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GIS-based mineral systems approach to mapping of prospectivity for surficial uranium deposits: a case study in British Columbia, Canada

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Although accounting for just 4% of the world's uranium resources, surficial uranium deposits attract much attention from the mining industry because they occur close to the surface and, therefore, are potentially more economical to mine. Surficial uranium deposits exist in south-central British Columbia of Canada [1] [3], but areas prospective for these deposits in the region have not been fully identified. A GIS-based mineral systems approach to regional-scale prospectivity mapping is applied in the region to identify prospective areas for further exploration of surficial uranium deposits.

GIS-based mineral systems approach to mapping of prospectivity for surficial uranium deposits was first demonstrated by Porwal et al. [4] in the Yeelirrie area of Western Australia, where surficial uranium mineralization is in the form of carnotite and hosted in calcretes [2]. In contrast, surficial uranium mineralization in south-central British Columbia is still ongoing and no uranium minerals exist (yet) as uranium is loosely bonded to sediments and easily remobilized, and there are no calcretes in the region [1] [3]. Therefore, the source-transport-trap system of surficial uranium mineralization in south-central British Columbia differs from that in Yeelirrie, and the approach to regional-scale GIS-based prospectivity mapping presented here is quite different from that in Porwal et al. [4]. An important feature in the south-central British Columbia is the availability of labile uranium data for potential source rocks [1] [3], and so a focus of this presentation is on how such data can be used in modelling and integration of spatial proxies of uranium source. Another focus of this presentation is on the analysis of efficiency of spatial proxies to predict prospective areas.

Initial results of analysis show that, in prospectivity mapping for surficial uranium deposits, it is important to integrate information about labile uranium content of potential source rocks, and this can be achieved through a modified fuzzy algebraic sum operation. In the study region, integration of labile uranium data for potential source rocks results in prospective areas with prediction rate that is significantly higher than if such data are not used (e.g., if unavailable). Initial results of analysis also show that slope is an inefficient spatial proxy of physical trap for surficial uranium mineralization, and so other spatial proxies suitable for regional-scale prospectivity mapping for surficial uranium deposits are desirable.

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