Predictive mapping using self-organizing maps, Baie Verte Peninsula, Newfoundland, Canada: a case study

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The extraction of usable information from large multi-dimensional geoscience datasets has become a crucial issue as more and more data of different types are collected over the same area. Ideally, interpretation of these large datasets should take into account all types of data during interpretation in order to produce the most coherent interpretation. Visualization and interpretation methods commonly used to interpret geophysical data often rely on visual inspection by the interpreter. This is problematic when the number of datatypes exceeds three as the human brain has difficulty visualizing relationships at high dimensions. As such, new methods for discovering patterns in multi-dimensional geophysical datasets need to be investigated. Self-organizing maps (SOMs) are a class of unsupervised artificial neural network algorithm which are be used to cluster multi-dimensional data while preserving the overall topology of the original dataset. In this project SOMs are employed to cluster multi-dimensional geophysical data. As the geophysical signature of an area is strongly influenced by the local geology these clusters could be used to produced maps showing the similarity between data points which reflects the geology. The Baie Verte Peninsula is a region of complex geology associated with the Taconic orogeny. The area is host to base-metal and gold deposits both historically mined and currently in production. The peninsula has good regional geophysical data coverage (magnetics, gravity, radiometrics, and VLF) presenting a good case study for the application of SOMs to the production of predictive geological maps. Good regional geological maps exist of the Baie Verte Peninsula allowing the predictive maps produced through the SOM process to be evaluated both through visual inspection and quantitatively using a number of measures of clustering quality.

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