The Western Canada Sedimentary Basin energy wells: $\delta^{13}$C gas isotopic mapping, from production to ground migration

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Despite the emerging new technology in renewables, society still relies overwhelmingly on fossil fuels for energy. Overall, data indicate that there is an increase in natural gas production as a less expensive, more “environmentally friendly” and efficient resource. $\delta^{13}$C studies are a standard tool to understand the origin, migration and mixing of natural gases. In the Western Canada Sedimentary Basin (WCSB), which is a major hydrocarbon producer, the isotopic variability of formations gases have been well characterized (i.e., Tilley and Muehlenbachs, 2006). Industry implements such information for predicting where economically substantial amounts of natural gas form. Ethane isotopic fingerprinting is more diagnostic of such thermally matured gases. Thus, it is a useful tool to identify unwanted fugitive gas emissions associated with petroleum resource development and activities. In an initiative to better understand, constrain and ultimately mitigate this historic engineering challenge, we contoured the isotopic values of 2800 SCV wells and 1200 GM, and used the production data to identify the source of gas emissions. Our outcomes are not only valuable to industry, but also to regulatory agencies to increase awareness about the use of organic (e.g. n-alkanes) and inorganic (e.g. $\text{CO}_2$) carbon isotope fingerprinting as retrospective environmental indicators at a local and regional scale.

Reference: