Figure 1

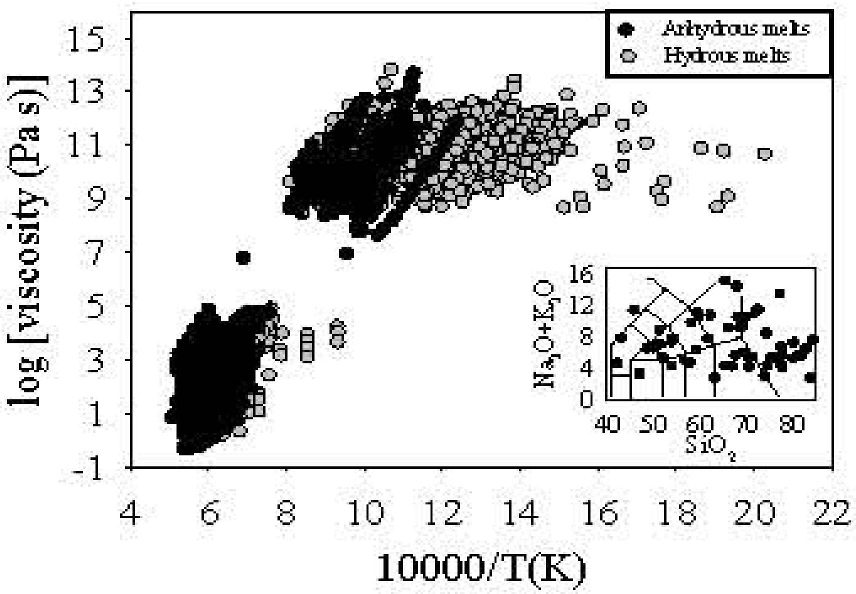

Figure 1. Main Panel. Interval of viscosity variation for the anhydrous (black circle) and hydrous (gray circles) melts used to calibrate GRD model. Inset. Compositional variation of melts for which viscosity has been measured, as illustrated by a Total Alkali vs. Silica diagram.

Figure 2

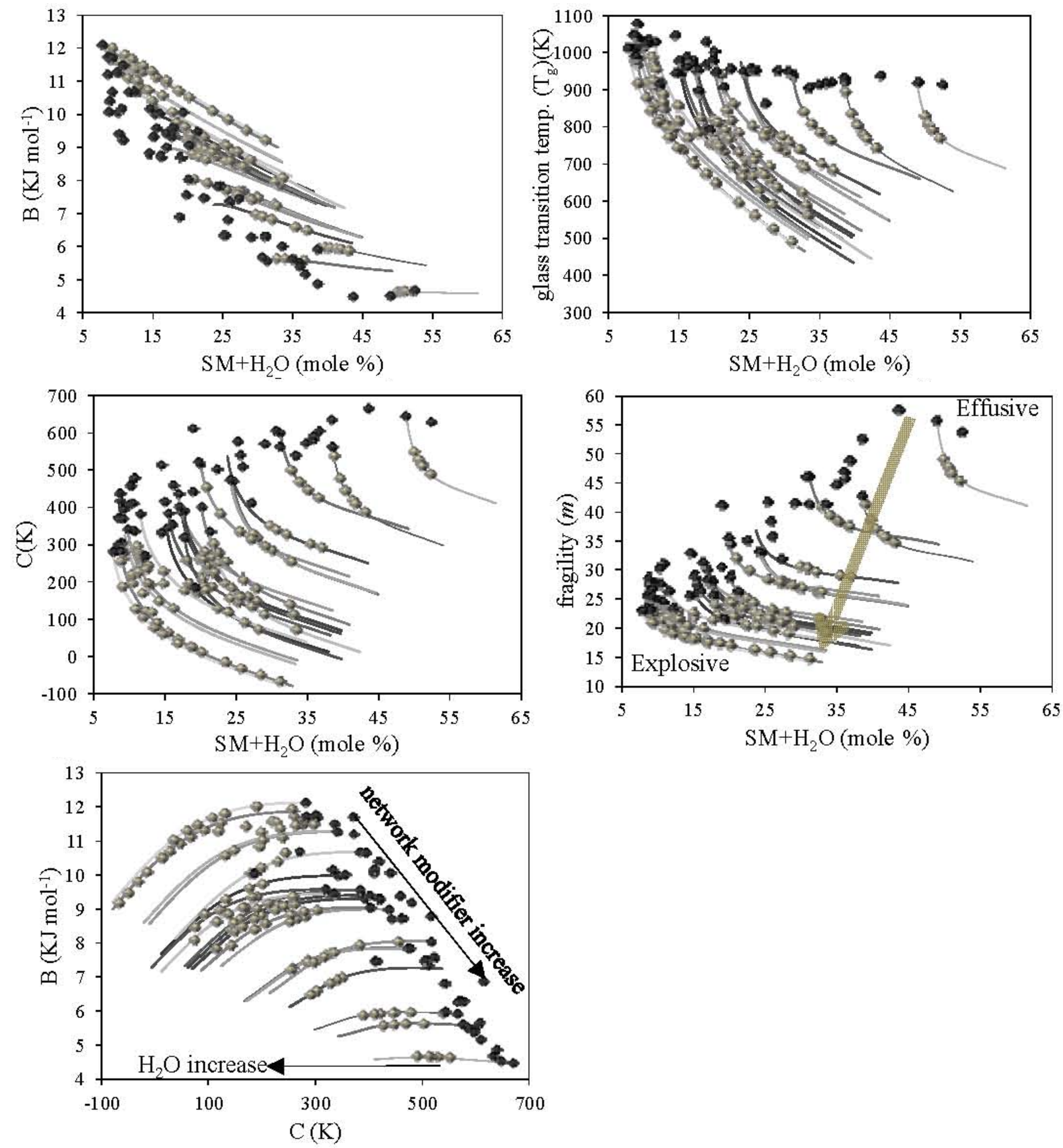

Figure 2. The effect of the addition of network modifiers content (SM) (Giordano and Dingwell, 2003) and water content (H_2O) affect the constitutive parameters of VFT equation (panels a), b) and c)); the glass transition temperatures (T_g)(panel d)) and the fragility (*m*)(panel e)). This figure shows that, compared to the other network modifiers (SM), H_2O has a different role and ability in changing constitutive parameters and physical properties. For instance, while the **C** parameter and the

fragility (*m*) are increased by the addition of SM, they are decreased by the addition of H_2O. **B** parameter is decreased by both increasing SM or H_2O (panel a). Panel d) shows that glass transition (T_g) is only slightly affected by the addition of even a large amount of SM, whereas it is hugely affected by the addition of even a small amount of H_2O. Panel e) shows that a relationship exists between *m* and the kind of volcanic activity. In particular, low *m* values seem to be associated with melts most commonly producing highly explosive eruptions whereas high *m* values are associated with melts whose most common activity is mostly effusive.

Figure 3

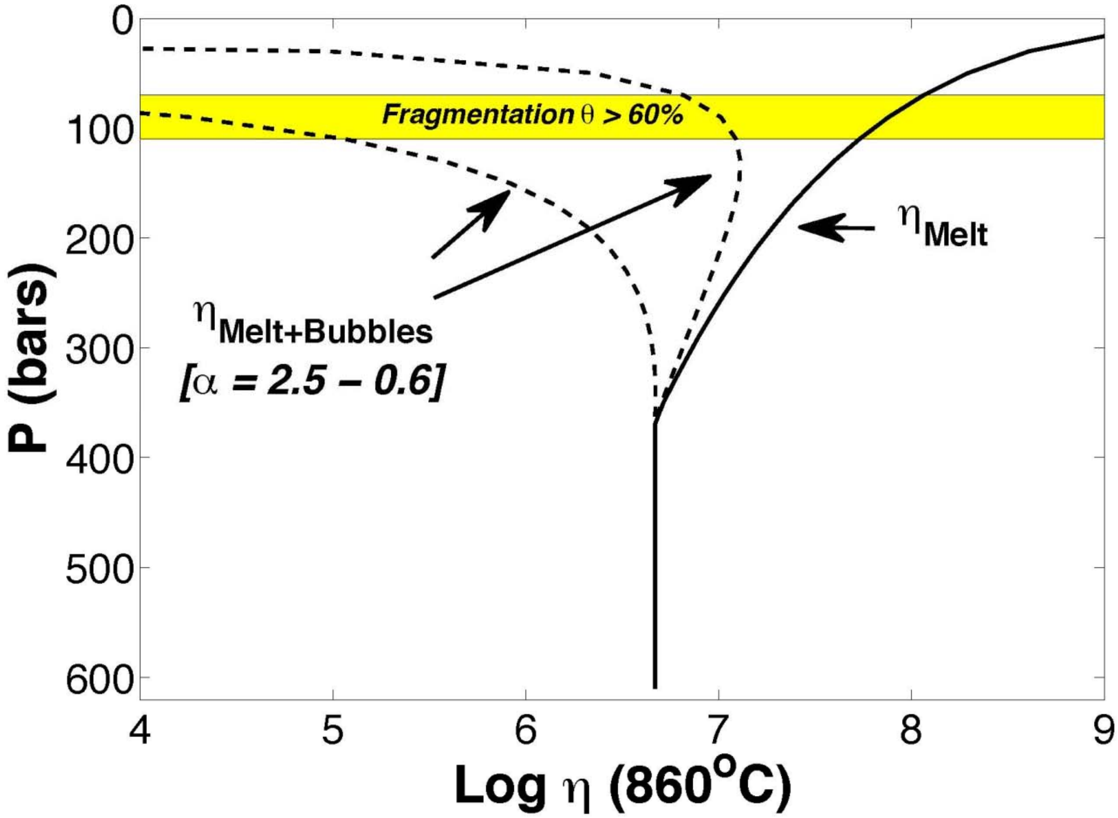

Figure 3. An application of the GRD model to the volcanic eruption of rhyolitic magma (redrawn after Giordano *et al*., 2008). The GRD model is used to compute the step-wise change in isothermal (860ºC) transport properties (i.e. viscosity) of rhyolite magma as it ascends to the surface, vesiculates due to depressurization and erupts. As the magma rises the melt exsolves an H2O fluid phase which causes the viscosity of the melt phase (solid black line) to rise rapidly towards its glass transition temperature (~10^{12} Pa s); the effective viscosity of the magma (melt+bubbles), however, shows a potential reduction in viscosity due to the increase in volume fraction of fluid vs. silicate melt (Quane *et al*., 2009). Superimposed on the diagram is an approximate field for onset of magmatic fragmentation driven by increased volume fractions of vesicles (i.e., bubbles > 60%).