3.3.P03

Geochemical and microstructural features of fault-related fluids in the western Sichuan foreland basin, China

DONG JIA, ZHUXIN CHEN, YIKUN ZHANG AND QIANWEI HU

Department of Earth Sciences, Nanjing University, Nanjing 210093, P.R.of China (djia@nju.edu.cn; dg0329014@ymail.nju.edu.cn; yikun_z@hotmail.com hu-qian-wei@163.net)

This paper aims at some typical fault-bend folds and fault-propagation folds in the western Sichuan foreland basin, and investigate the isotopes and element-geochemistry of crack-filled mineral veins (asphalt, calcite and quartz) and fluid inclusions, help to judge the features, sources and flow pass ways of paleo-fluids. By means of the labor of interior structures of fault zone and the quantitative statistics of micro-fractures, we confirm the characteristics of fault zone fabrics of the step-thrusts and estimate the fault-sealing capacity in different segments of flats and ramps. The tectonic stress field can be established by way of fluid-inclusion planes (FIP) measurement. The integrate analyses of interactive dynamic mechanism between the fluid flow and fault slip, can open out the migration behaviors and accumulation rules of fault-related fluids in the developing processes of fault-bend folds and fault-propagation folds. These research work can be provided with the theoretic significance of fault/fluid interaction, as well as redound to understanding of the hydrocarbon exploration in the foreland fold-thrust belt of western China. This study was financially supported by NSF of China (Grant No. 40372091).

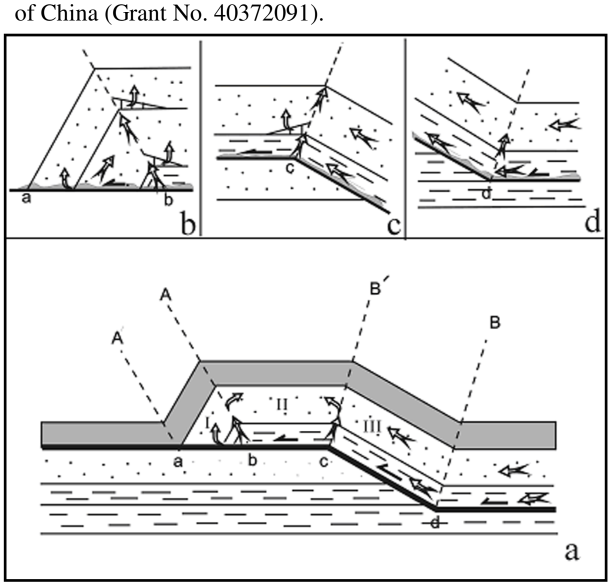

Figure 1 Fluid migration behaviors in fault-bend fold

3.3.P04

Importance of immiscible CO_2-H_2O fluids for geochemical processes in low to moderate temperature crustal environments

J.P. KASZUBA[1], L. WILLIAMS[2], D.R. JANECKY[3] AND W.K. HOLLIS[2]

[1] LANL, MS J514, Los Alamos, NM 87545 (jkaszuba@lanl.gov)
[2] LANL, MS E537 (williamsl@lanl.gov; hollis@lanl.gov)
[3] LANL, MS J591 (janecky@lanl.gov)

The significance of a single CO_2-H_2O fluid phase is well known for metamorphic systems, whereas CO_2-H_2O fluid immiscibility is explicit in fluid inclusion literature, especially regarding the genesis of hydrothermal ores. In addition, the CO_2-H_2O system exhibits complex multiphase behavior over wide temperature and pressure ranges overlapping other important geochemical processes that have not been broadly evaluated. The critical curve of the CO_2-H_2O system has a minimum critical temperature at ~265° C at a pressure of ~2150 bars. From this point (the saddle or bifurcation point) the system separates into three regions. At pressures below ~2150 bars and up to the critical temperature of water (374.2° C), two phases - a supercritical fluid rich in CO_2 and a liquid rich in H_2O - exist in equilibrium. At temperatures and pressures above the saddle point, a second region of two supercritical fluids (behavior known as gas-gas phase equilibrium) exists. Single-phase CO_2-H_2O supercritical fluid exists in the region between these two boundaries. Although evidence for multiphase behavior above the saddle point has not been recognized in geologic samples, relevant geochemical processes may occur at these pressure-temperature-X_{CO_2} conditions.

In addition to liquid-like density and solvent strength, supercritical CO_2-rich fluids possess contrasting gas-like transport properties of diffusivity and viscosity. These characteristics may result in faster diffusion of solutes into or out of complex geometries than is possible in aqueous systems. Coupled with the potential to dissolve and redistribute metals as organometallic compounds, supercritical CO_2 fluids bring added complexity to fluid-rock systems. Therefore, it is reasonable to ask whether evidence of previously unrecognized multiphase fluid-rock reaction processes occurs in the crust. Of many possible examples to explore (*e.g.*, clay desiccation, diagenetic and post-diagenetic silicate reactions, origin/distribution of carbonate cements in sedimentary basin sandstones, anthropogenic CO_2 injection, and quartz-carbonate vein systems), re-crystallization in the distal margin of a metamorphic aureole in silicious dolostone provides a system in which interaction between two disparate CO_2-H_2O fluid phases controls water activity and the progress and distribution of metamorphic hydration reactions.