Data fusion for mineral exploration
using fuzzy set theory

Chil-Sup So, Sungwon Choi*, Seon-Gyu Choi
Dept. of Earth and Environmental Science, Korea University,
Seoul, Korea, 136-701
TEL : 953-1676 FAX : 927-6180
E-mail: earthcom@cmrgis.korea.ac.kr

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.