MAPPING GOLD PATHFINDER METAL RATIOS IN NORTHERN NEVADA A COMPOSITIONAL ANALYSIS APPROACH

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ABSTRACT: The aim of this presentation is to evaluate a methodology developed by Braga, L.P.V., Porto, C. and Silva, F.J., based on the works of Pawlowsky-Glahn, V., and Olea, R. A., for mapping gold pathfinder metal ratios as a tool to reinforce geochemical signals. The area chosen comprehends the Carlin type gold deposits (CGTD) in northern Nevada. Carlin-type gold deposits are mainly hosted in sedimentary rocks, such as limestone, siltstone, argillite, and shale. Gold contained in them is micron-size, usually associated with arsenic-rich pyrite. One traditional exploration method for gold deposits is prospecting by tracing gold placers to their source. This has not worked in exploration for Carlin-type deposits because the gold particles are so small that detectable gold in placers is not present downstream. Regarding the difficulties of interpreting mineral exploration information and the absolute importance attached to it to find new deposits, a new approach for treating the soil data is introduced. It combines compositional analysis with geostatistical interpolation in order to highlight potential mineralized areas, in this particular case relevant to gold. Pathfinder elements associated with CGTDs have led to the discovery of several CGTDs such as Cortez, Jerrit Canyon and Goldstrike in Northern Nevada. By comparing the maps generated by the proposed methodology to known deposits sites we can point out the relevance of the procedure. The data were provided by an open report from the United States Geological Survey (USGS). The basic steps are:1. Exploratory analysis of the data; 2. Calculation of compositions; 3. Principal compositional component analysis; 4. Selection of subcompositions; 5. Modeling the logratio variogram; 6. Selection of balances; 7. Mapping the interpolation of composition represented by a chosen balance, the intensity of the signal is associated to gold mineralization. All the calculations were done with the package Compositions, in R. A pathfinder in geochemical exploration is a relatively mobile element that occurs in close association with an element or commodity being sought, but that can be more easily found because it forms a broader prospecting halo or can be detected more readily by analytical methods. A pathfinder serves to lead investigators to a deposit of a desired substance. This broad definition of a pathfinder element can be extended to the composition approach. The results show a favorable likehood regarding the use of balances as pathfinders in geochemical exploration. Nevertheless, other processes of validation must be carried out to confirm the use of metal balances as of significance to help define mineral targets.

KEYWORDS: COMPOSITIONAL ANALYSIS, CARLIN TYPE GOLD DEPOSITS, BALANCE PATHFINDERS