minerals

MDPI

Editorial

Editorial for the Special Issue: "Studies of Seismic Reservoir Characterization"

Fengjiao Zhang [1,*] and Monika Ivandic [2]

[1] College of Geoexploration Science and Technology, Jilin University, Xi Min Zhu Street No. 938, Changchun 130026, China
[2] Department of Earth Sciences, Uppsala University, Villavägen 16, 75236 Uppsala, Sweden
* Correspondence: zhangfengjiao@jlu.edu.cn

Seismic reservoir characterization plays an essential role in the study of integrated reservoirs, with applications from prospect identification to detailed reservoir delineation. Seismic data provide an excellent image of structure and stratigraphy, but can be inverted to also provide a quantitative interpretation of porosity, lithology, and lithofluid facies. To improve the accuracy of reservoir property assessments and minimize uncertainties, seismic exploration deserves considerable attention. This Special Issue consists of nine studies, which could be divided into three thematic categories.

More than half of the articles focus on developing various seismic reservoir characterization methods and case studies related to oil and gas exploration. Liu and Liu [1] performed a sedimentary characteristics analysis and sedimentary facies prediction of Jurassic strata in the northwest margin of the Junggar basin, a key area for oil and gas exploration. Anees et al. [2] used sedimentary facies to control the reservoir quality prediction of lower Shihezi member-1 in the Hangjinqi area, Ordos basin. Their study used the cores, logs, and 3D seismic data from the study area to perform geological modeling, seismic attributes, and petrophysical modeling. Their results showed that the reservoir quality within member-1 of the lower Shihezi formation is favorable for gas production within the Hangjinqi area. Ahmad et al. [3] interpreted the subsurface structural features of the Rajian area, upper Indus basin, Pakistan, using 2D seismic sections, also using the petrophysical analysis method to identify hydrocarbon-bearing zones. Tian et al. [4] provided novel ideas for future presalt carbonate reef reservoir prediction and characterization methods. They utilized wavelet frequency decomposition technology to depict the seismic blank reflection area's signal and improve the presalt signal's resolution. The high-precision prestack inversion based on the Bayesian theory makes full use of information from various angles and, simultaneously, inverts multiple elastic parameters, effectively depicting reservoirs with substantial heterogeneity. Wang et al. [5] took a tight sandstone reservoir in the Ordos basin of China as an example to explore the detection method of subtle faults in low-amplitude structural areas. Their results successfully predicted a shear fault zone, found a novel fracture zone, as well as a series of hidden faults in nontarget strata.

Two papers focus on the seismic characterization of sandstone-type uranium deposits. Wu et al. [6] showed a case study where they used 2D and 3D seismic surveys for sandstone-type uranium deposit structure imaging and pattern prediction in the Erlian basin, China. Their results showed that seismic technologies are worth considering in future stone-type uranium deposit exploration. Sun et al. [7] proposed a novel method based on the 3D seismic attribute to obtain 3D sedimentary characteristics of a target uranium reservoir quickly and efficiently. Their case study example showed they could provide important reference information for exploring sandstone-type uranium deposits.

In addition, there are two FWI method development studies in this Special Issue. Zhang et al. [8] used multisource seismic datasets to improve full waveform inversion results in a metal mining area. Their results showed that by using both passive and

Citation: Zhang, F.; Ivandic, M. Editorial for the Special Issue: "Studies of Seismic Reservoir Characterization". *Minerals* **2022**, *12*, 1133. https://doi.org/10.3390/min12091133

Received: 29 August 2022
Accepted: 5 September 2022
Published: 6 September 2022

active seismic data in full, waveform inversion could obtain a suitable result for the high-resolution seismic imaging of metal ore bodies. Zhang et al. [9] proposed a structure-guided perturbation decomposition method, which can separate strong scattering salt information from direct envelope inversion results with the help of reverse time migration images. The numerical tests showed that the method is effective with good antinoise performance.

The studies in this Special Issue provide novel real techniques for solving seismic exploration problems, and we hope they are of great interest to a wide audience, providing a future research direction for seismic reservoir characterization.

Finally, the guest editors thank the authors, editors, and reviewers for their hard work on this Special Issue.

Author Contributions: Conceptualization, F.Z. and M.I.; Writing—original draft preparation, F.Z.; Writing—review and editing, F.Z. and M.I. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Liu, S.; Liu, Y. Sedimentary Characteristics Analysis and Sedimentary Facies Prediction of Jurassic Strata in the Northwest Margin of Junggar Basin—Covering the W105 Well Region in the Wuerhe Area. *Minerals* **2022**, *12*, 68. [CrossRef]
2. Anees, A.; Zhang, H.; Ashraf, U.; Wang, R.; Liu, K.; Abbas, A.; Ullah, Z.; Zhang, X.; Duan, L.; Liu, F.; et al. Sedimentary Facies Controls for Reservoir Quality Prediction of Lower Shihezi Member-1 of the Hangjinqi Area, Ordos Basin. *Minerals* **2022**, *12*, 126. [CrossRef]
3. Ahmad, N.; Khan, S.; Noor, E.F.; Zou, Z.; Al-Shuhail, A. Seismic Data Interpretation and Identification of Hydrocarbon-Bearing Zones of Rajian Area, Pakistan. *Minerals* **2021**, *11*, 891. [CrossRef]
4. Tian, X.; Huang, H.; Gao, J.; Luo, Y.; Zeng, J.; Cui, G.; Zhu, T. Pre-Stack Seismic Data-Driven Pre-Salt Carbonate Reef Reservoirs Characterization Methods and Application. *Minerals* **2021**, *11*, 973. [CrossRef]
5. Wang, E.; Zhang, J.; Yan, G.; Yang, Q.; Zhao, W.; Xie, C.; He, R. Concealed-Fault Detection in Low-Amplitude Tectonic Area—An Example of Tight Sandstone Reservoirs. *Minerals* **2021**, *11*, 1122. [CrossRef]
6. Wu, Q.; Wang, Y.; Li, Z.; Qiao, B.; Yu, X.; Huang, W.; Cao, C.; Li, Z.; Pan, Z.; Huang, Y. 2D and 3D Seismic Survey for Sandstone-Type Uranium Deposit and Its Prediction Patterns, Erlian Basin, China. *Minerals* **2022**, *12*, 559. [CrossRef]
7. Sun, Z.; Liu, Y.; Han, F.; Zhang, F.; Ou, X.; Cao, M.; Lei, A.; Yang, S.; Liu, M.; Gao, Z. Study on the 3D Sedimentary Characteristics of Sandstone Type Uranium Reservoir Based on 3D Seismic Attribute. *Minerals* **2021**, *11*, 1096. [CrossRef]
8. Zhang, F.; Zhang, P.; Xu, Z.; Gong, X.; Han, L. Multisource Seismic Full Waveform Inversion of Metal Ore Bodies. *Minerals* **2021**, *12*, 4. [CrossRef]
9. Zhang, P.; Han, L.; Zhang, F.; Feng, Q.; Chen, X. Wavefield Decomposition-Based Direct Envelope Inversion and Structure-Guided Perturbation Decomposition for Salt Building. *Minerals* **2021**, *11*, 919. [CrossRef]