

Geothermics of the Phanerozoic Strata of Saskatchewan

Tibor Lengyel¹ and Ben Rostron¹

Abstract

Knowledge of the subsurface thermal conditions of Saskatchewan is needed for projects like geothermal energy exploitation, exploration for hydrocarbons, variable density flow mapping, and CO₂ sequestration. Thus a geothermal mapping study was initiated by the government of Saskatchewan within the framework of the Saskatchewan Phanerozoic Fluids and Petroleum Systems assessment project.

Industrial and scientific data (temperature, thermal conductivity) were compiled and used to re-evaluate the geothermal conditions of the Phanerozoic strata in Saskatchewan. To start, temperature data were assembled from diverse and previously un-utilized sources. Then, erroneous measurements were identified and culled. Next, the retained temperature values were mapped for various depths, elevations and major hydrostratigraphic units.

Subsurface temperature values in Saskatchewan increase with depth from 5°C to over 100°C between the surface and the Precambrian basement. Geothermal gradients vary between 10°C/km and 40°C/km across the province. Temperature values over 100°C were identified in southeastern Saskatchewan, in the deepest part of the basin. Depth and elevation specific temperature maps highlight several anomalous temperature highs in the shallower layers throughout southern Saskatchewan. Previous studies identified positive geothermal anomalies along the outcrop edge of the basin. However, these anomalies were not observed on the maps produced from the processed data and were deemed to be data processing artefacts.

This study provides a new, detailed, and accurate characterization of the geothermal conditions of Phanerozoic strata of Saskatchewan. These results are usable in future scientific and industrial investigations, such as subsurface basin modeling studies and possible geothermal energy exploitation in the deepest parts of the basin.

¹Geology Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, Canada

Tibor Lengyel obtained his B.Sc. in Earth Sciences from Eötvös University, Budapest with a thesis focusing on geothermal conditions of a part of Hungary. He is currently working in the Department of Earth and Atmospheric Sciences, University of Alberta under the supervision of Dr. Ben Rostron; this presentation focuses on research undertaken for his M.Sc. thesis. His primary areas of interest are geothermics and subsurface fluid flow.