Study on diagenetic environments of calcite veins hosted in marine carbonate rock in middle Yangtze region of Southern China

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Thin slices suggest that calcite veins hosted in marine carbonate rock of appearing locating in middle Yangtze region of southern China develop two crystal forms including radiaxial calcite and isometric structure calcite in Triassic, and isometric structure calcite can be identified of calcite veins in Permian and Ordovician. And some calcite veins develop double-crystal pattern.

Cathodeluminescence document that different structure calcite veins show different luminous intensity in Triassic which can identified three periods of calcite veins, and luminous intensity has no different between calcite veins and surrouding rocks in Permian and Ordovician with medium orange to dark light.

Carbon-oxygen isotopes of calcite veins show that The range of $\delta^{13}C$ is -6.76 ‰ ~ 4.01‰(PDB), $\delta^{18}O$ is -17.95‰ ~ -5.67‰(PDB) in calcite veins, which indicates that calcite veins deposit in marine phreatic environment and mixing phreatic environment. Calcite veins in Triassic are sedimentary origin, and part of calcite veins in Permian and Ordovician suffer latter diagenesitc fluid dissolution. Fluid generating from organic-matter maturation effect the information of calcite veins in Permian to some degree.

Tectonothermal evolution of the Triassic flysch in the Songpan-Garzê orogen, Eastern Tibetan plateau

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Low temperature metamorphic indicators give an insight into the tectonothermal evolution of the Triassic flysches in the Songpan-Garzê orogen, eastern Tibetan plateau. The Triassic flysches experienced large-scale folding, faulting and a thermal overprint from diagenesis to lower greenschist facies. Maximum metamorphic conditions were 380 ± 25ºC and low to intermediate pressures. Iso-thermal zones mapped with illite crystallinity (IC) describe following relationships between thermal zones and fold axes, faults and strata boundaries: i) anchizonal boundaries run across strata boundaries and fold axes indicating the main folding of the flysches occurred prior to metamorphism; ii) large-scale faults make boundary offsets in thermal zones suggesting the structural movement along the Longmenshan (LMS) and the Xianshuihe faults took place after low grade metamorphism.

From NW to SE, the Triassic flysches in the Songpan-Garzê orogen show a complex pattern. From this pattern a general increase in grade towards the LMS fault belt and across the LMS fault belt, greenschist facies rocks on its NW side are juxtaposed to diagenetic rocks in the Sichuan basin on its SE side. This juxtaposition is marked by IC jumps of 0.23°Δ2θ in SW of LMS, 0.40°Δ2θ in the Middle and 0.66°Δ2θ in NE of LMS. Across the Xianshuihe fault, the truncated IC zones within the flysches suggest a total offset of roughly 60 km due to post-metamorphic sinistral strike-slip.

Compression at the end of the Triassic induced by the interaction of the South China, North China and the North Tibetan blocks caused the closure of the Paleotethys ocean and led to folding of the flysches within the Songpan-Garzê basin. Very low to low grade metamorphism may have been caused by the increase in thermal gradient due to large-scale magmatic activity in the Jurassic. FT ages reveal Early to mid-Cretaceous exhumation. Finally the India–Asia collision caused the formation of the Longmenshan fault and the Xianshuihe strike-slip fault in the early Tertiary and disturbed the distribution of metamorphic zones.