

Appendix N The MELTS software (Ghirosio and Sack, 1995; Asimow et al, 2001) was used to calculate the olivine liquidus temperature at 1 bar at two fO₂ conditions ($\Delta\text{QFM} = +1$ and $+2$, which is approximately equal to $\Delta\text{NNO} = +0.2$ and $+1.2$) for the whole-rock compositions in Table 6. For the 14 samples that have olivine as their liquidus phase according to MELTS, the liquidus temperature calculated from MELTS matches the results from the Mg -thermometer in this study with an average deviation of 20 and 13 °C, respectively, for the $\Delta\text{QFM} = +1$ and $+2$ runs. This close match in temperature is within the ± 1 -sigma error of the Mg-thermometer calibration ($\pm 26^\circ\text{C}$, Table 3 in text). In addition, the composition of the most Mg-rich olivine analyzed in each sample (Table 6) closely matches (within $<1\%$ Fo content) the liquidus olivine composition predicted by MELTS.

These results support the following conclusions: (1) the whole-rock compositions in Table 6 closely approximate liquid compositions, (2) these liquids had ΔNNO values between ~ 0 and $+1.2$ (as calculated from olivine KD and shown in Table 6), and (3) the most Mg-rich olivine in each sample closely approximates the first olivine to crystallize from each liquid.

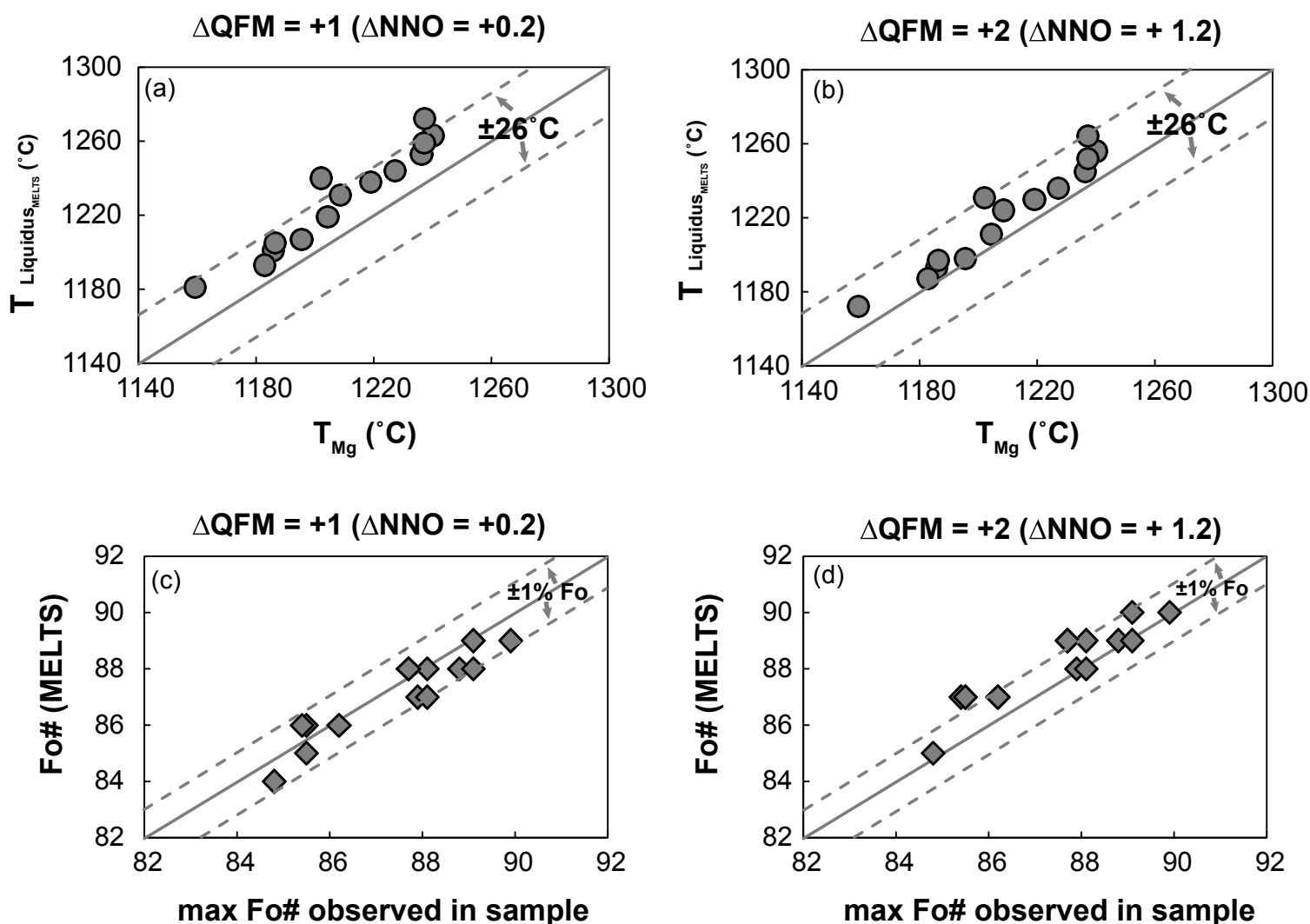


Figure caption: (a) Plot of the olivine liquidus temperature calculated by MELTS (at $\Delta\text{QFM} = +1$) vs. the temperature calculated with the Mg-thermometer in this study (Table 3) for whole-rock samples from the Mexican volcanic arc (Table 6). Solid line is the 1:1 correspondence and dashed lines are $\pm 26^\circ\text{C}$ (1-sigma error of Mg-thermometer). (b) Same as (a) but MELTS run at $\Delta\text{QFM} = +2$. (c) Plot of the olivine liquidus composition (Fo#) calculated by MELTS (at $\Delta\text{QFM} = +1$) vs. the most Mg-rich olivine analyzed in each sample (Table 6). Solid line is the 1:1 correspondence and dashed lines are $\pm 1\%$ Fo. (d) Same as (c) but MELTS run at $\Delta\text{QFM} = +2$.