From the Desk of the Patron

The special volume of GeoChronicle Panorama encompasses sequence and seismic stratigraphy, which aimed to unfold the fundamental and applied aspects of recent methodology of this science to the readers particularly Earth Science students and budding researchers.

The concept of sequence stratigraphy was first developed by Peter Vail in the year 1960. While he was a senior scientist at Exxon, he come up with three core concepts that define sequence stratigraphy. 1) Seismic reflections are generated by physical bedding surfaces, 2) Seismic reflections create patterns or sequences that can be used to interpret depositional environment and lithology, and 3) Unconformities that form sequence boundaries are the same age when located in multiple basins are located. Vail also believes that eustacy is the main control on unconformities, sedimentary systems, and system tracts within a stratigraphic sequence. In this way, they establish the presence of unconformity-bound depositional sequences, deduce relative sea-level changes, and describe the depositional and erosional history of an area.

Sequence stratigraphy is the study of rock relationships within a time-stratigraphic framework of repetitive, genetically related strata bounded by surfaces of erosion or non-deposition, or their correlative conformities (Posamentier et al., 1988; Van Wagoner et al., 1988) and integrates time and relative sea-level changes to track the migration facies. Sequence stratigraphy focuses on allogenically induced changes such as eustasy, tectonics, and climate and integrates stratigraphic succession, lithology, its vertical-lateral relationship, paleo-bathymetry, bio-isotope stratigraphic proxy, and tectonic events. Sedimentology and ichnology are helpful in the identification and interpretation of bounding surfaces separating stratal units. These are recognized through the use of trace-fossil omission suites and the juxtaposition of ichnological suites. Thus, sequence stratigraphic techniques can be used to evaluate reservoir system continuity and trend directions, source and sealing facies of reservoir. The concepts and methodology of sequence stratigraphy is primarily engrained in seismic stratigraphic sequence analysis, and its strength lies in its potential to predict facies within a chronostratigraphic ally constrained framework of unconformity-bound depositional sequences.

Thus, concepts and methodology of sequence stratigraphy is primarily engrained in seismic stratigraphic sequence analysis, and its strength lies in its potential to predict facies within a chronostratigraphically framework of unconformity-bound depositional sequences. Sequence stratigraphy can be addressed through interpretations of outcrops, well logs or cores, and depositional sequences thus facilitating the integration of stratigraphic succession, lithology, its vertical-lateral relationship, paleobathymetry, bio-isotope stratigraphic proxy, and tectonic events. The methodology developed for seismic sequences by Vail et al. (1977), interpreters analyse seismic reflections to describe stratal geometry and delineate the systematic patterns of sequence surfaces, stacking patterns and truncation of strata against chronostratigraphically constrained surfaces. In this way, they establish the presence of unconformity-bound depositional sequences, deduce relative sea-level changes, and describe the depositional and erosional history of an area. Sequence stratigraphy is a tool for every exploration geologist/scientist for the identification of 3rd Order depositional sequences and systems tracts that are associated with potential hydrocarbon reservoirs, source rocks and seals in sedimentary basins (Obaje, 2013). Sequences are bounded by unconformities and their correlative conformity. A sequence is formed in response to sea level change, subsidence, and sediment supply. They can be broken down into system tracts. Within a sequence there is a parasequence and parasquence set. Parasequences are defined by marine flooding planes, and are usually aggradational. Parasequence sets form distinct stacking patterns that are bounded, usually by flooding surfaces. Both squences and parasequences are defined by their physical relationship of the strata. Sequences and parasequences allow geologists to predict stratal relationships and infer geologic age. Seismic stratigraphy is the science of interpreting or modeling stratigraphy, sedimentary facies, and geologic history from seismic reflection data. A fundamental principle of sequence stratigraphy is that seismic reflections are produced by contrasts in sonic velocity at chronostratigraphically significant stratal surfaces and unconformities; therefore, they are considered to approximate time-lines in the sedimentary record. The basic assumption behind seismic stratigraphy is that individual reflector can be considered as timelines i.e. it is representing a very short time interval of similar sedimentation conditions. This assumption signifies that seismic reflector can have different depositional environment and therefore it has information of various lithofacies units. However, for seismic stratigraphic analysis, only sedimentary reflections are generally used. Seismic reflection represents bedding plane. So, its characteristics should change with conformable changes in depositional regime. These changes can be energy level, depositional environment, sedimentation rates, source, diagenesis and pore contents.

There are several features of seismic data that can help us to interpret depositional regimes. These are reflection continuity, reflection amplitude, reflection configuration, reflection frequency and reflection velocity. Several types of seismic reflection terminations can be seen at these unconformable interfaces. These are erosional truncation, toplap, concordance, onlap and downlap. The structural configurations of the beds of both sides of the unconformity and the internal reflection patterns displayed by overlain and underlain units gives tectonic and environmental significance of the interface. Several types of seismic reflection terminations can be seen on at these unconformable interfaces. These are erosional truncation, toplap,concordance,onlap and downlap. The structural configurations of the beds of both sides of the unconformity and the internal reflection patterns displayed by overlain and underlain units gives tectonic and environmental significance of the interface. There are several features of seismic data that can help us to interpret depositional regimes. These are reflection continuity, reflection amplitude, reflection configuration, reflection frequency and reflection velocity. Above mentioned reflection terminations need to be mapped out on seismic data. After mapping, it is possible to outline the unconformities. These boundaries separate genetically related depositional units and hence, subdivide seismic sections into various Depositional Sequences. A variety of seismic facies units may be present in a single depositional sequence. The next step in seismic stratigraphy is to map out these seismic facies units. These seismic facies units are interpreted on the basis of reflection configuration, continuity, amplitude, frequency and interval velocity. System tracts are associated with seismic stratigraphy and eustacy. A system tract is an indicator of the depositional sequences that would be present within a sea level cycle. They fall into three categories, Low System Tract (LST), Transgressive System Tract (TST) and High System Tract.Low System Tract (LST) is created when sea level is low, but sea level starts to rise later. There is high sedimentation rates coupled with little accommodation space which causes layer stacking. Within a LST there will be progradational parasequences moving out from the shelf. Transgressive System Tract (TST) is created when sea level is rising. Here, accomedation space is greater than the sedimentation rate, which causes a retrogradational set of parasequences. At the very top of the TST the maximum flooding surface (MFS) is available before sea level begins to drop. High System Tract (HST) or High Stand System Tract is created when sea level starts to drop. Accomodation space is once again less than sedimentation rates causing aggradational stacked parasquences in the first phase and then progradational stack in the second phase. At the top of the HST, a squence boundary is formed. This boundary can be affected by erosion, especially if there is a long period of low sea level. Thus seismic stratigraphy interpretation includes seven steps viz.,seismic sequence analysis, well log sequence analysis,synthetic well to seismic ties,seismic facies analysis ,interpretation of Depositional environment and lithofacies and seismic modelling.

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We are extremely thankful to our authors for their contribution of research and review papers from abroad to different parts of our country specially for students and researchers.We have received eight articles viz., **Sequence stratigraphy of a Post Rift sedimentary succession: Example from Kachchh Basin, India,** *Bhawanisingh G. Desai et al,* School of Petroleum Technology, Pandit Deendayal Energy University, Raisan, Gandhinagar, **Gujarat** ; **Impact stratigraphy– from crater-filling to distal ejecta from** *David T. King, Jr*. and *Lucille W. Petruny* Geosciences, Auburn University, Auburn, Alabama 36849 **USA**; Sequence stratigraphy in the Petroleum industry; A review, *Gargi Sen* Digital and Integration Division, Schlumberger, Kuala Lumpur, **Malaysia, Sequence depositional model of Cretaceous sedimentary succession of Cauvery Basin in Ariyalur area;** *R. Nagendra, A.N. Reddy** and *Harry Gilbert** Formerly at Department of Geology, Anna University, **Chennai-**600025. Formerly at Department of Geology, Anna University, Chennai-600025. *Formerly @ OIDB, Anna University, Chennai-600025. **Regional Geoscience laboratories, ONGC, Chennai-600101; **Fundamentals of Sequence Stratigraphy,** *Nivedita Chakraborty* Department of Geology, Kabi Jagadram Roy Government General Degree College, Mejia, Bankura-722143, **West Bengal etc.**

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