

Chris J. Ballentine, University of Manchester, Manchester, United Kingdom

### **New Developments in Reservoir-Scale Noble Gas Isotope Techniques**

Noble gases from different sources (groundwater, radioactive decay in the crust, magmatic systems) have a unique isotopic fingerprint. Combined with their chemical inertness, these tracers have provided information about regional fluid sources, groundwater involvement during transport, and in some cases relative time of fluid interaction. There are now several case studies, presented here, that provide detail at the reservoir scale. Information available includes identifying reservoir compartments whose fluids have had different interaction with the groundwater system, the ability to quantify the amount of groundwater 'seen' by the hydrocarbon phase in these compartments (e.g. Magnus Oil field, North Sea) and most recently placing dates on the age of the associated groundwater in different sections of the field (e.g. San Juan Basin coal bed methane field, NM). Combined with stable isotopes, noble gases uniquely enable different sources of non-hydrocarbon gases (e.g. N<sub>2</sub> and CO<sub>2</sub>) to be resolved at the reservoir scale (Hugoton-Panhandle giant gas field, Texas-Oklahoma-Kansas). In the case of magmatic CO<sub>2</sub>, they also enable the amount of carbon precipitation out of the gas phase to be quantified (Bassett-Brown Gas Field, Val Verde Basin, Texas; Bravo Dome CO<sub>2</sub> field, NM).