

Fraser Keppie

Biography

Dr. Fraser Keppie has been employed as a geologist with the Geological Services Division, Department of Natural Resources, Nova Scotia, since 2010. His initial research and mapping in Nova Scotia is focused on compiling and extending tectonic models for the assembly and breakup of Pangea, with an emphasis on understanding the mechanisms of formation and evolution of the Devonian-Carboniferous Maritimes Basin and its hydrocarbon potential. Prior to 2010, Fraser completed undergraduate degrees in geology and computer science at St. FX and Acadia Universities, respectively, a doctoral degree in tectonics at McGill University, and a post-doctoral appointment at Caltech in geodynamics. Previous research directions have included understanding forearc removal processes at subduction zones, and evaluating tectonic models for the opening of the Gulf of Mexico and the origin of the Caribbean Plate.

Presentation Abstract: Implications of Pangean tectonics for onshore hydrocarbon exploration in Nova Scotia

Much of the onshore hydrocarbon exploration in Nova Scotia focuses on geological models for the formation and evolution of the several Devonian-Carboniferous sub-basins preserved on the Avalon and Meguma basements. Broadly, such models are developed by identifying basin-specific reconstructions for: (1) how the late stages in the assembly of Pangea led to the deposition, subsequent deformation and erosion, and thermal maturation of Horton and Windsor Group stratigraphy, (2) how Windsor salt may have migrated subsequently due to gravitational instabilities or tectonic triggers, and (3) how rifting during the break-up of Pangea may have introduced tectonic permeability into basin strata. In this context, new mapping in the key example of the Kennetcook sub-basin in central Nova Scotia has advanced our understanding of key exploration parameters. For example, duplication of source and reservoir rocks appears to have taken place during localized Alleghenian thrusting (ca. 320-310 Ma), and potential structural traps may have been developed during regional Alleghenian shortening (ca. 325-275 Ma). Deformation contemporaneous with Fundy Basin rifting may have played a role in the formation or re-activation of a NW-SE trending fault network across Nova Scotia which has implications for the localization of fluid migration. Equivalent events may be expressed elsewhere.