Data fusion for mineral exploration

using fuzzy set theory

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In mineral exploration, new methods of fusion or integration based on computer approach allow multiple data sets to be processed and combined together, so that we discover what areas have higher possibility with respect to a given proposition or hypothesis. One of these new methods is a fuzzy set theory which was applied in this study. This theory enables non-discrete natural process or phenomena to be represented as mathematical formulas.

Several types of raw exploration data sets are compiled, digitized and converted to raster format for the study, in the Yemi district, Taebaek; I) geological maps, II) geochemical maps, III) total magnetic intensity map, and IV) gamma-ray spectrometer data. Each of data sets is assigned to a fuzzy membership function based on the model of skarn type (magnetite) deposit with respect to a given hypothesis, "there is an magnetite deposit closely related to skarn type in the study area.", and then fused together. In this study, we use several fuzzy operators such as fuzzy OR, fuzzy AND, fuzzy algebraic Product and fuzzy Gamma operator, with buffering the contact zones of granite and limestone with respect to the hypothesis so as to integrate data sets together. Final resultant map confirms that a known Fe skarn deposit, Shinyemi mine, is in accord with the area of high possibility.