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Examining the geochemistry of the Athabasca Oil Sands Region: towards dynamic modeling of acid-sensitive landscapes

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Northern Alberta, Canada is experiencing proliferation of industrial activity owing to the large-scale exploitation of the vast energy reserves. Much of this activity is concentrated in the Athabasca Oil Sands Region, where sulphur and nitrogen emissions have increased substantially over the last 40 years and are expected to be sustained at high levels during most of this century. Large tracts of land in this area have been identified as acid-sensitive; however, the terrain is highly heterogeneous, lake catchments are often ill-defined, peatlands occupy a significant area (30-50%), and regional and local (connectivity within catchments) hydrologic influences are not well understood. Extensive regional sampling of this remote area has revealed spatial chemical variability of soils and of peatland surface waters. A catchment-scale dynamic acidification model (MAGIC: Model of Acidification of Groundwater in Catchments) will be applied at different spatial scales in order to address this heterogeneity and predict the environmental response to estimated acidic deposition.