



Study on sequence stratigraphy in the Permian sediments of terrestrial sequences within the Chintalapudi sub-basin, Godavari Coalfield, Southern India: insight from palynology and geochemistry

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Abstract

The opening of Neo-Tethys within Gondwanaland during the Guadalupian (transition signified a pivotal transgressive event) in the Permian Period. Consequently, an attempt has been undertaken to elucidate the sequence stratigraphy and palaeodepositional settings of fluvial sedimentary deposits encompassing coal and shale sediments within the Godavari Valley Coalfield, South India. The Total Organic Carbon (TOC) content across the examined samples exhibits a discernible range from 0.07 to 65.53 wt%, with reactive carbon, measured as Pyrolyzable Carbon (PC), displaying variations from 0.02 to 15.93 wt% and non-reactive carbon, characterized, as Residual Carbon (RC), spans a percentage range of 0–66.86 wt% within the selected samples. The predominant organic matter manifests as type III kerogen, except Sh-47, where type II kerogen is identified. The combination of Rock–Eval pyrolysis alongside palynofacies analysis facilitates the differentiation of significant system tracts arising from relative sea level fluctuations within the deposited terrestrial sequences. These tracts include swampy and flooded palaeomires settings. Terminologies denoting system tracts within the sequences are indicted as *T-1st*, *T-hst*, *T-tst* and *T-mfs* corresponding to the Low Stand System Tract (LST), High Stand System Tract (HST), Transgressive System Tract (TST) and Maximum Flooding Surface (MFS) respectively. A noteworthy one and half cycles are discerned within the sequence, predicted on Amorphous Organic Matter (AOM), TOC, Hydrogen Index (HI), PC and Gelification Index (GI) values. In the initial cycle, *T-mfs* is identified based on the preponderance of fluorescent AOM, coupled with the highest value of HI and PC. The ratio of opaque/translucent phytoclasts serves as a discriminant in delineating the boundaries of *T-1st*, *T-tst* and *T-hst* within the sequences, corroborating the aforementioned observation. This research serves as a preliminary assessment of the system tracts within fluvial environments. A more intricate, high-resolution exploration of deeper sequences holds the potential to furnish comprehensive insights for subsequent studies.

Keywords Sequence stratigraphy · Terrestrial · Permian · System tracts · Transgression · TOC

Abbreviations

AOM	Amorphous organic matter
CH	Charcoal/opaque phytoclasts
f-AOM	Fluorescent AOM
GI	Gelification Index
GVC	Godavari Valley Coalfield
HI	Hydrogen Index
HST	High Stand System Tract

LST	Low Stand System Tract
MFS	Maximum Flooding Surface
nf-AOM	Non fluorescent AOM
NSC	Non-structured opaque phytoclasts
OI	Oxygen Index
PC	Pyrolyzable Carbon
PF	Palynofacies assemblage
RC	Residual Carbon
RHP	Relative Hydrocarbon Potential
S1	Free hydrocarbons
S2	Heavy hydrocarbons
S3	Residual hydrocarbon
SC	Structured opaque phytoclasts
SP	Spore/pollen
ST	Structured phytoclasts/translucent phytoclasts
<i>T-hst</i>	Terrestrial-High Stand System Tract

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