From the Desk of the Editor-in-Chief

Stratigraphy, with its various specialized branches, is fundamental to geological sciences, allowing us to decipher the Earth's history, reconstruct paleoenvironments, and predict natural resource distribution. This special volume on *'Sequence and Seismic Stratigraphy'* provides a comprehensive overview of some crucial stratigraphic techniques: sequence stratigraphy, seismic stratigraphy, and magnetic stratigraphy, besides impact stratigraphy. Each methodology offers unique insights and tools essential for academic research and practical applications, such as hydrocarbon exploration, sedimentology, and basin analysis. Sequence stratigraphy, formalized in the 1970s, revolutionized geological understanding of sedimentary basin fills by subdividing these basins into genetic packages bounded by unconformities. This framework interprets depositional patterns and paleogeographic changes using data from sedimentological, paleontological, and geophysical sources. It predicts the spatial and temporal distribution of key petroleum system elements—reservoirs, sources, and seals. Identifying system tracts and critical stratigraphic surfaces like sequence boundaries and maximum flooding surfaces has made sequence stratigraphy indispensable in hydrocarbon exploration and development. Seismic stratigraphy, based on interpreting seismic reflection data, offers a powerful approach to understanding sedimentary sequences. It identifies seismic reflection patterns corresponding to stratification within the Earth's subsurface, interpreted as chronostratigraphic surfaces that provide timelines crucial for reconstructing depositional environments and identifying lithofacies. Seismic stratigraphy has been widely adopted due to its success in hydrocarbon exploration, particularly in mapping depositional environments and predicting the distribution of reservoirs and traps in sedimentary basins. Magnetic stratigraphy, or magnetostratigraphy, enhances our ability to date and correlate rock sequences by analyzing their magnetic properties. This technique is based on Earth's historical magnetic field reversals, recorded in rocks as alternating normal and reversed polarity chrons. By correlating these magnetic polarity patterns with the geomagnetic polarity time scale, geologists can establish precise chronological frameworks for sedimentary sequences, even without fossils. Magnetostratigraphy has refined our understanding of geologic time, plate tectonics, and sedimentation rates, and often complements other dating methods such as biostratigraphy and cyclostratigraphy. Impact stratigraphy highlights the stratigraphic relationships resulting from cosmic impacts on Earth's surface and oceans. It discusses crater-filling, crater-rim, proximal ejecta, and distal ejecta stratigraphy using well-known examples, emphasizing marine impacts like the Wetumpka structure and Chicxulub crater. The study integrates field observations, laboratory analyses, and digital modeling to enhance the understanding of marine impact-generated stratigraphy and its relevance to geological processes. Each stratigraphic technique discussed in this volume offers distinct advantages and applications, but their true power lies in integration. Combining sequence stratigraphy, seismic stratigraphy, and magnetic stratigraphy enables geoscientists to construct robust geological models that enhance our understanding of sedimentary processes, basin evolution, and resource distribution. This integrated approach is particularly beneficial in hydrocarbon exploration, where accurate predictions of reservoir quality and distribution are crucial for reducing exploration risks and maximizing resource recovery. Readers will learn the theoretical foundations, methodological approaches, and practical applications of sequence, seismic, impact, and magnetic stratigraphy. This comprehensive guide aims to serve both as an educational resource and a reference for those engaged in the study and application of stratigraphy in geological sciences. In compiling this volume, we have drawn on the expertise and insights of leading researchers and practitioners in the field. We extend our gratitude to all contributors for their invaluable input and dedication to advancing our understanding of stratigraphy. We also acknowledge the continuous advancements in technology and methodology that drive the evolution of this dynamic field.

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