North Dakota’s Precambrian basement consists of various igneous and metamorphic rocks (e.g., granite and schist) that underlie the oil and gas bearing sedimentary layers of the Williston Basin (Fig. 1). Many of the significant structures within the Williston Basin (e.g., Medicine Anticline) formed through basement block faulting.

Beginning in the early 1960s, six different studies have produced 35 radiometric ages from 16 Precambrian basement samples from across North Dakota (Table 2). The first radiometric dating study that included North Dakota was completed by Burwash et al. (1962), while the last similar study was completed by Sims et al. (1991). Sims et al. (1991) recalculated several of the previously published ages, and reviewed most of the radiometric ages from North Dakota’s Precambrian basement.

Beginning with the radiometric age system published by (1962), this chronological subdiscipline and the geologic history of a rock sample, a radiometric age may correlate with one of several types of geologic events, including: initial crustal formation or crustal-extraction (e.g. Sm-Nd whole rock ages), metamorphism (e.g. U-Pb zircon ages), or exhumation (e.g. Rb-Sr whole rock ages). Rb-Sr ages tend to be insignificant because the Rb-Sr radioactive isotopic system tends to reset during many geologic events, including: high-temperature events, metamorphism, and exhumation (uplift and erosion). Fission Track ages are considered insignificant because the analyzed samples were collected from depths below the fission track closure depth (Nesheim, 2011).

The various radiometric ages produced from North Dakota’s Precambrian basement reveal several significant, widespread geologic events. North Dakota’s Precambrian basement consists of pieces of crust that formed separately between 2.2 and 2.9 Ga (billion years ago) before being accreted (merged) together (Figs. 2-4) (Sims et al., 1991). Eastern North Dakota last underwent regional metamorphic-tectonic activity during the Trans-Hudson Orogeny at 1.8-1.6 Ga (Figs. 2-3) (Sims et al., 1991). For the purpose of this presentation, the history of a rock sample, a radiometric age may correlate with one of several types of geologic events, including: initial crustal formation or crustal-extraction (e.g. Sm-Nd whole rock ages), metamorphism (e.g. U-Pb zircon ages), or exhumation (e.g. Rb-Sr whole rock ages).

Fissile Track ages are considered insignificant because the analyzed samples were collected from depths below the fission track closure depth (Nesheim, 2011). Fission Track ages are considered insignificant because the analyzed samples were collected from depths below the fission track closure depth (Nesheim, 2011). Fission Track ages are considered insignificant because the analyzed samples were collected from depths below the fission track closure depth (Nesheim, 2011).