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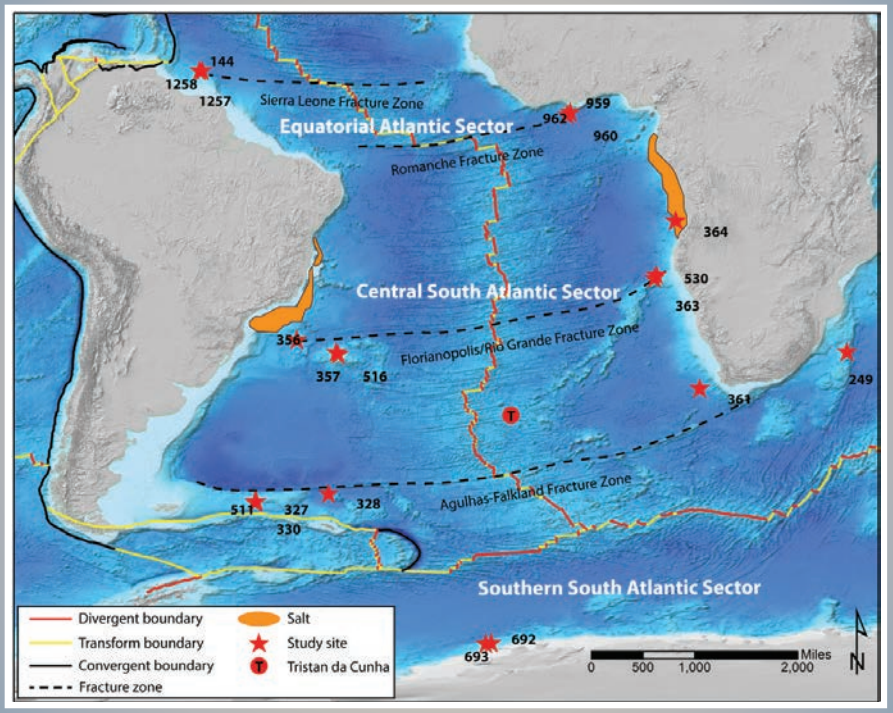
EGI Oceans: South Atlantic

Regional Assessment & Petroleum Systems Evaluation



Sudeep Kanungo, PhD, Matthias Greb, MS,
Eiichi Setoyama, PhD & David Thul, MS
I 01276

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Excecutive Summary

The research has established the first high-resolution (+/- 0.5 Myr best resolution) Mesozoic chronostratigraphic framework with three identified regional unconformities serving as tectono-stratigraphic bookends delineating four age-bracketed source rock systems. This is based on the re-analysis of over 16,000 published and EGI-analyzed sample data from 20 of the most stratigraphically complete DSDP/ODP sites. This study reduces exploration and production risk in the South Atlantic conjugate margin through the unified age, paleoenvironmental framework, and advanced organic geochemistry analysis that includes a newly proposed reclassification of the Jurassic source rock system. The study documents heterogeneity within the individual source rock systems, i.e., the Aptian–Albian, Cenomanian–Turonian, and Coniacian–Santonian system. It provides detailed source rock descriptions through TOC/pyrolysis data for more than 5,000 samples and preliminary kinetic results indicating the onset of hydrocarbon generation fairways for three of the principal source systems. These results were accomplished through strategic sampling at the IODP core repositories followed by systematic, multi-disciplinary re-analyses by EGI scientists. At least five key Mesozoic stratigraphic intervals that had never been sampled previously for source rock characterization and age evaluation are included in the petroleum systems re-evaluation. In the southern South Atlantic, we have extended the age of the oldest section by an estimated magnitude of 10–20 Myr into the Middle Jurassic.

Project Sponsors

Anadarko YPF ExxonMobil Chevron Statoil TOTAL

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- Phase 1: 20 DSDP-ODP sites (data from literature with up to 6 microfossil disciplines per site)
- Phase 2: 17 DSDP-ODP sites (EGI re-analysis of core samples from select Mesozoic intervals)

Appendix B: Chronostratigraphic markers (with notes)

Appendix C: Top age-depth relationship table

Appendix D: Paleoenvironment data table

Appendix E: Chronostratigraphic glossary (of terms used)

Appendix F: Organic geochemistry database (one master spreadsheet)

- Phase 1: 20 DSDP-ODP sites (data from literature)
- Phase 2: 20 DSDP-ODP sites (EGI re-analysis of core samples from select Mesozoic intervals)

Appendix G: Wireline logs from ODP sites (.dlis and .las format)

Appendix H: Digital integrated Geochemical Well Summaries (.las format)

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Expertise

- Integrated microfossil chronostratigraphy
- Nannofossil biostratigraphy
- Integrative source rock studies

Sudeep Kanungo is a nannofossil biostratigrapher recognized for his work in applied chronostratigraphy through the graphic correlation methodology and composite standard database technology. The foundation of this method is the former Amoco Composite Standard. Sudeep leads his team in integrative, multi-disciplinary chronostratigraphy projects to identify periods of rock accumulation, unconformities and depositional environments in absolute time (mega-annum age). This aids in creating data for improved spatial and temporal calibration of source rock events. Sudeep specializes in Mesozoic (Cretaceous) nannofossils, and integrating them with foraminifera and palynofossils. Sudeep is the principal investigator for the EGI Oceans Research Program and received the Best Science Poster Award for the EGI Oceans South Atlantic Project at the 15th Annual Houston Geological Society Africa Conference in September 2016.

Regional Experience:

- Central and North Atlantic: Conjugate Margin
- South Atlantic: Conjugate Margin
- Equatorial Transform Margin: Côte d'Ivoire – Ghana Transform Margin
- East and West India Passive Margin: 16 onshore to offshore basins
- East Africa: Somalia to Mozambique basins (onshore to offshore)

Recent Publications:

- Kanungo, S., Bown, P. R., Young, J. R., and Gale, A. S.: A brief warming event in the late Albian: evidence from calcareous nannofossils, macrofossils, and isotope geochemistry of the Gault Clay Formation, Folkestone, southeastern England, J. Micropalaeontol., 37, 231-247, https://doi.org/10.5194/jm-37-231-2018, 2018.
- Ahmed, W., Bhat, G.M., Mc Lennan, J., Sinha, H.N., Kanungo, S., Pandita, S.K., Singh, Y., Hakhoo, N., Hafiz, M., Thusu, B. & Choudhary, N.H.: Kerogen typing using palynofacies analysis in Permian Barren Measures Formation in Raniganj sub–basin, East India. The Palaeobotanist 67(2): 113–122, 2018.
- Kanungo S., Young J., Skowron, G.: Microfossils: Calcareous Nannoplankton (Nannofossils). In: Sorkhabi R. (eds.) Encyclopedia of Petroleum Geoscience, Encyclopedia of Earth Sciences Series, Springer, Cham, https://doi.org/10.1007/978-3-319-02330-4_4-2, 2017.

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Research Interests

- Application of foraminifera for paleoenvironmental and paleobathymetric estimation
- High-resolution biostratigraphy

Eiichi Setoyama, PhD

Foraminiferal Biostratigrapher

Dr. Eiichi Setoyama's expertise is in benthic foraminifera, a microfossil group that is critical in the industry and academia for paleoenvironmental reconstructions to underpin the understanding of the distribution of source and reservoir sediments and margin paleogeography. Dr. Setoyama joined EGI in 2014 as a paleoenvironment and biostratigraphy expert with the Chronostratigraphy Team.

Dr. Setoyama earned his Ph.D. from the Institute of Geological Sciences, Polish Academy of Sciences, in 2012, followed by a post-doctoral research position at the King Fahd University of Petroleum and Minerals in Dhahran, Saudi Arabia where he focused on the project "Pliocene to Pleistocene benthic foraminifera from IODP Expedition 323 Cores in the Bering Sea: The role of sea-level change, oxygenation, productivity, and volcanism."

He also received his MS in Paleobiology from University College London, UK. In addition to authoring multiple peer-reviewed publications, he is the proud recipient of several academic awards and grants related to ocean research drilling, and notably the Alan Higgins Award for Applied Micropalaeontology from The Micropalaeontological Society. Dr. Setoyama is bilingual in Japanese and English.

Dr. Setoyama has been involved in EGI Oceans South Atlantic (I 01350), Central & North Atlantic (I 01229), and iCORDS. His role includes conducting paleoenvironmental evaluation and high resolution chronostratigraphy of Mesozoic and Cenozoic sections of the DSDP/ODP/IODP sites.

His research focus areas include:

- Source rock depositional environment
- Paleobathymetric modeling
- Biofacies modeling
- The use of foraminiferal assemblages for analysis of displaced sediments
- Integrated, multi-disciplinary biostratigraphy

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