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鄂西南利川三叠纪须家河组地球化学特征及其对风化、物源与构造背景的指示

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摘要：

鄂西南利川地区三叠纪须家河组砂岩碎屑颗粒富石英(Q),贫岩屑(L)与长石(F),平均值分别为:76.23%、7.08%与4.88%,Q/(Q+F+L)平均值为0.86,具有锆石-板钛矿-磁铁矿-电气石重矿物组合,指示源岩以酸性岩或低级变质岩为主。砂岩主量元素SiO_2含量高(77.14%~92.79%,平均84.14%),Al_2O_3次之(3.86%~14.15%,平均9.69%),$(Fe_2O_3^T+MgO)^*$(0.98%~3.20%,平均1.50%)、TiO_2^*(0.09%~1.09%,平均0.39%)含量低,Al_2O_3/SiO_2比值低(0.04~0.18,平均0.12),K_2O/Na_2O比值高(4.90~82.41,平均40.01),最接近被动大陆边缘特征值。样品具有与上地壳相似的高场强元素与大离子亲石元素组成,ΣREE分布于62×10^{-6}~495×10^{-6}之间,平均181×10^{-6},球粒陨石标准化配分型式与上地壳极为相似,呈现轻稀土富集、重稀土平坦、中度Eu、Ce负异常特征,特征微量、稀土元素含量及比值,如:Th、La、Ce、Rb/Sr、Th/U、La/Sc,指示了晚三叠世构造背景为被动与活动大陆边缘。样品成分变异指数ICV均<1(0.18~0.68,平均0.45),指示物源主要为再循环的沉积物,而沉积物再循环会导致粘土矿物比例增加,从而使化学风化指标CIA值得到累积。较高的CIA值(72.10~96.28,平均81.18)表明沉积物累积经历的化学风化作用强烈,而CIA与ICV强烈负相关,则表明CIA值的变化主要是由不同时期输入碎屑物成分不同引起的。结合物源、构造背景判别图解,上述特征综合表明研究区须家河组形成于被动大陆边缘(为主)与活动大陆边缘环境,其物源来自东南的雪峰隆起区(为主)与北侧的秦岭造山带。

英文摘要：

Petrography, major, trace and rare earth element compositions of clastic rocks from Upper Triassic Xujiahe Formation, Lichuan area, southwestern Hubei Province, have been investigated to determine their weathering condition, provenance and tectonic setting. All sandstone samples are enriched in quartz (average 76.23%), but poor in lithic fragment (average 7.08%) and feldspar (average 4.88%). The mean value of Q/(Q+F+L) is 0.86. Heavy mineral assemblage constituted by zircon, brookite, magnetite and tourmaline supported an acidic or low-grade metamorphic source. The sandstones are characterized by high SiO_2 (77.14%~92.79%, average 84.14%), Al_2O_3 (3.86%~14.15%, average 9.69%) content, low $(Fe_2O_3^T+MgO)^*$ (0.98%~3.20%, average 1.50%), TiO_2^* (0.09%~1.09%, average 0.39%) content, low Al_2O_3/SiO_2 (0.04~0.18, average 0.12) and high K_2O/Na_2O (4.90~82.41, average 40.01) ratio, which is similar to the characteristic of passive continental margin. High field strength and large-ion lithophile elements contents in sediments from Xujiahe Formation are similar to that of the upper crust. ΣREE contents of clastic rocks are 62×10^{-6}~495×10^{-6} with an average of 181×10^{-6}, ΣLREE/ΣHREE ratios are 7.74~18.27 with an average of 13.51. As similar to upper crust REE pattern, chondrite-normalized REE patterns of samples show enrich LREE, flat HREE, moderate Eu (Eu/Eu^*=0.53~0.79, average 0.61) and Ce (Ce/Ce^*=0.55~1.09, average 0.79) negative anomalies. Part characteristic contents and ratios of trace and rare earth elements in sandstones, such as: Th, La, Ce, Rb/Sr, Th/U and La/Sc, hinted that the tectonic background were passive and active continental margin. Compositional variation index ICV (0.18~0.68, average 0.45) implied the source material were mainly recycled sediments. Sediment recirculation could cause clay minerals increased, then make CIA (chemical weathering index) accumulated. The value of CIA (72.10~96.28, average 81.18) demonstrated that these sediments accumulatively experienced intense chemical weathering. Meanwhile, strong negative correlation between CIA and ICV indicated that the variation of CIA is mainly caused by clastic input with different composition during sedimentary period. In combination with provenance, tectonic discrimination diagrams, these characteristics all above suggested Xujiahe Formation deposited under tectonic settings of passive (main setting) and active continental margin, and its provenances were from Xuefeng paleo-uplift area (main source) and Qinling orogenic belt.

关键词：碎屑岩 地球化学 风化作用 物源 构造背景 须家河组 鄂西南

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