

ISOTOPIC AND GEOCHEMICAL MONITORING IN UNDERGROUND GAS STORAGE, UGS DIADEMA-ARGENTINA

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The Diadema field is located 40 km northwest of the city of Comodoro Rivadavia on the northern flank of the San Jorge basin, Argentina.

A gas-bearing layer known as “Banco Verde” horizon, which pertains to the Cretaceous-Tertiary Salamanca Formation, occurs among various hydrocarbon-producing horizons, at an average depth of 500 meters below surface. Gas was produced from the Banco Verde horizon approximately between 1950 and 2000. During that period of time, reservoir pressure dropped from 25 bar (initial pressure) to about 5 bars. A portion of the depleted gas reservoir was then converted for natural gas storage purposes.

Gas storage operations are carried out in the so-called Repsol-YPF licensed block. Nine operation wells are used for gas injection and withdrawal. Gas is injected into the reservoir during summer using the gas pipeline pressure. Then, it is withdrawn during winter and sent back to the pipeline using compressors.

Due to the presence of hydrocarbons in the aquifers occurring above the Underground Gas Storage Diadema (UGSD), geochemical and isotopic determinations were performed to determine the source and monitor the proportions of the mixture of native gas and stored gas. Original reservoir gas, gas injected into the storage facility, gas occurring in overlying aquifers (Río Chico and Patagonia Formations), and gas from oil reservoirs occurring beneath UGSD were sampled.

This paper shows the results of three works performed during 2003/06, which are as follows:

- Combining isotope composition with molecular ratios, the different components involved can be clearly differentiated (Figure 1).
- Gas occurring in the Patagonia Fm. is methane and its maximum concentration is 6.55% molar.
- The molecular and isotopic fingerprint of gas samples is typical of thermogenic gases associated with oil and gas accumulations.

- CO₂ isotope composition combined with molar ratios in sampled gas has played a key role to determining potential leakage into aquifers or other gas-bearing horizons (Río Chico Fm.).
- The results show no evidence of gas migration from UGSD into the Patagonia and Río Chico Fms. aquifers.
- Isotope composition has been found to vary with time in the injection-area wells due to the mixture of original and injection gas.

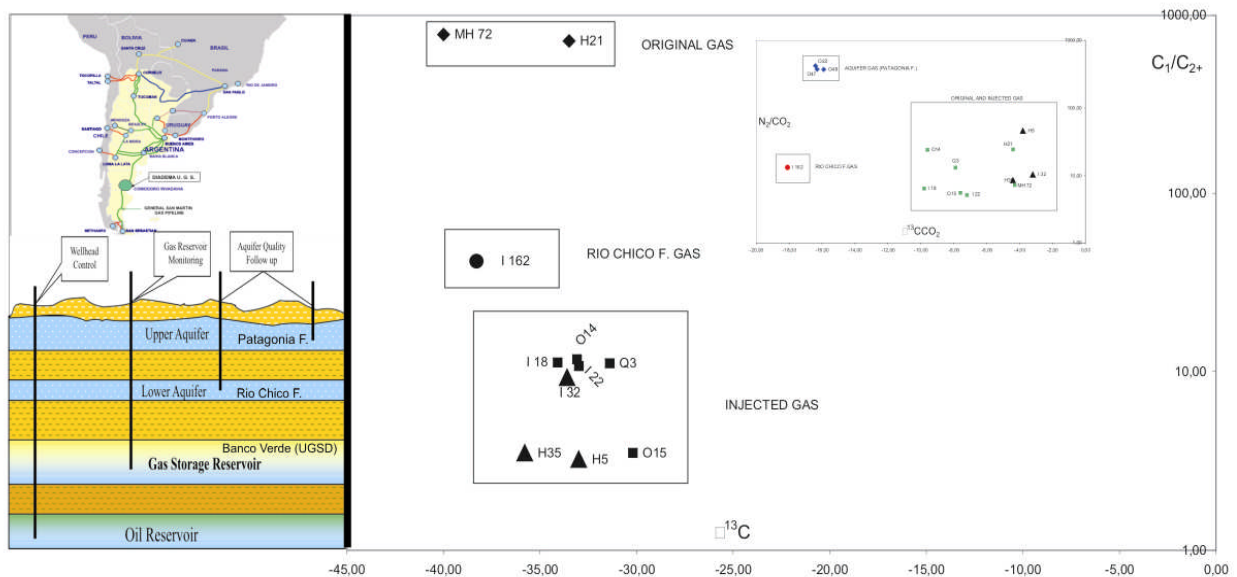


Figure 1. Location map, geological sketch and bivariate plots (C_1 vs. C_2+ vs. $\delta^{13}C_{CH_4} - N_2/CO_2$ vs. $\delta^{13}C_{CO_2}$ (insert). Original, injected, and aquifer gas fields recognized.

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