Introduction

Rajasthan basins have been quite important in last few decades for hydrocarbon exploration and academic research (e.g. Dasgupta and Mukherjee 2017; Biswas et al. 2022a,b, 2024; Kar et al. 2022, 2025; Dasgupta 2023; Dasgupta et al. 2023, 2024; Mishra et al. 2023; Puniya et al. 2023a,b). Geoscientific teams planning a fieldwork in the Barmer basin can also visit the rather less known Kiradu temples (Haldar et al. 2023). This edited book consists of nine main chapters. In **Chapter "Geomorphology, Elevation and Gravity Studies from the Western Rajasthan Basins (Barmer, Bikaner-Nagaur and Jaisalmer), India", Ansari et al. (2025a)** performed geophysical and morphometric studies from Barmer, Jaisalmer, and Bikaner–Nagaur basins. The presence of neotectonics faults is perceived from the Bikaner–Nagaur basin that led rivers to incise. From a few places, gravity lows were detected from the Jaisalmer basin. In **Chapter "Lignites of Western Rajasthan as a Source Rock for Hydrocarbons", Kumar et al. (2025)** reviewed lignites from different basins of Rajasthan. Huminite is dominantly found in all such seams. These lignites are thermally immature and contain type-III and mixed type-II-III kerogens. In **Chapter "Morphometric, Gravity and Bathymetric (Topographic) Analysis of Bayana Basin, Rajasthan, India", Ansari et al. (2025b)** provided a morphometric analysis of the Proterozoic Bayana basin by considering six watershed-scale morphometric parameters. They deduced the *Index of Active Tectonics* (IAT) for five watersheds. In **Chapter "Morphometric and Geophysical Studies from a Part of Aravalli-Delhi Fold Belt, Rajasthan, India", Ansari et al. (2025c)** analysed a part of Aravalli Delhi Fold belt's river channels, near the location Pali, through morphometry. They located the most active watershed and the most active mountain front. In **Chapter "Palm Leaf Fossils from the Early Eocene of Western Rajasthan: Paleoclimatic Implications", Ali et al. (2025a)** first reported fossil of palm fronds described as the fossil-genus *Amesoneuron* Göppert from the Early Eocene sedimentary rock of the Gurha lignite mine. The fossil indicates a warm humid climate during the Early Eocene. In **Chapter "Plant Megafossil Diversity in the Palaeogene Rajasthan Basins of Bikaner-Nagaur, Barmer and Jaisalmer: A Review", Ali et al. (2025b)** reviewed plant megafossil diversity in the Palaeogene sediments from the Rajasthan basins. Tropical warm and humid climate was deciphered based on this review. In **Chapter "Palaeoenvironmental Significance of Trace Fossils from Pokaran Sandstone of the Jodhpur Group, Marwar Supergroup, Western India", Parihar et al. (2025a)** reported fourteen trace fossils from the Pokaran Sandstone (basal Ediacaran Jodhpur Group, Marwar Supergroup). A shallow marine environment of deposition of the Pokaran unit is indicated based on this study. In **Chapter "The Ediacaran Discoidal Fossil *Aspidella* from Sonia Sandstone of the Jodhpur Group, Marwar Supergroup, Western India, and Their Palaeobiological Implications", Parihar et al. (2025b)** first report more than a hundred specimens of an Ediacaran discoidal fossil *Aspidella* from Sonia Sandstone (Jodhpur Group, Marwar Supergroup, Sursagar area). This is the first report of *Aspidella* from India. In **Chapter "Geomorphic and Geophysical Studies from the Sukri River Watersheds, Rajasthan, India", Raha et al. (2025)** performed morphometric and geophysical studies from the Sukri River's watersheds. Using analytic hierarchic process (AHP) and index of active tectonics (IAT), same sets of watersheds were identified to be of different degrees of tectonic activeness. Geophysical studies through gravity modelling predicted graben geometry in some of these watersheds. We hope that this book will be useful to both resource geoscientists and academicians.

Acknowledgements

We thank the book proposal reviewer(s), proofreaders, and the publisher—Springer.

Soumyajit Mukherjee
smukherjee@iitb.ac.in
soumyajitm@gmail.com

Nihar Ranjan Kar

References

Ali, A., R. Patel, R. S. Rana, S. Kundu, and M. A. Khan. 2025a. Palm leaf fossils from the early Eocene of western Rajasthan: Paleoclimatic implications. In: Mukherjee S, Kar NR (Eds) *Geosciences of the Rajasthan basins*. pp. 71–84. Springer. ISBN 978-981-96-3004-2.

Ali, A., R. Patel, R. S. Rana, S. Kundu, and M. A. Khan. 2025b. Plant megafossil diversity in the Palaeogene Rajasthan Basins of Bikaner-Nagaur, Barmer and Jaisalmer: A review. In: Mukherjee S, Kar NR (Eds) *Geosciences of the Rajasthan basins*. pp. 85–107. Springer. ISBN 978-981-96-3004-2.

Ansari, K., M. Biswas, S. Mukherjee, and S. Dasgupta. 2025a. Geomorphology, elevation & gravity studies from the western Rajasthan basins (Barmer, Bikaner-Nagaur and Jaisalmer), India. In: Mukherjee S., and N. R. Kar (Eds) *Geosciences of the Rajasthan basins*. pp. 1–18. Springer. ISBN 978-981-96-3004-2.

Ansari, K., M. Biswas, S. Das, and S. Mukherjee. 2025b. Morphometric analysis of Bayana basin, Rajasthan, India. In: Mukherjee S., Kar NR (Eds) *Geosciences of the Rajasthan basins*. pp. 43–56. Springer. ISBN 978-981-96-3004-2.

Ansari, K., M. Biswas, S. Das, and S. Mukherjee. 2025c. Morphometric analysis of a part of Aravalli-Delhi fold belt, Rajasthan, India. In: Mukherjee S., Kar NR (Eds) 2024. *Geosciences of the Rajasthan basins*. pp. 57–70. Springer. ISBN 978-981-96-3004-2.

Biswas, M., M. P. Gogoi, B. Mondal, T. Sivasankar, S. Mukherjee, and S. Dasgupta. 2022a. Geomorphic assessment of active tectonics in Jaisalmer basin (western Rajasthan, India). *Geocarto International* 37, 12382–12413.

Biswas, M., M. K. Puniya, M. P. Gogoi, S. Dasgupta, S. Mukherjee, and N. R. Kar. 2022b.

Biswas, M., A. Raha, S. Mukherjee., and V. S. Kotak. 2024. Geomorphic imprints of active tectonics of the Bikaner-Nagaur petroliferous rift basin and its surroundings (western Rajasthan, India). *Journal of the Geological Society of India* 100, 377–390.

Dasgupta, S. 2023. Paleostress analyses and tectonic evolution of the Barmer continental rift basin, western Rajasthan, India. Unpublished Ph.D. thesis. IIT (ISM) Dhanbad.

Dasgupta, S., and S. Mukherjee. 2017. Brittle shear tectonics in a narrow continental rift: asymmetric non-volcanic Barmer basin (Rajasthan, India). *The Journal of Geology* 125, 561–591.

Dasgupta, S., S. Mukherjee, and R. Chatterjee. 2024. Tectonics and Geodynamics of a Narrow Continental Rift: Barmer basin, Rajasthan, India. In: Ciner A. et al. (Eds) Recent Research on Sedimentology, Stratigraphy, Paleontology, Geochemistry, Volcanology, Tectonics, and Petroleum Geology, Advances in Science, Technology & Innovation. Springer. 223–227.

Dasgupta, S., S. Mukherjee, N. Vanik, R. Chatterjee, S. K. Pal. 2023. Paleostress analyses and rift kinematics of the petroliferous Barmer rift basin, western Rajasthan, India. *Marine and Petroleum Geology* 156, 106442.

Haldar, P., M. K. Puniya, M. Biswas, S. Mukherjee, N. R. Kar, and R. Choudhary. 2023. Architecture and structures of Kiradu temple (Barmer region, Rajasthan, India). In: Mukherjee S (Ed) *Structural Geology and Tectonics Field Guidebook–Volume 2*. Springer Geology. 359–418.

Kar, N. K., D. Mani, S. Mukherjee, S. Dasgupta, M. K. Puniya, A. K. Kaushik, M. Biswas, and E. V. S. S. K. Babu. 2022. Source rock properties and kerogen decomposition kinetics of Eocene shales from petroliferous Barmer basin, western Rajasthan, India. *Journal of Natural Gas Science and Engineering* 100, 104497.

Kar, N. R., D. Mani, B. S. Seetha, E. V. S. S. K. Babu, S. Mukherjee, S. Dasgupta, and M. K. R. Mudiam. (2025) Organic provenance and depositional environment of Eocene carbonaceous rocks from petroliferous Barmer basin, Western Rajasthan, India. *Journal of the Geological Society of India* 101, 112–122.

Kumar, A., K. A. Mustapha, and A. K. Singh. 2025. Lignites of western Rajasthan as a source rock for hydrocarbons. In: Mukherjee S, Kar NR (Eds) *Geosciences of the Rajasthan basins*. pp. 19–41. Springer. ISBN 978-981-96-3004-2.

Mishra, P., G. Karthikeyan, S. Dash, S. Konar, A. K. Bora, U. Kuila, D. K. Mukhopadhyay, and M. D. Zoback. 2023. In situ stress state in the petroliferous Barmer Basin, northwestern India: A new geomechanical approach. *AAPG Bulletin* 107, 1639–1667.

Mondal, B., M. Biswas, S. Mukherjee, and M. A. Shaikh. 2024. Geomorphic signatures and active tectonics in western Saurashtra, Gujarat, India. *Geodesy and Geodynamics* 15, 82–99.

Parihar, V. S., S. L. Hukmaram, P. Kumar, and A. Harsh. 2025b. The Ediacaran discoidal fossil Aspidella from Sonia Sandstone of the Jodhpur Group, Marwar Supergroup, western India, and their palaeobiological implications. In: Mukherjee S, Kar NR (Eds) *Geosciences of the Rajasthan basins*. pp. 135–151. Springer. ISBN 978-981-96-3004-2.

Parihar, V. S., S. L. Humukram, S. L. Nama, and S. C. Mathur. 2025a. Palaeoenvironmental significance of Trace fossils from Pokaran Sandstone of the Jodhpur Group, Marwar Supergroup, western India. In: Mukherjee S, Kar NR (Eds) *Geosciences of the Rajasthan basins*. pp. 109–134. Springer. ISBN 978-981-96-3004-2.

Puniya, M. K., A. K. Kaushik, S. Mukherjee, S. Dasgupta, N. K. Kar, M. Biswas, and R. Choudhary. 2023a. New Structural Geological Input from the Barmer Basin, Rajasthan (India). In: Mukherjee S (Ed) *Structural Geology and Tectonics Field Guidebook–Volume 2*. Springer Geology. 285–296.

Puniya, M. K., A. K. Kaushik, S. Mukherjee, N. R. Kar, M. Biswas, and R. Choudhury 2023b. Structural Geology and Stability Issue of the Giral Lignite Mine, Rajasthan, India. In: Mukherjee S (Ed) *Structural Geology and Tectonics Field Guidebook–Volume 2*. Springer Geology. 297–310.

Raha, A., K. Ansari, and S. Mukherjee. 2025. Geomorphic and geophysical studies from the Sukri River watersheds, Rajasthan, India. In: Mukherjee S, Kar NR (Eds) *Geosciences of the Rajasthan basins*. pp. 153–168. Springer. ISBN 978-981-96-3004-2.