PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

General Discussion

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General discussion

I. Hutcheon. Why is there any pore space left in sandstones?

D. Emery. Pore space remains in the Magnus Field because hydrocarbons have prevented further cementation (although this does not always prevent diagenesis).

J. P. B. Lovell. I worry about these rapid diagenesis rates. How can such vast volumes of fluids be got through the system to effect diagenetic precipitation in such a short time?

D. Emery. Rapid burial diagenesis (10 Ma) has been confirmed by other studies; not only for quartz but for illite as well (Southern North Sea). I disagree that the problem is continuous through flow; it is more likely to be in our understanding of mineral solubilities.

D. P. McKenzie. What is fast? What is slow? Is it a problem that you need to know how much fluid goes through the system? It seems to be quite permeable.

R. K. O'Nions. The Pannonian Basin system presents no problem. Water is not the only carrier for noble gases; transport may be effected with N_2 and CO_2, which move much faster.

P. Aagaard. The present hydrodynamic situation (high meteoric flow) in the Pannonian, Vienna and Po basins probably makes them poor analogues for petroleum reservoir traps at the time of filling. This is born out by the Jurassic reservoirs of the North Sea Basin, which were covered by Cretaceous–Tertiary sediments during post-Cimmerian subsidence and effectively isolated from meteoric water ingress. In the context of the amount of water flow required to explain sandstone diagenesis, our group in Oslo (Knut Bjorlykke, myself and co-workers) believe that, in the major phase of diagenesis (apart from the early post-depositional and the Cimmerian rifting/uplift phases), large scale fluid flow is not involved. The diagenetic alteration can be mostly explained by nearly closed system behaviour.

D. Emery. Within the Magnus system, most reaction probably was closed system, with the exception of silica.

A. C. Aplin. For quartz cementation, you need 0.5 million pore volumes of water through the system and this does present problems. From $\delta^{18}O$ studies, it seems that North Sea fluids are highly evolved. Present-day fluid inclusions are heterogeneous.

K. V. Ragnarsdottir. Why does quartz govern the solubility of silica? Amorphous silica is important in hydrothermal systems; it is much more soluble than quartz.

P. Aagaard. Analysis of formation water gives values close to saturation with quartz.

P. Ortoleva. Why is not the quartz derived from pressure solution?

D. Emery. Evidence from the reservoir (SEMCL) shows that contacts/sutures comprise boundaries from the cement, not pressure solution. Deeper down, there is a greater probability of pressure solution contributing silica. In the reservoir itself it can be ruled out apart from a few silty quartz stringers.