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How do We Determine and Use Geochemical Background in Big-Data-Based Exploration?

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Understanding how to determine and use a background geochemical signature in a region, a stratigraphic interval, or within a set of outcrops is critical to unraveling whether any particular geochemical excursion is of geological and economic significance in mineral exploration. But what, exactly, does ‘background’ mean in this context? Is the background determined geographically? Is it bounded by structure or determined by the watershed in which the sampling occurred? Is the geochemical background narrow or widely ranging, and how do you determine what is outside the background signal? Although the concept of a geochemical background has been used for a long time, it continues to be poorly defined, and thus the use of the concept is highly uneven in the literature and in exploration programs. In this contribution, we examine the importance of background geochemical data in a number of different contexts, and we demonstrate that results are critical to determine the relevance of signal excursions from a baseline. We examine how properly evaluating the ‘background’ signature is important for robust mineral exploration and targeting, and how spurious positives or negatives can be avoided by systematic use of a background geochemical baseline range. This work has implications for everything from local to regional studies, and from classic geochemical analysis to cutting-edge machine learning.