

RADARSAT Imagery: A New Way to Help Map Discharge and Recharge, Athabasca Oil Sands Area

Kevin P. Parks*

Alberta Geological Survey, Alberta Energy and Utilities Board
Edmonton, AB

Kevin.Parks@gov.ab.ca

and

Eric Grunsky

Alberta Geological Survey

Groundwater-resource studies benefit from maps of discharge and recharge areas. Even without wells, discharge areas are easy to locate, being characterized by low topographic position, positive surface-moisture balances, and anomalous geochemistry. Recharge areas are more difficult to map without wells because their negative surface-moisture balances are indistinguishable from areas with high local rates of evapotranspiration. As well, recharge may happen only seasonally or episodically, like during storm events. Because of these difficulties, hydrogeologists seeking to quantify groundwater balances in resource assessments where discharge-recharge maps don't exist must resort to applying uniform, constant recharge rates over all non-discharge areas to balance the more easily definable and mappable groundwater discharge.

Radarsat imagery may offer a new way to map discharge and recharge areas, especially in remote areas like the Athabasca Oil Sands Area. Radar reflectivity of the land surface is largely controlled by the dielectric constant, itself a function of moisture content, as well surface texture, roughness, relief, and other factors. By processing radarsat data from the Athabasca Oil Sands Area with statistical techniques, the AGS has documented patterns that appear from aerial reconnaissance to be correlative with surface-moisture content. Further processing of the imagery is underway to account for the contributions of elevation, relief, surficial geology, and vegetation to the imagery. Such integrated analysis may allow us to identify and map recharge and discharge areas for future monitoring in this large and remote area undergoing rapid oil-sands development.