# Variations of the $\delta^{81}Br$ and $\delta^{37}Cl$ stable isotope signature for pre-Mississippian formation waters of the Williston Basin

O. SHOUAKAR-STASH[1], S.K. FRAPE[1], B.J. ROSTRON[2] AND R.J. DRIMMIE[1]

[1] Department of Earth Sciences, University of Waterloo, 200 University Ave. W., Waterloo, Ontario, Canada N2L 3G1; orfan@uwaterloo.ca, shaun@uwaterloo.ca, rdrimmie@uwaterloo.ca

[2] Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, Canada T6G 2E3; Ben.Rostron@UAlberta.ca

Sixty five brine samples were analyzed from the central part of the Williston Basin from different pre-Mississippian formations. The formations range in age between 360 million years (Upper Devonian) and 500 million years (Cambrian). The chemical composition and the isotopic signatures ($^{2}H$, $^{18}O$, $^{37}Cl$ and $^{81}Br$) of these samples were determined.

The $\delta^{81}Br$ values obtained for these formation waters ranged between -1.50‰ and +2.83‰ relative to SMOB. The $\delta^{37}Cl$ values ranged between -0.74‰ and +0.47‰ relative to SMOC. The Upper Ordovician, Yeoman, formation waters showed the most depleted values for both $\delta^{81}Br$ and $\delta^{37}Cl$, while the Upper Devonian, Bakken, formation waters showed the most enriched values for both isotopes.

The comparison of the $\delta^{81}Br$ versus time (Figure 1) provides a curve that suggests a systematic temporal variation of seawater $\delta^{81}Br$ signature. The compraison between the obtained $\delta^{37}Cl$ values versus time also illustrates a similar trend. The temporal variations for the $\delta^{81}Br$ values are more pronounced in comparison to the variations in the $\delta^{37}Cl$ values.

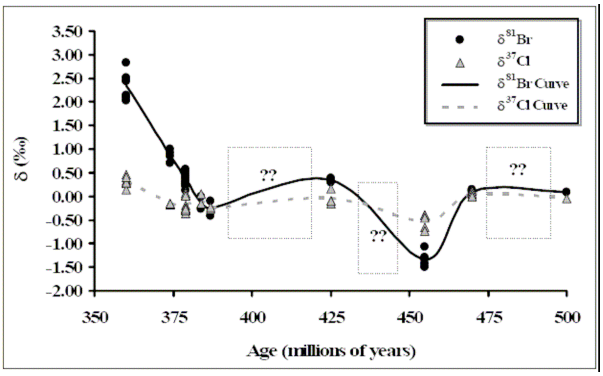


Figure1: $\delta^{81}Br$ and $\delta^{37}Cl$ versus time of the pre-Mississippian formation waters of the Williston Basin. Solid line represents the temporal variation curve of $\delta^{81}Br$. Dotted line represents the $\delta^{37}Cl$ variation curve.