Gas accumulation rules of volcanic rocks of deep formations in Songliao Basin, Northeast China

Z.H. ZHAO[1]*, G.H. JIAO[1], P. SUN[1], X.S. JUAN[1], J.X. XIAO[2], X.H. JIANG [1] AND H.Q. BAI[1]

[1]Langfang Branch of Petroleum Exploration and Development Research Institute, Petrochina, Langfang 065007 (*correspondence: zehui_zhao@pku.org.cn)

[2]School of Energy Resources, China University of Geosciences (Beijing), Beijing 100083 (xiaojx@cugb.edu.cn)

Deep formations of Songliao basin are defined as between basement and second member of Quantou formation in lower Cretaceous, including later Jurassic Huoshiling formation, early Cretaceous Shahezi formation, Yincheng formation, Denglouku formation and 1-2 members of Quantou formation. Songliao basin was made up of groups separated fault depressions in Shahezi age of early Cretaceous.

The volcanic rocks in Yincheng formation and Huoshiling formation, are the major reservoirs for deep gas. By the means of systematically analyzing the form conditions, accumulation patterns and exploration prospects of the deep gas, it is suggested that the deep volcanic gas reservoirs are characterized by the short distant migration for gas, locating around main trough and along the fault. The existence of deep volcanic gas pool is controlled by source rocks. High quality volcanic reservoirs controlled by lithology, by lithofacies, by fracture and diagenesis, take controls of the extent of the gas pool. The locations and high production of volcanic gas pools are controlled by faults. Generally, the source rocks, reservoirs and faults all make the contribution to the formation of volcanic gas pool. From the point of view of the forming conditions of deep volcanic gas pools, it is suggested that the beneficial tectonic zone with both development of the source rock and the volcanic reservoir are the favorable exploration zone.

A 4 million year record of paleo-erosion rates from the Qilian Shan, China

ZHIJUN ZHAO[1] AND DARRYL E. GRANGER[2]*

[1]College of Geographical Sciences, Nanjing Normal University, Nanjing 210046, China (zhaozhijun@njnu.edu.cn)

[2]Dept. of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana, 47907 USA (*correspondence: dgranger@purdue.edu)

It has been proposed that mountain erosion rates increased rapidly at 2-4 Ma due to climate change, based partly on sediment accumulation rates in central Asia [1]. This idea has been recently supported by paleo-erosion rates from the Tien Shan determined from ^{10}Be in basin sediments, which suggest that erosion rates in these mountains doubled near 2 Ma [2]. To test the hypothesis that this represents a regional climatic signal, we constructed a 4 Ma record of paleo-erosion rates from the Qilian Shan, at the northeastern topographic boundary of the Tibetan Plateau.

We analyzed 22 samples for ^{10}Be to determine paleo-erosion rates from the Laojunmiao (LJM) section exposed in an anticline near the city of Yumen. A subset were also analyzed for ^{26}Al. The LJM section has previously been dated by magnetostratigraphy [3]. After accounting for changes in sedimentation rates, we observe no clear change in source area erosion rates from 4 Ma to 1.2 Ma; however, erosion rates increase by an order of magnitude during a discrete interval extending from 1.2-0.8 Ma, subsequently returning to near the background rate. The interval of rapid erosion is found immediately above a regional unconformity.

Our erosion rate record indicates that climate change across the Plio-Pleistocene boundary did not strongly influence erosion in the sparsely glaciated Qilian Shan. Although we cannot exclude that climate change near the Middle Pleistocene transition may have driven the rapid erosion we observe, we prefer the explanation that rapid erosion is a transient response to a tectonic uplift and fault activity near the range front, as evidenced by the regional unconformity. Rapid erosion and sedimentation rates observed elsewhere, such as the Tien Shan [2], may therefore be a local response to either glaciation or uplift, rather than indicators of a global response to climate variability.

[1] Zhang, P., and Molnar, P. (2001) *Nature* **410**, 891-896. [2] Charreau *et al*. (2011) *Earth Plan. Sci. Lett*. **304**, 85-92. [3] Fang, X.M. *et al*. (2005) *Science in China D* **48**, 1040-1051.