A proposed method for determining a magnetic textural index using polynomial regression in a moving window

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The interpretation of airborne regional magnetic data is a common practice when developing regional scale geological maps. Standard interpretation involves visual inspection of the magnetic data and products generated from the data by filters, like vertical and horizontal derivatives, upward and downward continuation, reduction-to-the-pole and analytical signal. The interpreter uses these products to subdivide a survey area into regions of different magnetic character. These kinds of methods are time-consuming and inherently subjective but useful. With the advent of automated interpretation techniques and artificial intelligence, the need to quantify the properties of magnetic data that humans use to form a geological interpretation is necessary. Many methods have been suggested for automated lineament detection through automated edge detection or edge enhancement. Less work has been done in developing quantitative methods for analysing the texture of magnetic maps. In this study, an approach using polynomial regression in a moving window to calculate a general magnetic texture index is investigated. A series of polynomial surfaces of increasing order are found that best match the set of magnetic data. The lowest order polynomial that matches the magnetic data sufficiently well is said to represent the complexity of the texture of the magnetic data. The order of the polynomial is then assigned as the textural index for the point at the centre of the moving window for which the index was calculated. In this way, the textural index correlates to the complexity, such that increased complexity will lead to an increased magnetic texture complexity. These indices can then be used to provide further information to computational interpretation algorithms. Case studies using magnetic data from the Baie Verte Peninsula, Newfoundland, and Mine Centre, Ontario, illustrate the success of the method.

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