LETTERS

Closure in crystal size distributions (CSD), verification of CSD calculations, and the significance of CSD fans

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ABSTRACT

Crystal size distribution (CSD) measurements are susceptible to the closure problem, just like chemical compositions. In its simplest form this means that the total crystal content of a rock cannot exceed 100%. Where chemical or thermal effects limit the total quantity of a single phase, closure can occur at lower volumetric phase proportions. This means that parts of the CSD diagram [ln(population density) vs. size] are not accessible. If the volumetric phase proportion is constant, then straight CSDs will appear to rotate around a point at small sizes giving a fan of CSDs. These fans are significant and do show changes in crystal sizes that can be interpreted in terms of magmatic processes. However, the correlation between the slopes (or characteristic lengths) and intercepts of individual CSDs in a family is not significant, but just a consequence of the constant phase proportion effect. Many other graphs, such as characteristic length vs. volumetric phase proportion, can give more information on magmatic processes.