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3D gravity anomaly separation method for the deep reservoir's residual thickness: Application to the Sichuan Basin

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The Sichuan Basin has the largest number of proven gas reserves, gas fields found and the cumulative output in China. The oil and gas reservoirs are deeply buried and the stratum structure is complex, so the structures of the basement and deep reservoirs cannot be clearly described only by seismic method. Based on the super position effect of gravity potential field, the residual gravity anomaly of the target layer can be separated by forward method, thus the depth of the target interface can be calculated through Parker method and then the residual thickness of the target layer can be obtained. As the depth of Cambrian bottom interface has been controlled by the high resolution seismic reflection method, the key issue of the Cambrian reservoir's residual thickness to get the depth of Cambrian top interface, which means the gravity effect of the Cambrian stratum should be obtained. As viewed from the stratigraphic density statistics of the Sichuan Basin and its adjacent area, it is observed that there are five main density interfaces in this region, i.e., Cretaceous–Jurassic (Δσ=0.12 g/cm3), Mid-Late Triassic (Δσ=0.15 g/cm3) and Cambrian–Sinian (Δσ=0.14 g/cm3), high-velocity bodies in homogeneous mantle (Δσ=0.1 g/cm3) and Moho (Δσ=0.6 g/cm3) (*Δσ represents the density difference). Their gravity responses are deducted from the Bouguer gravity anomaly. Then the gravity effect of the stratum of Cambrian was separated and the residual gravity anomaly of Cambrian top interface was calculated through 3rd wavelet analysis and the depth of top interface by Parker inversion. At last, the Cambrian reservoir's residual thickness equals to the depth difference between the bottom and the top interface. Considering the prior information of 6 2D-seismic sections, Cambrian bottom interface was stretched 1.25 times and downward continuation of 3 km. Late-Sinian bottom interface was obtained, which can match the 2D seismic sections well and then its thickness was calculated.

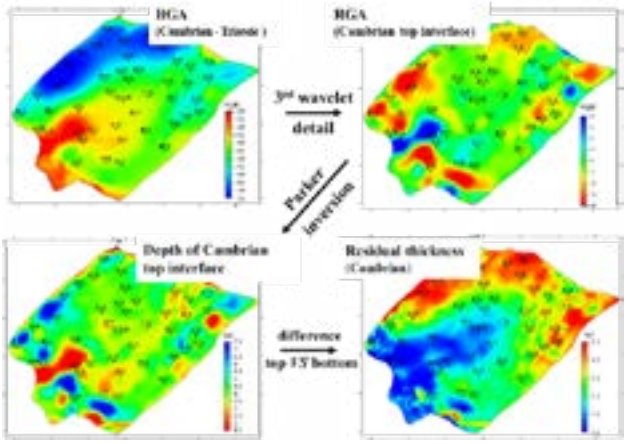

Fig: Cambrian residual thickness

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Biography

Fangzhou Nan is a Research Assistant at the Institute of Geology and Geophysics, Chinese Academy of Sciences and he is mainly engaged in ocean bottom seismograph data processing and integrated geophysical research.

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