

Effect of present climate on the distribution of the world sandstone-hosted uranium deposits

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The sandstone-hosted uranium deposit (SUD) is the most important type of uranium deposit. The SUD is widely but unevenly distributed throughout the world. The reasons led to such distribution of the SUD has caught much more attention among researchers. Previous studies have shown that paleoclimate has a certain effect on the formation of SUD. This study, however, shows a strong coupling relationship between present climate and the distribution of the SUDs worldwide, as present climate significantly affecting the distribution of the SUDs. Such effect of present climate on the distribution of the SUDs have been underestimated in the previous studies.

In this study, the vegetation development and annual precipitation were selected as the two main indicators of the present climatic conditions. By plotting the SUDs on the satellite map of vegetation development (data from NASA and NOAA) on the earth's surface, we found that the SUDs mainly occur in areas with sparse vegetation or no vegetation, such as desert, gobi, arid grassland and plateau. Specifically, in Central Asia, the sandstone-hosted uranium deposits mainly occur in the south of the Balkhash Lake, both sides of Caracas Hill, the Karakum Desert and other Turan lowland hinterland of the desert area. In East Asian areas such as China and Mongolia, the SUDs are mainly distributed along the Tianshan-Hexi Corridor-Yinshan fold belt and both sides of deserts as well as arid areas with extremely sparse vegetation. In North Africa, Niger's SUDs also occur in the desert, whereas in western United States, the SUDs are mostly concentrated in Colorado Plateau and the Wyoming basin where the vegetation is sparse. Likewise, the SUDs are located in the desert or gobi areas of the central and western Australia. On the contrary, no economic SUDs have been found in the tropical rain forest areas, which are the largest areas of vegetation.

The distribution of the SUDs also show spatial correlation with annual precipitation. Almost all the SUDs are distributed in areas with annual precipitation less than 400 mm, such as these in western United States, South America, Africa and northern China. Especially, the SUDs have been found in some small areas such as the western Liaoning of Songliao Basin in China, Somalia in East Africa and Tucano Basin in the eastern part of South America where annual precipitation is less than 400 mm. However, the SUDs in much more larger areas surrounding these small areas and having annual precipitation > 400 mm are totally lack.

The above analysis shows that annual precipitation seems to control the distribution of the SUDs worldwide. Overall, the SUDs in the northern hemisphere mainly occur in the temperate continental climate zone, the subtropical high-pressure belt and its surrounding trade-wind zones. The SUDs in the southern hemisphere are mainly distributed in the arid climate zone such as the tropical desert near the Tropic of Capricorn.