Quantitative description of oscillatory zoning pattern in magmatic plagioclase using spectral analysis.

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A quantitative expression of the natural oscillatory zoning (OZ) pattern by a chaotic analysis was initiated by Higman and Pearce (1993). They extracted the compositional time series by treating spatial data series of zone thickness across the OZ, and then re-plotted the data series on reconstructed phase space of Takens (1981), that is Lorentz plot. Then, they conclude that the existence of a chaotic behavior in plagioclase-melt system is supported by the triangle shape of observed attractors.

Although this chaotic analysis is valid, the data are insufficiently accumulated and, in paticular, the diversity of the observed patterns in a rock sample is not fully examined. For example, although Higman and Pearce (1993) state that all the studied plagioclases exhibit the triangle geometries in Lorentz plot, Tsune and Toramaru (2008) report that various OZ patterns such as simple period, multi-period, and chaos-like patterns, are found in dacitic plagioclases of a rock sample. Since the diversity may provide information on heterogeneity of the magmatic environment or an occurrence condition of a chaotic behavior in the nonlinear system, the author considers that the quantitative evaluation of a variety of the OZ patterns is necessary to understand the origin of the OZ pattern.

A main purpose of this study is to clarify the variation of the dacitic plagioclases. The author make a presentation about an examination of the OZ patterns using spectral analysis.