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Adapting Hydrocarbon Exploration Data Workflows for Geologic Light Gases

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Introduction

Legacy geological information and knowledge from hard copy reports and early field mapping efforts has always been an integral part of oil and gas exploration data workflows. Even as embedded data workflows methodologies have become more digital and more focused on delivery to advanced data platforms such as generativeAI, the need to integrate data across scales and vintages remains critical. As the energy sector continues to diversify and tap into more sustainable and low-carbon energy sources using naturally occurring geologic resources such as hydrogen and helium, we present best practices for meeting the challenges and creating opportunities from data workflows that can be adapted to exploration in the era of the subsurface as a multi-resource asset.

Method and Theory

We have developed a standards-based platform for finding, accessing, and interoperating with digital data in traditional hydrocarbon exploration workflows. Much of the data used for basin scale and and frontier exploration is necessarily sourced from legacy data sets that may require extensive effort to digitize, standardize, index and curate before they are suitable for use by modern cloud based data technologies. In the context of energy diversification, we wanted to test these workflows for their effectiveness in accessing data types directly relevant to exploring for reservoirs of naturally occurring light gases hydrogen and helium. We worked with legacy data including well site reports and mud logs that in some cases contain handwritten references to inert gases in wellbores, and with field mapping studies that may mention semi-circular surface depressions with vegetation changes, now recognized as potential surface manifestations of natural hydrogen seeps.

Results and Conclusions

We found that established and embedded data workflow methodologies were well suited to working with exploration data for naturally occuring geologic traps of light gases. Established best practices for ingestion, curation and delivery of legacy data sets allow existing geological knowledge to be integrated with modern techniques such as high resolution geology, geophysics, and geochemical data to high-grade exploration targets and make curated data available to advanced data integration and analysis tools such as generative AI.