

## **Eocene Magmatism in the Subsurface of Southern Alberta: Aeromagnetic Expression and Implications for Hydrocarbon Exploration**

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### **ABSTRACT**

*New, high-resolution aeromagnetic anomaly data acquired over the Phanerozoic Western Canada Sedimentary Basin and underlying Archean Medicine Hat Block of southern Alberta reveal the presence of striking short wavelength anomalies that are clearly distinct from longer wavelength anomalies from sources within the basement. The most dramatic anomalies comprise a series of northwest-striking, linear features, up to 30 km long, between the towns of Milk River and Lethbridge. A second, less prominent, set of north-northeast-trending anomalies occurs south of the city of Medicine Hat. A ground magnetometer survey conducted over one of the anomalies south of Lethbridge indicated that the anomalies are real and cannot be attributed to cultural sources or artifacts of the acquisition program. Modeling of the anomalies suggests that their source lies within the sedimentary column at depths of ca. 250 m or less. The linear nature of the anomalies and their subparallel disposition in a "swarm" is similar to the aeromagnetic expression of mafic dyke swarms in the Canadian Shield. We believe that the southern Alberta anomalies represent dyke-like igneous bodies and further hypothesize that they are correlative with mafic potassic dykes of Eocene age exposed in the Sweet Grass Hills of southern Alberta and northern Montana. If correct, this hypothesis implies that dyke emplacement and associated extension, occurred over a broad region of southern Alberta and may represent an eastward continuation of the association of Eocene alkaline magmatism and extension observed in the southern Canadian Cordillera. Recognition of the orientation and age of Eocene extension may have important implications for understanding the formation of, and exploration for, hydrocarbon traps in the sedimentary section formed by post-Cretaceous fault movement and development of fracture porosity. Studies are presently underway to determine if these dykes extend into southwestern Saskatchewan.*