

Compositional and noble gas isotope banks in two phase flow: Changes in gas composition during migration

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We use experimental results, theoretical models, and existing field data to determine whether hydrocarbon gas will show any appreciable change while migrating a distance greater than 1km. Theoretical two-phase gas displacement models predict that volatile gas components will become enriched at the front of gas plumes, leaving the surrounding residual water stripped of dissolved gases, and the first arrival of natural gas enriched in light hydrocarbons and transported noble gases.

In combination with analytical models, we present results of experiments investigating these processes. We use a 1m long, 1cm diameter packed with glass beads and saturated with water containing a dissolved gas species. We then displace this water with a gas mixture, and measure the effluent gas concentrations.

Experimental results agree with theory and field observations, and show that compositional and isotope changes during gas migration must be considered when identifying gas sources.