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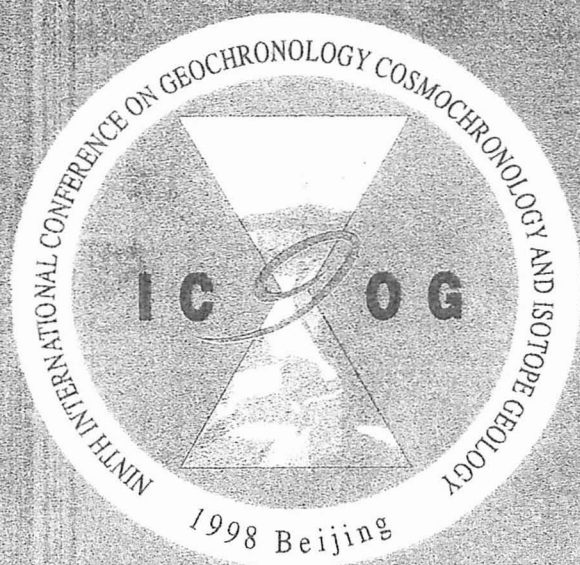
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THE TECTONOGEOCHEMICAL DIVISIONS AND NOBLE GASES IN CHINA

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The tectonogeochemical division is put forward in oil-gas-bearing areas of Chinese intraplate after Indosinian Movement.

The tectonically active rift region in eastern China: The tectonic environment is a rift formed as a result of diapiric mantle injection and crust thinning to form graben-type basins and lithospheric fractures. Along both sides of the Tancheng-Lujiang Fracture Zone, a series of mantle source gas pools constitute a massive-scale tectonic accumulation zone, with the mantle geochemical characteristics of high concentrations of CO_2 and He, high $^3\text{He}/^4\text{He}$ — $^{40}\text{Ar}/^{36}\text{Ar}$ ratio system and high $\delta^{13}\text{C}_{\text{CO}_2}$ ratios (the main frequency, $-3.4 \sim -4.6\text{‰}$). The mantle-derived volcanic rocks and inclusions are well-developed and a high geothermal zone exists in the area.

The tectonically stable region (Ordos and Sichuan) of craton in central China: The region is tectonically stable, lacking ultradeep faults and magmatism. Oil was produced in Mesozoic Erathem, but gas is mainly in Paleozoic Erathem. $^3\text{He}/^4\text{He}$ ratios in the region are characteristically on the order of 10^{-8} ; the $^{40}\text{Ar}/^{36}\text{Ar}$ ratios are highly variable, with those in the Sichuan Basin being the highest. This variation trend is negatively correlated with the age of the reservoir strata and is attributed to the chronologic accumulation effect of ^{40}Ar . The mantle degassing is very weak in the region.

The northwestern sub-stable region of tectonic inversion: This region, including Tarim, Junggar, Turpan-Hami and Qaidam basins, is characterized by apparent mantle uplifting, but the crust is relatively thick and magmatism is extremely weak. Basins were developed in a tension environment but subjected to compression-shearing subsequently, giving rise to an inversion structure as most typically exemplified by the Tu-Ha Basin. The $^3\text{He}/^4\text{He}$ ratios of natural gases in the region are on the order of 10^{-8} in the interior of the basins or on the order of 10^{-7} in the piedmont faults surrounding the basins (indicative of a small amount of mantle-source helium).

The tectonically active region of collision and compression in Qinghai-Xizang: The region is characterized by a compression, intense structural deformation and very thick crust, with mantle uplifting and extension structures on the top surface of crust. The $^3\text{He}/^4\text{He}$ ratios are highly variable ($10^{-8} \sim 10^{-6}$) in a complicated manner. The region is also characterized by extensive deep faulting and a very high geothermal gradient (above 100 mW/m^2).

ISOTOPIC CONSTRAINS ON THE PROTEROZOIC GEOLOGICAL HISTORY OF THE AMAZONIAN CRATON

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The Amazonian Craton (AC) comprises six tectonic provinces, whose crustal evolution is based on the concept of continental accretion along the borders of an ancient Archean nucleus, the Central Amazonian Province. The Proterozoic provinces are: Maroni - Itacaiúnas (MIP) (2.25 - 1.95 Ga); Ventuari - Tapajós (VTP) (1.95 - 1.8 Ga); Rio Negro - Juruena (RNJP) (1.8 - 1.55 Ga); Rondonian - San Ignacio (RSIP) (1.5 - 1.3 Ga) and Sunsás (SP) (1.25 - 1.0 Ga).

Sr, Pb and Nd isotopic compositions of igneous or orthogneissic rocks demonstrate that the Proterozoic crustal growth in the AC involved the addition of juvenile material as well as reworking of older continental crust. Part of the MIP and the whole of RNJP and VTP appears to have evolved through successive magmatic arcs, whilst the RSIP, SP and the other part of the MIP may have been mainly associated with continental collision. Sm-Nd model ages from the granitoids samples on the AC indicate that about 30% of the area of the continental crust was derived from the mantle during the Archean and about 70% in the Proterozoic time. During the Proterozoic the main crust-formation event was about 2.0 Ga.

Paleoproterozoic orogenies are typically developed in the border zone of the CAP, and are well represented in the eastern and northern part of the CAP by the MIP, and in the western by the VTP. The MIP contain small areas of 2.9 Ga, but is largely composed by rocks formed at 2.25 to 1.95 Ga. The MIP welds the Archean blocks which constitute the CAP. No clear geochronological differences are shown by the MIP and VTP, nevertheless the MIP seems to be older than the VTP, because the MIP is truncated by the VTP, which presented a geochronological pattern from 1.95 to 1.8 Ga. The VTP and RNJP are composed mainly of granitic to granodioritic rocks. U-Pb, Sm-Nd, Rb-Sr and Pb-Pb age determinations have suggested that the VTP and RNJP evolved through successive magmatic arcs during the time-interval between 1.95 to 1.55 Ga. The RSIP comprises many kinds of migmatites and granitoids, mainly metamorphosed to amphibolite facies, and granulitic terranes. These lithological assemblage range in age from 1.5 to 1.3 Ga, although they include some rocks with ages around 2.0 - 1.8 Ga. The SP is composed of meta-sedimentary sequences and granitoids rocks. It includes older terranes reworked between 1.3 - 1.0 Ga, which may have been associated with inversion of marginal belt produced by continent - continent collision.