



Tectonics of the zagros orogen: An introduction

The ca. 1800 km long Zagros Fold and Thrust Belt (ZFTB) developed in the framework of the collision zone between the Arabian and the Eurasian plates. The belt constitutes a part of the Alpine-Himalayan orogen that evolved during opening and closure history of the Neotethys Ocean in the Neogene (Sherkati et al., 2006; review in Razavi Pash et al., 2021). The ZFTB is amongst the most prolific hydrocarbon reserves when counted in collisional orogens. Around 12 % of global oil reserves come from this terrain (Bordenave and Burwood, 1990). Bordenave and Hegre (2005) stated that the ZFTB contains ~ 9 % of the world's oil and ~ 15 % of the world's gas reservoirs. The proven and producing reserves in Zagros are far more economic than those in any collisional orogens such as the Himalaya (e.g., Biswas et al., 2022). Fold and thrust belts in general have been questioned for the feasibility for exploration (review in Hammerstein et al., 2020). However, such a doubt did not arise for the ZFTB (Razavi Pash et al., 2024). Summarily, ZFTB is crucial in geoscientific studies (e.g., Cooper, 2007).

This special volume consists of two review articles and two original works. Alipour (2024) reviews the hydrocarbon system from the Iranian part of the ZFTB by compiling stratigraphic columns, maps and structural cross-sections. He recognizes asymmetric folds as the most common reservoirs, and describe the Asmari and the Dalan/Kangan carbonates as the most prolific producers of fuel. Tavakoli and Barfiza-deh (2024) review the reservoir condition from the Iranian carbonates. The carbonates deposited in a ramp-setting and got dissolved and dolomitized. Facies transition, diagenesis, fracturing and faulting affected the reservoir property. Nezamzadeh et al. (2024) utilize displaced river terraces to decipher the active tectonics from the Zagros orogenic belt. Strike-slip of the Sabzpoushan Fault Zone for the last ~ 100 Ma at ~ $1-2.8 \pm 0.2 \text{ mm y}^{-1}$ deformed the crust aseismically. Several recent papers have emphasized the importance of the South Dezful Embayment in the hydrocarbon geoscience and tectonics of the Zagros and the surrounding areas (e.g., Shamszadeh et al., 2022a, 2022b; Joudaki et al., 2024). In this line, Afroogh et al. (2024) investigate field data, 2D and 3D seismic lines and well data to comment on the geometric and genetic variation of structures of the Mansourabad anticline from the Dezful Embayment. These variations are crucial to understand the reservoirs in the embayment. We hope that these papers will prove useful to the Zagros geoscience researchers.

Acknowledgements

We thank the reviewers, the Chief Editors (Mimmo Palano and Andrew Kerr), proofreaders and Yuan Li (Content Acquisition Specialist, Elsevier).

References

- Afroogh, A., Shoghi, J., Seraj, M., Mukherjee, S., Azar, J.H., 2024. Along-strike variation of structural style: Mansourabad Anticline in the Dezful Embayment, SW Iran. *Results Earth Sci.* 2, 100047.
- Alipour, M., 2024. Petroleum systems of the Iranian Zagros Fold and Thrust Belt. *Results Earth Sci.* 2, 100027.
- Biswas, T., Bose, N., Dutta, D., Mukherjee, S., 2022. Arc-parallel shears in collisional orogens: global review and paleostress analyses from the NW Lesser Himalayan Sequence (Garhwal region, Uttarakhand, India). *Mar. Pet. Geol.* 138, 105530.
- Bordenave, M.L., Burwood, R., 1990. Source rock distribution and maturation in the Zagros orogenic belt: provenance of the Asmari and Bangestan reservoir oil accumulations. *Org. Geochem.* 16, 369–387.
- Bordenave, M.L., Hegre, J.A., 2005. The influence of tectonics on the entrapment of oil in the Dezful Embayment, Zagros Foldbelt, Iran. *J. Pet. Geol.* 28, 339–368.
- Cooper, M., 2007. Structural style and hydrocarbon prospectivity in fold and thrust belts: a global review. In: Ries, A.C., Butler, R.W.H., Graham, R.H. (Eds.), *Deformation of the Continental Crust. The Legacy of Mike Coward*, 272. Geological Society, London, pp. 447–472 (Special Publications).
- Hammerstein, J.A., Dicuia, R., Cottam, M.A., Zamora, G., Butler, R.W.H., 2020. Fold and thrust belts: structural style, evolution and exploration—an introduction. In: Hammerstein, J.A., Dicuia, R., Cottam, M.A., Zamora, G., Butler, R.W.H. (Eds.), *Fold and Thrust Belts: Structural Style, Evolution and Exploration*, 490. Geological Society, London, pp. 1–8. Special Publications 490.
- Joudaki, M., Faghih, A., Mukherjee, S., Seraj, M., Soleimany, B., 2024. Structural style & kinematic analysis of deformation in the northern Dezful Embayment, Zagros Fold-Thrust Belt, SW Iran. *Mar. Pet. Geol.* 170, 107122.
- Nezamzadeh, I., Faghih, A., Oveisi, B., Kusky, T., Khajavi, N., Soleimani, M., Meng, J., 2024. On the use of displaced river terraces to characterize active tectonics of the Zagros orogenic belt, SW Iran. *Results Earth Sci.* 2, 100045.
- Razavi Pash, R., Davoodi, Z., Mukherjee, S., Hashemi-Dehsarvi, L., Ghasemi-Rozveh, T., 2021. Interpretation of aeromagnetic data to detect the deep-seated basement faults in fold thrust belts: NW part of the petroliferous Fars province, Zagros belt, Iran. *Mar. Pet. Geol.* 133, 105292.
- Razavi Pash, R., Seraj, M., Mukherjee, S., Radmehr, A., 2024. Structural relationship between subsurface oil fields in the North Dezful Embayment: Qaleh Nar, Lower and Upper Balarud Anticlines (central Zagros, Iran). *Bull. Miner. Res. Explor.* 174, 67–83. <https://doi.org/10.19111/bulletinofmre.1344433>.
- Shamszadeh, A., Sarkarinejad, K., Ferrer, O., Mukherjee, S., Seraj, M., 2022a. Effect of the inherited structural highs on the structure and kinematics of the South Dezful Embayment (SW Iran): insights from analogue modelling. *Geol. Mag.* 159, 1744–1766.
- Shamszadeh, A., Sarkarinejad, K., Mukherjee, S., Seraj, M., 2022b. Interaction of inherited structure and contractional deformation in the South Dezful Embayment: insights from the Gachsaran oilfield, SW of Iran. *Mar. Pet. Geol.* 145, 105871.
- Sherkati, S., Letouzey, J., Frizon de Lamotte, D., 2006. Central Zagros fold-thrust belt (Iran): new insights from seismic data, field observation, and sandbox modeling. *Tectonics* 25, TC 4007.
- Tavakoli, V., Barfiza-deh, H., 2024. The role of plate movements on reservoir development of the Iranian carbonate formations: a review of the interplay between tectonics, paleoclimate, and diagenesis. *Results Earth Sci.* 2, 100037.

Soumyajit Mukherjee*

Department of Earth Sciences, Indian Institute of Technology Bombay,
Powai, Mumbai, Maharashtra 400076, India

<https://doi.org/10.1016/j.rines.2025.100062>

Available online 22 January 2025

2211-7148/© 2025 Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Raana Razavi Pash
Department of Earth Sciences, Collage of Sciences, Shiraz University, Shiraz,
Iran

Şule Gürboğa
Department of Geological Engineering, Faculty of Mines, İstanbul Technical
University, İstanbul, Türkiye

* Corresponding author.
E-mail addresses: soumyajitm@gmail.com, smukherjee@iitb.ac.in (S.
Mukherjee).