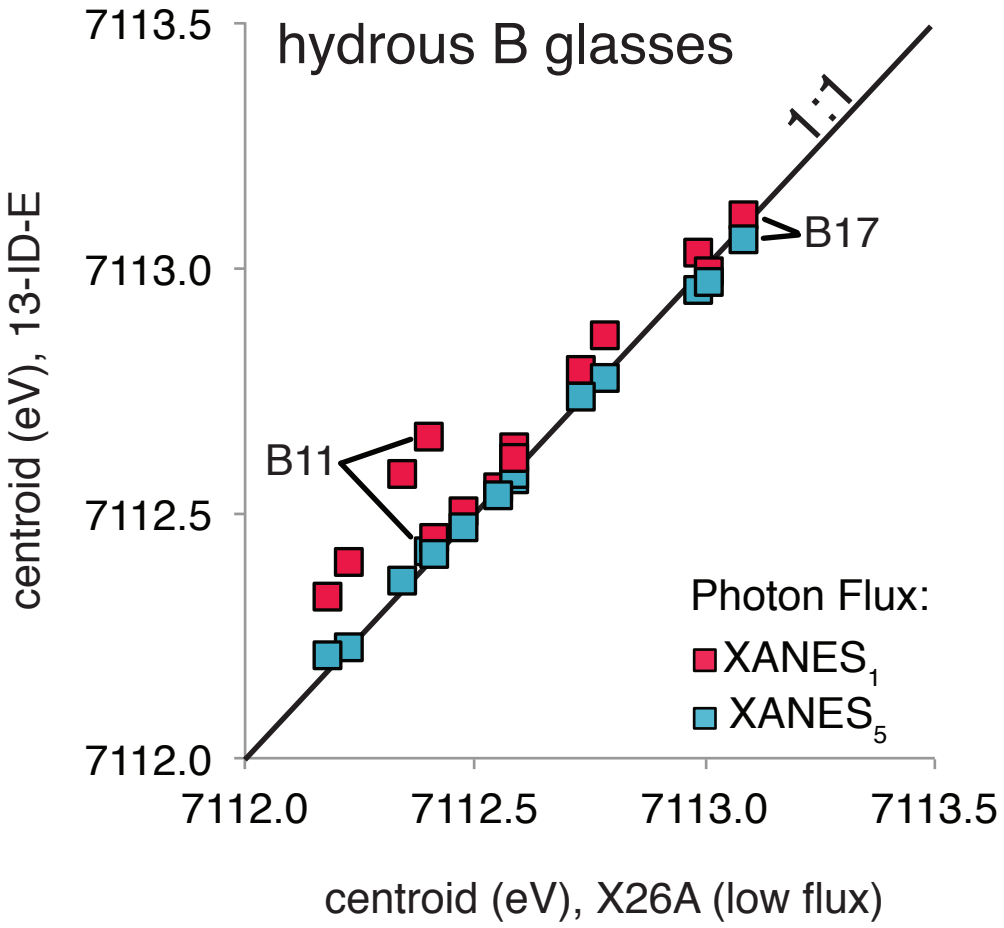

Figure S5. Pre-edge spectral features of hydrous B glasses obtained at low radiation dose at station X26A compared to the same features extracted from spectra obtained at high radiation dose (red squares, condition XANES1) and low radiation dose (blue squares, condition XANES5) at station 13-ID-E.

Figure S5