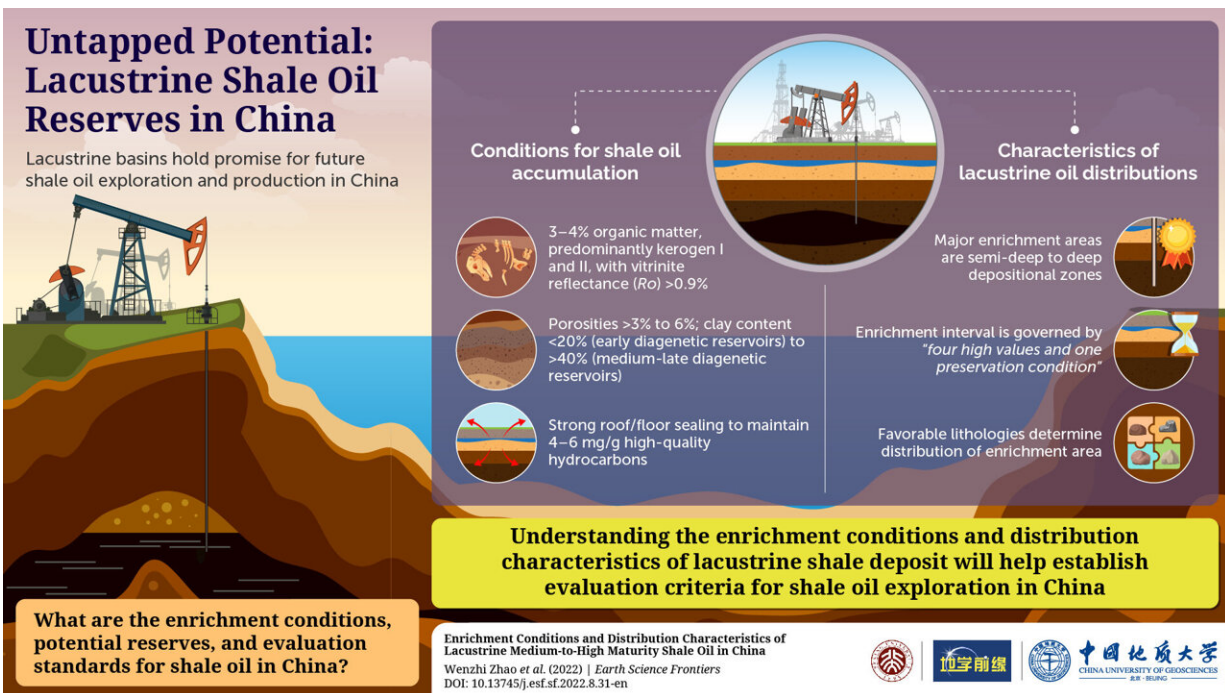


# New study suggests lacustrine shale reserves can bolster China's energy independence

September 1 2022



Credit: Earth Science Frontiers

Shale oil exploration has rapidly expanded since the beginning of the 21st century, particularly in North America. Since 2010, the production of marine shale oil has increased at an average rate of more than 25% annually, making the US the global leader in production with total recoverable resources pegged at approximately 20.7 billion tons. Developing shale oil resources has significant potential to shape energy

security and geopolitics. In addition to marine shale oil, countries have also begun utilizing lacustrine basins for oil production.

Lacustrine shale oil reserves are deemed optimal when their organic content is high, the reservoirs feature a suitably high pressure to facilitate formation, and the Ro value, which indicates the thermal maturity of shale, is greater than 1.0%. In China, the lacustrine medium-to-high maturity shale oil is characterized by mature liquid hydrocarbons and a high proportion of movable oil. While these characteristics make it a valuable resource, questions surrounding [production costs](#) and recoverable quantities remain. Furthermore, without low development costs it remains to be seen if these reserves can be utilized economically.

Now, a group of petroleum scientists led by Dr. Wenzhi Zhao at the China National Petroleum Corporation, have presented their evaluation of the enrichment conditions and occurrence characteristics of lacustrine shale oil reservoirs in China. "We have proposed a set of evaluation parameters for shale oil enrichment zones and evaluated the occurrence of optimal areas. This data will serve as a good reference to help promote the development of these oil reserves economically," says Dr. Zhao while explaining the motivation behind the research. This study was recently published in *Earth Science Frontiers*.

The team utilized data collected from lacustrine medium-to-high maturity shale reserves currently being developed in China for their analyses, and specifically determined the optimal conditions for shale oil accumulation and the characteristics of these deposits. Their analysis revealed that shale with a high organic content and appropriate thermal maturity favored oil retention.

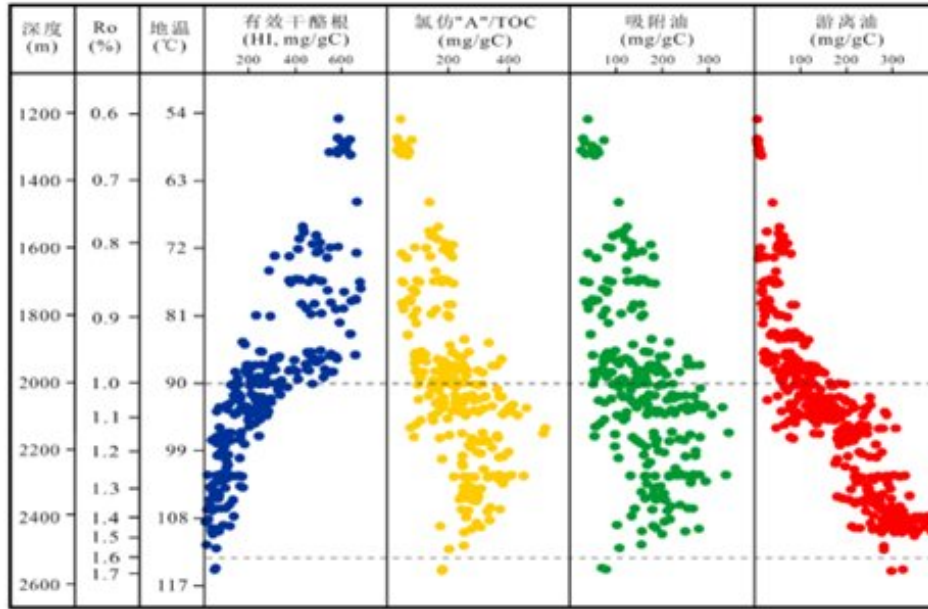


FIG. 3 Formation and evolution of Gulong shale oil in the Songliao Basin  
(obtained from PetroChina Daqing Oilfield)

深度	Depth
地温	Ground temperature
有效干酪根	Effective kerogen
氯仿	Chloroform
吸附油	Adsorbed oil
游离油	Free oil

Analyses from the Songliao Basin revealed a significant increase in free hydrocarbons at  $Ro > 0.9\%$  due to the thermal maturity threshold of the sweet-spot for lacustrine shale oil. Credit: Wenzhi Zhao from RIPED

"The optimal [organic content](#) of this shale ranges from three to four percent, and kerogen I and II seems to be the dominant type of organic matter. Interestingly, the  $Ro$  values of this shale were greater than  $0.9\%$ . Finally, these reservoirs must exhibit a certain degree of brittleness and have porosities between three to six percent," says Dr. Zhao when asked

to elaborate on the key findings. In addition to these parameters, shale oil with good mobility was found when large amounts of high-quality hydrocarbons were present, and the enrichment interval of this oil was highly dependent on the reservoir having a tightly sealed roof and floor.

"What we see is that major enrichment of oil occurs at semi-deep to deep depositional zones. Moreover, the distribution of shale oil enrichment intervals is governed by the type of lithologies as oil and gas is retained in the source rock. Shale assemblages are the best lithologic sections while Mudstone is not," observes Dr. Zhao, surmising the characteristics of these shale oil deposits.

The team pegs the total [shale](#) oil reserves in China with medium-to-high maturity to be close to 16.3 billion tons of which nearly 8.4 billion tons could be developed commercially. These reserves are spread across the Ordos, Songliao, Bohai Bay, and Junggar Basins and represent a significant energy resource for China's future. "We can now offer better guidance to reduce the number of ineffective wells and have set the stage to greatly improve the number of economic discoveries in China," concludes Dr. Zhao.

**More information:** Enrichment conditions and distribution characteristics of lacustrine medium-to-high maturity shale oil in China, *Earth Science Frontiers* (2022). [DOI: 10.13745/j.esf.sf.2022.8.31-en](https://doi.org/10.13745/j.esf.sf.2022.8.31-en)

Provided by Cactus Communications

Citation: New study suggests lacustrine shale reserves can bolster China's energy independence (2022, September 1) retrieved 11 July 2024 from <https://phys.org/news/2022-09-lacustrine-shale-reserves-bolster-china.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.