Tracing fluid retention in gas shales using noble gases.

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INTRODUCTION

Noble gases are used in the field of hydrocarbons, focussing on the analyses of gas samples [1,2]. We measured He, Ne, and Ar concentration and, $^{40}Ar/^{36}Ar$, $^{4}He/^{40}Ar^{*}$ (where $^{40}Ar^{*}$ is radiogenic ^{40}Ar) and $^{20}Ne/^{36}Ar$ in shales from two cores of Haynesville-Bossier (HB) formation, studied for their carbon isotopic composition [3]. Five samples from 3490-3540 m were analysed from core 1, and seven from 3540-3726 m for core 2.

RESULTS AND DISCUSSION

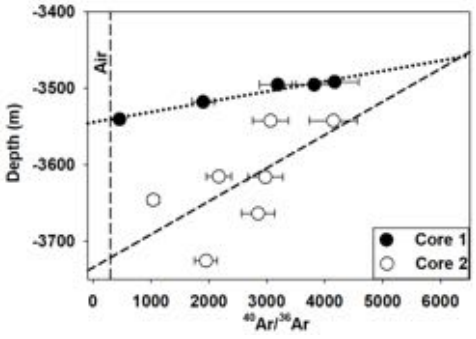

Figure 1 Decreasing $^{40}Ar/^{36}Ar$ with increasing depth in shales from HB formation, East Texas Basin.

The Measured porosity in both cores show an increasing trend with depth that cannot be explained by mechanical compaction during burial. Change in porosity can be a consequence of mineral dissolution, and/or precipitation or, related to the occurrence of over pressured zone.The $^{40}Ar/^{36}Ar$ ratios are above air value indicating presence of crustal fluids. The $^{4}He/^{40}Ar^{*}$ and $^{20}Ne/^{36}Ar$ ratios deviate from unfractionated values. The $^{40}Ar/^{36}Ar$ ratios show a correlated trend with depth (Figure 1) and may be related to changing porosity.

[1] Hunt *et al.* (2012) AAPG Bulletin **96(10),** 1785-1811. [2] Byrne *et al.* (2018) GCA **241,** 240-254. [3] Basu *et al.* (2018) Energy Procedia **146,** 47-52.