

## **APPLICATION OF ARTIFICIAL NEURAL NETWORKS TO MINERAL EXPLORATION**

TERUIYA,R.K.; MOREIRA,F.R.S.; CÂMARA,G.; MONTEIRO,A.M.V. and ALMEIDA FILHO,R. INPE, São José dos Campos, SP

This work presents an application of Artificial Neural Network (ANN) techniques to the generation of a favourability map of radioactive mineral occurrences in the Poços de Caldas Alkaline Complex - Minas Gerais, Brazil. We used a georeferenced database of the area with lithologic, structural and gamma-ray information, and compared the result with prospective maps generated by different methods, including Fuzzy Logic, Boolean and bayesian techniques. The integration of ANN with GIS was achieved by loosely coupling the SPRING GIS with the SNNS (Stuttgart Neural Network Simulator), both public domain packages. Data collection and visualization was done in SPRING and training, configuration and implementation of the neural net in SNNS. After several tests, the neural net that obtained best results had the following characteristics: a feed-forward configuration with resilient propagation algorithm; an entrance layer with four processing units (four maps: lithologic, structures, gamma-ray and circular structures); two intermediary layers with six processing units in each layer and an exit layer with one processing unit (map with predicted mineral occurrences). For the evaluation of the favourability map produced by the Artificial Neural Network, we used the methodology of bayesian (a posteriori) probability. The results compare very favorably with the best results obtained by traditional geocomputational methods, and indicate a great potential for the use of ANN in mineral prospecting.