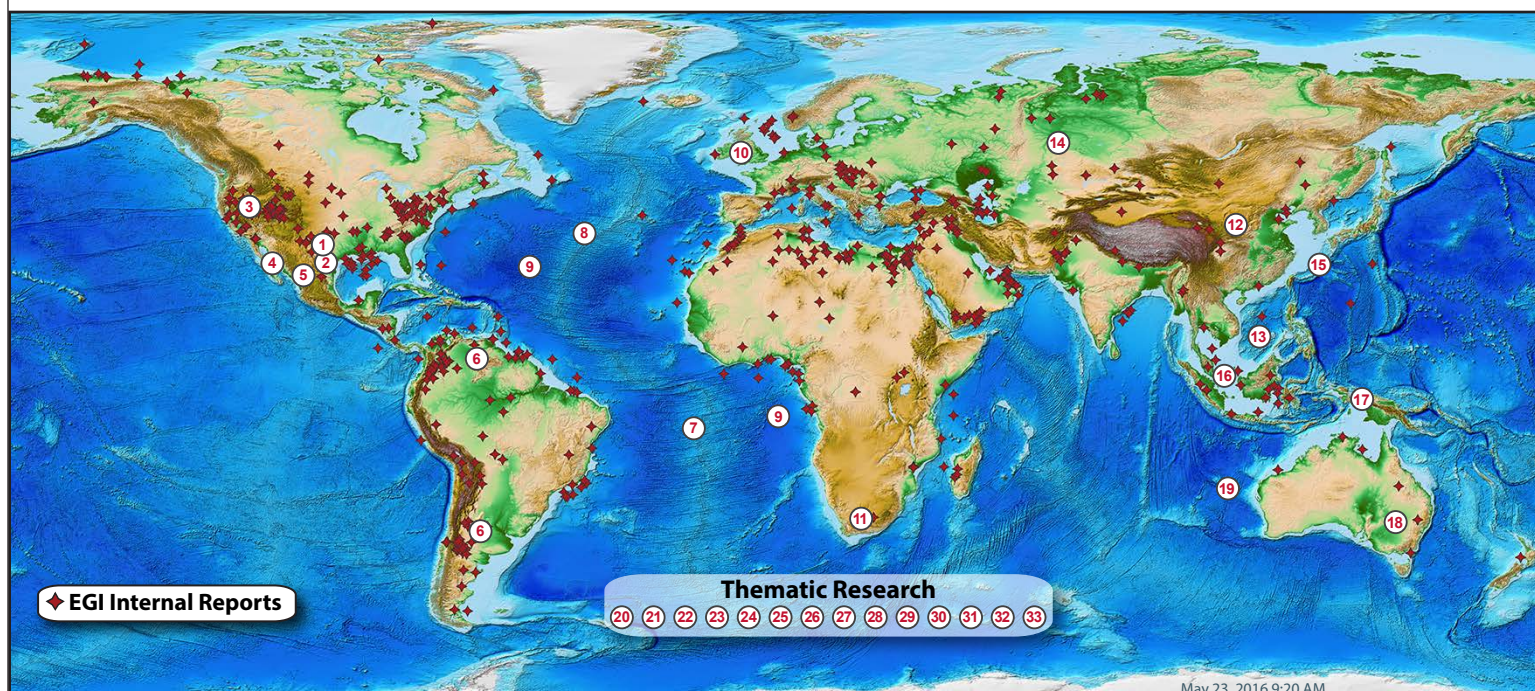


18 Regional Studies

- | | | | |
|----|---|-------|--|
| 1 | Liquids From Shales, Phase 2 | 11 | Karoo Basin Reservoir Characterization |
| 2 | Shale Gas Production Analysis, Phase 2 | 12 | China Shale, Phase 2 |
| 3 | Central Utah-Nevada Deep Plays | 13 | South China Sea Petroleum Systems |
| 4 | Frontier Basins of Mexico: Gulf of California | 14 | Central Eurasia Shales |
| 5 | Petroleum Systems Atlas of Mexico | 15 | Asia-Pacific Hybrid Unconventional Non-marine Plays |
| 6 | South American Shales, Phase 2 | 16 | Myanmar to Java – Basin Analysis & Petroleum Systems |
| 7 | EGI Oceans – South Atlantic | 17 | Southern Papuan Basin Petroleum Systems |
| 8 | EGI Oceans – C & N Atlantic Petroleum Systems | 18 | Australian Shales |
| 9 | EGI Oceans – Oceanic Petroleum Systems | 19(1) | Sheared Margins of Western Australia, Phase 1 |
| 10 | UK Shales | 19(2) | Sheared Margins of Western Australia, Phase 2 |

16 Multi-Region & Thematic Studies

- | | | | |
|-------|--|----|--|
| 20 | More Efficient Hydraulic Fracturing – Ultra-tight | 27 | Fluid, Mineral & Source Rock Chemistry |
| 21(1) | Source Rocks in Space & through Time, Phase 1 | 28 | Tracers for Characterizing Shale Gas Hydrofractures |
| 21(2) | Source Rocks in Space & through Time, Phase 2 | 29 | Flow in Nanoporous Rocks |
| 23 | Petroleum Systems of Sheared Margins, Phase 2 | 30 | Searchable Index & Analytics Engine for Core Databases |
| 24 | “Rifts & Passive Margins” | 31 | Shale Liquids Production Analysis |
| 25 | Improved Liquid Recovery in Shales | 32 | Optimization of Refracturing & Infill Drilling |
| 26 | Large-scale Geologic Controls on Hydraulic Stimulation | 33 | Improved Kinetic Models for Resource Play Assessment |



EGI Research Portfolio Categories

In Development | For Sponsorship

Research topics in this stage range from concept to kick-off. As CA sponsors indicate interest and meet with the research team the critical goals and deliverables are developed along with the workflow and timeline. Most projects require a minimum number of sponsors and when the goal is met the research commences. New sponsors are welcome to join at any time and provide guidance for the project goals and objectives.

In Progress | Open for Sponsorship

The project is moving forward based on the input of the initial CA sponsors and research team. Regular meetings provide updates and reviews. In some cases information and interpretations are uploaded to dedicated, secure websites for easy access during the study. New sponsors may join during this research phase and help steer the project through completion.

Completed | Immediate Delivery

The research study is complete and the report has been delivered to the initial sponsors. New sponsors may join and immediately receive the entire report and all connected documents. Additionally, the principal investigator will be available for an on site, full presentation, including work flow integration for the CA.

800+ & 17,000+ Additional Geoscience Documents

These projects make up the bulk of EGI's Online Database. The 800+ are reports completed by EGI researchers and the 17,000+ additional reports have been gathered over the years and new reports are added regularly. The 800+ EGI research reports are represented on the map with a red dot.

Via EGIconnect.com Corporate Associate members access our entire Online Global Database from the convenience of their office. Along with >800 research reports, our online database contains 350,000 km+ of 2D seismic data and 9,000+ well logs with locations.

EGICONNECT.COM

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Step 1: Create your individual user profile with log-in credentials using your company email address and a password of your choice. Click 'Create Account' to register.

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Step 3: Log in at EGIconnect.com

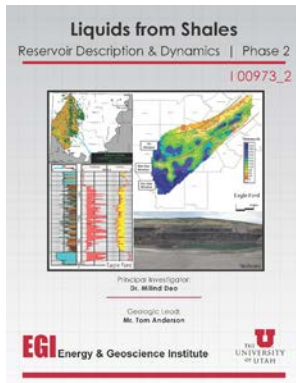
(Note: EGIconnect supports Internet Explorer 10+, Google Chrome, Mozilla Firefox & Safari)

Contact Information:

Dr. Raymond A. Levey, EGI Director & Research Professor
423 Wakara Way, Suite 300, Salt Lake City, UT 84108 USA
ContactEGI@egi.utah.edu | (801) 585-3826

1 Liquids From Shales, Phase 2

Completed | Available for Immediate Delivery



I 00973_2

Full Title: Liquids from Shales | Phase 2: Reservoir Description & Dynamics

Investment & Timetable: \$40k (USD) per Sponsor

Project Completion: Q1 2014

EGI Contacts:

Dr. Milind Deo | Principal Investigator | Chair & Professor, Department of Chemical Engineering, University of Utah,
Tel. (801) 581-7629 | Email: Milind.Deo@utah.edu

Mr. Tom Anderson | Senior Advisor & Research Scientist, EGI
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Project Rationale & Significance:

The production of liquids from shales has revolutionized the oil industry. In this second phase of research, we continued in our comprehensive quest at understanding all of the components that contribute to optimum exploitation of shales for liquids. These included geologic considerations, geomechanical modeling, reservoir engineering evaluations, and environmental aspects. We have learned and document that geologic characterization at various scales is important in establishing producibility and optimum recovery.

Sections 2–5 of the report focus on geologic evaluations. Detailed geologic characterizations of the Niobrara are discussed to establish the role of geology on production, the results have identified the property with the strongest correlation to production. An examination of pore-level characterization and a detailed workflow of shale characterization at the pore scale fill out the geology sections.

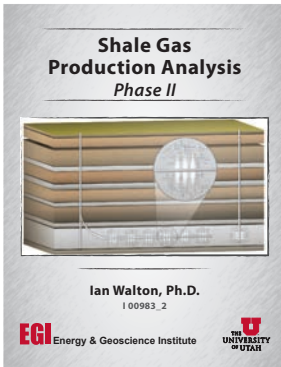
Sections 6 –11 deal with various engineering operations. The material balance methodology utilized production data and fluids characterization. The method developed makes it possible to obtain pressure profiles and saturation information, and to estimate reservoir permeability prior to interference with another hydraulic fracture. The development of this method for all types of reservoir fluids, and associated data analysis technique, were significant achievements in this project. This analytical tool for matrix permeability determination is available to all sponsors.

Deliverables:

- Determination of key geologic parameters that contribute to liquid production and methods for the development of quantitative geologic models with relevance to flow in liquid shale plays
- Development of multiphase flow pressure-variability in oil and condensate recoveries
- Relationships for variability in recovery, etc., with respect to all of the important parameters in a multivariate system. Development of selected response surfaces and surrogate models
- Study of the variability in the morphology of the hydraulic fractures in shales with changes in mechanical properties and/or mineralogy
- New reservoir engineering analysis tools in the form of modules or spreadsheets
- A workflow to simulate a combination of hydraulic and natural fractures. This work will be developed further and continued in Improved Recovery of Liquids from Shales

2 Shale Gas Production Analysis, Phase 2

Completed | Available for Immediate Delivery



I 00983_2

Full Title: Shale Gas Production Analysis | Phase 2

Investment & Timetable: \$42k (USD) per Sponsor
Project Completion: Q3 2014

EGI Contacts:

Dr. Ian Walton | Senior Research Scientist | Principal Investigator
Phone: 801-581-8497 | Cell: 281-381-5295 | E-mail: iwalton@egi.utah.edu

Project Rationale & Significance:

As we outlined at the start of Phase 1, the key to the identification of prospective shale gas plays and to the development of enhanced exploration, production and stimulation technology is an understanding of the production mechanisms. In turn, this depends on the availability of a model of the production process that represents the physical aspects of the reservoir and the completion and provides a satisfactory match with available production data.

In Phase 1 we developed a rigorous, semi-analytic, physics-based model of gas production from tight shales that recognized the distinguishing features of these reservoirs and allowed us to identify the major production drivers. The new model allows us to analyze production data from many wells as quickly as conventional decline curve analysis, but has the advantage of being rooted in the physics of the process. Consequently, it provides a predictive and interpretive capability that is lacking in empirical models or, for that matter, large scale reservoir simulators.

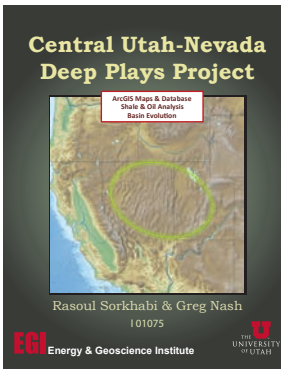
Deliverables – Phase 2:

Phase 2 used the semi-analytic production model from Phase 1 and the understanding gained from it to:

- Better characterize shale gas production through various stages of the production process including early-time transient (influenced by variable drawdown), linear flow and boundary-dominated flow. This involved the development of an improved asymptotic model and an improved (and unique) method of data interpretation, leading to better forecasts of EUR, particularly with limited production data. Industry interpretation of the restricted choke technique was critically assessed.
- Improve understanding and application of decline rates and decline curve analysis; this includes a critical assessment of industry perceptions in the use of decline rate and decline curve analysis.
- Provide an estimate of stimulated reservoir volume and productive reservoir volume. We developed a method of identifying well-to-well interference and assessing its impact on well productivity. We provide guidelines as to appropriate well-to-well spacing.
- Develop a preliminary interpretation of oil production rate from shales by adapting the semi-analytic techniques developed for shale gas production.

3 Central Utah-Nevada Deep Plays

Completed | Available for Immediate Delivery



I 01075

Full Title: Central Utah-Nevada Deep Plays | ArcGIS Maps & Database, Shale & Oil Analysis, and Basin Evolution

Investment & Timetable: \$57k (USD) per Sponsor
Project Completion: Q1 2016

EGI Contacts:

Dr. Rasoul Sorkhabi | Research Professor | Principal Investigator
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Dr. Greg Nash | Research Associate Professor | Principal Investigator
Phone: 801-585-9986 | E-mail: gnash@egi.utah.edu

Project Rationale & Significance:

The Central Utah-Nevada region covers a large part of the Great Basin bounded by the Rockies/Colorado Plateau on the east and the Sierra Nevada Mountains on the west. The region includes the Lower Paleozoic shelf of the North American continent which has been affected by a series of tectonic collisions (fold-and-thrust belts) from Late Paleozoic through Eocene times, and upon which the Neogene Basin-and-Range extensional basins were superimposed. The Paleozoic-Mesozoic plays of the region offer important frontier exploration targets both for conventional and unconventional oil and gas resources.

Value:

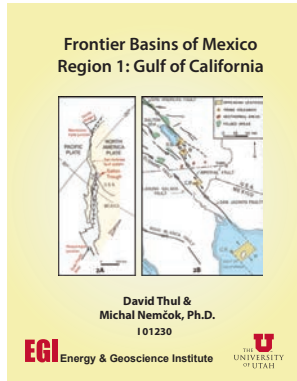
- Providing insight into the hydrocarbon potential of both conventional and unconventional shale plays of the highly faulted Paleozoic section across Central Utah-Nevada, explorationists can more quickly focus on those areas of highest potential.
- Characterizing known source rocks and correlating them to oils produced from the few existing fields and natural seeps, explorationists will have a better understanding of the Petroleum System(s) yet to be discovered within this complex tectonic regime.
- Exploration risk and cost can be reduced by having a better understanding of the depositional facies of key shale intervals and their present day structural orientation.

Deliverables:

- An ArcGIS Knowledge-database: Integrating geological, geochemical and geophysical data.
- Geochemical analysis and description of shale horizons to characterize the source rock potential from deep wells (including geothermal wells) as well as outcrop samples.
- Geochemical analysis of oil samples from fields and seeps to better understand and identify the oil family and oil-source rock correlation.
- Paleofacies maps of the Paleozoic sediments beneath the Great Basin of Central Utah-Nevada.
- Three (3) East-West regional transects depicting plausible shale plays.
- A detailed faults-fractures map highlighting the (a) tectonic genesis, orientation and relative population of lineaments and fractures and (b) basement-cover relationships using both satellite images and field observations.
- A bibliographic geoscience database for the region.

4 Frontier Basins of Mexico: Gulf of California

In Development | For Sponsorship



I 01230

Full Title: Frontier Basins of Mexico | Region 1: Gulf of California

Investment & Timetable: \$72.5k (USD) per Sponsor

Projected Start Date: 2016

Duration: 12 months

EGI Contacts:

Mr. David Thul | Manager of Petroleum Systems & Geochemistry | Principal Investigator | Tel. (720) 232-5798 | Email: dthul@egi.utah.edu

Dr. Michal Nemčok | Research Professor | Principal Investigator
Tel. 421 254 630 337 (Bratislava, Slovakia) | Email: mnemcok@egi.utah.edu

Project Rationale & Significance:

The application of techniques designed for pull-apart terrains to this project could give EGI Corporate Associates exploring in this frontier region a competitive advantage. Furthermore, understanding the thermal history of the Salton Trough-Gulf of California, which is controlled by the interaction of crustal thinning, magmatism and geothermal fluid flow systems, provides EGI Corporate Associates with an exploration manual for similar settings that occur worldwide.

Value

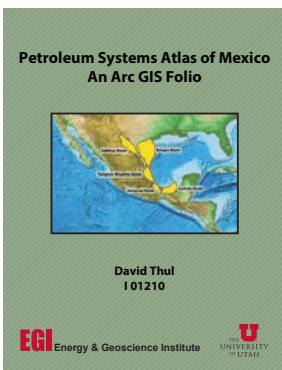
- A detailed understanding of the Salton Sea-Gulf of California region for thermal and hydrocarbon development history as a function of pull-apart basin maturity creating a competitive advantage for sponsors.
- Create an exploration manual for both regional exploration of Mexico and for companies focused on pull-apart settings around the world
- Ultimately, this work will lead to a true understanding of the continuum that exists between petroleum systems in pull-apart basins at different phases of their evolution from the initial stretching to sea-floor spreading.

Key Deliverables

- Maps in GIS format: Present-day thermal regime maps; Crustal thickness map; Fault map; Magmatic product distribution map in GIS format; Geothermal field distribution map; Regional facies distribution maps for pull-apart fill
- Color-coded maps showing the distribution of various properties of source, reservoir and seal rocks of the pull-apart fill in GIS format
- Gravity maps of different types (free-air, Bouguer, Isostatic residual anomaly, 1st vertical derivative, total horizontal derivative, several band passes of the Isostatic residual anomaly map) and magnetic maps.
- Map of the main sediment entry points into the pull-apart basins – all in GIS
- Set of 1D PetroMod source rock maturation and expulsion history models, characterizing individual pull-apart basins during their evolution from initial phases of crustal thinning to sea-floor spreading. Submitted in both exported bitmap and original PetroMod file formats

5 Petroleum Systems Atlas of Mexico

In Progress | Open for Sponsorship



I 01210

Full Title: Petroleum Systems Atlas of Mexico | An ArcGIS Folio

Investment & Timetable: \$50k (USD) per Sponsor

Start Date: Q4 2014 Duration: 8 months

EGI Contacts:

Mr. David Thul | Manager of Petroleum Systems & Geochemistry | Principal Investigator | Tel. (720) 232-5798 | Email: dthul@egi.utah.edu

Project Rationale & Significance:

Recent amendments to Mexico's constitution have changed the structure of the petroleum industry in Mexico, setting the stage for significant opportunities in wildcatting, exploration, field development, and EOR. Successful ventures in each of these categories are predicated on a fundamental understanding of the petroleum systems in each basin. This Petroleum Systems Atlas aims to provide that understanding by assembling information and data from the literature, universities, and government sources into a coherent view of the proven and speculative petroleum systems. The project will cover five of Mexico's producing, onshore and shallow-water basins. The atlas will evaluate conventional petroleum systems as well as unconventional petroleum opportunities.

The timing of this project is set to deliver the Atlas prior to bid round one in mid-2015. The delivery date will provide CAs with a report and GIS framework for rapid evaluation of initial opportunities. The project will also position EGI for subsequent, in-depth projects focused on specific areas of interest to future bid rounds. As in EGI's South American Shales project, we aim to create close collaboration with organizations inside Mexico to provide new samples for analysis and integration into the GIS during future stages.

A coherent description and characterization of proven and speculative petroleum systems in the following Mexican Basins will be created:

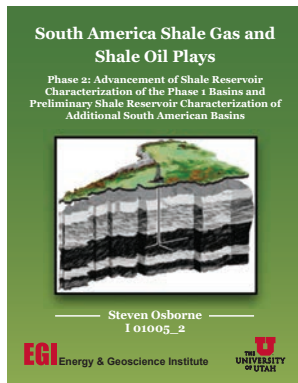
« Sureste Basin « Tampico-Misantla Basin « Burgos Basin « Veracruz Basin « Sabinas Basin

Deliverables:

- Digital, hot-linked report with an emphasis on describing petroleum system components and analog petroleum systems
- Integrated Stratigraphic Chart & Petroleum Systems Event Chart for each basin
- GIS map database that will include geographic information, topography, shaded relief, satellite image, basin outline, protected areas, surface geologic map, well locations, oil and gas fields, key information from data sources, data and sample locations as well as interpretations derived from the Atlas generation
- Preliminary assessment of risk for each petroleum system

6 South American Shales, Phase 2

In Progress | Open for Sponsorship



I 01005_2

Full Title: South America Shale Gas and Shale Oil Plays | Phase 2: Advancement of Shale Reservoir Characterization of the Phase 1 Basins and Preliminary Shale Reservoir Characterization of Additional South American Basins

Investment & Timetable: \$156k (USD) per Sponsor for the two-year project
\$77k (USD) due upon signing \$79k (USD) due in 2014
Project Start: Q4 2013 Duration: 24 months

EGI Contacts:

Mr. David Thul | Manager of Petroleum Systems & Geochemistry | Principal Investigator | Tel. (720) 232-5798 | Email: dthul@egi.utah.edu

Project Rationale & Significance:

The over-riding objective of Phase 2 is to comprehensively build on the knowledge, database, methodology, experience, contacts and signed agreements of Phase 1. It is the intention to establish an unparalleled understanding of shale resources in South America, enabling sponsors to make well informed exploration and exploitation decisions. Establish an unparalleled understanding of shale resources in South America, enabling well informed exploration and exploitation decisions.

Value

- Establish an unparalleled understanding of shale resources in South America, enabling well informed exploration and exploitation decisions.
- Evaluate facies, diagenetic history, microtectonics, fabric, texture, kerogen type and distribution, permeability, pore type and pore distribution at the core, thin section and SEM scales.
- Expand detailed quantitative and qualitative comparisons between U.S. producing shales and South Americas' most promising shales.

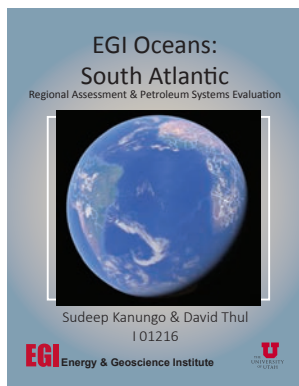
Deliverables

- Digital hot-linked report: emphasis on aspects that impact shale gas/liquid potential, including: petroleum system elements, structure, tectonics, fractures/faults, burial history, petrology, mineralogy, and organic geochemistry. The report includes basin and shales summaries with maps, cross sections, diagrams and analytical results.
- GIS map database: geographic information, topography, shaded relief, satellite image, basin outlines, protected areas, surface geologic map, well locations, oil and gas fields, petroleum infrastructure, key data, sample locations, interpretations and location points derived from this study.
- A ranking of the petroleum potential of the basins studied.
- Database of shale analytical parameters including data from 2000+ new samples analyzed at EGI and more than 10,000 additional data points.

(Note: Phase 2 makes direct use of the results from Phase 1, sponsorship for Phase 1 & 2 is available for new sponsors.)

7 EGI Oceans – South Atlantic

In Progress | Open for Sponsorship



I 01216

Full Title: EGI Oceans | South Atlantic Regional Assessment of Deepwater Petroleum Systems: Re-evaluation & New Sample Analyses of Key DSDP-ODP Study Sites

Investment & Timetable: \$88k (USD) per Sponsor

Projected Start Date: Q2 2015

Duration: 6 months

EGI Contacts:

Dr. Sudeep Kanungo | Research Assistant Professor | Principal Investigator
Tel: (801) 585-7852 | Fax: (801) 585-3540 | Email: skanungo@egi.utah.edu

Mr. David Thul | Manager of Petroleum Systems & Geochemistry | Principal Investigator | Tel. (720) 232-5798 | Email: dthul@egi.utah.edu

Dr. Eiichi Setoyama | Research Instructor | Foraminiferal Biostratigraphy
Tel. (801) 585-9768 | Email: esetoyama@egi.utah.edu

Project Rationale & Significance:

Investigations from the southern South Atlantic DSDP-ODP sites that were drilled in the 70's, are indicating large-magnitude shifts in the revision of their age models, especially in the Lower Cretaceous and Upper Jurassic sections.

Up to 200 samples will be analyzed from 20 study sites in the South Atlantic to augment the regional synthesis results. The composite standard methodology of absolute age calibration via the graphic correlation technique will be employed for the new sample analyses.

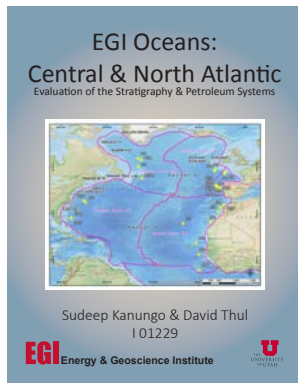
Samples collected will be analyzed using standard methodologies to assess kerogen richness, quality, kinetics, and prepared for molecular chemistry evaluation. Biostratigraphic and geochemical interpretations will be merged into a single diagram to understand source-reservoir-migration relationships.

Deliverables

- Improved age re-synthesis: Based on interpretations via new sample acquisition and analysis, the age-depth interpretations will be updated comprehensively. This will improve the resolution of the age models, that have indicated some large shifts, especially in the Falkland sector.
- Paleoenvironmental interpretations from new data will improve the existing interpretations, and data-permitting, paleofacies maps will be generated for selected source rock related time intervals, e.g., Tithonian, early Aptian, mid-to late Albian.
- Chronostratigraphic cross-sections: Improved chronostratigraphic cross-sections will illustrate the regional chronostratigraphy and distribution of biofacies, data permitting.
- Source rock characterization for richness, maturity, kerogen type, and kinetics.
- Petroleum systems integration
- Geochemical logs: Posted depth standardized data for geochemical log for age-depth interpretation of results.
- Anhydrous pyrolysis kinetic values for elected source intervals.

8 EGI Oceans – C & N Atlantic Petroleum Systems

In Progress | Open for Sponsorship



I 01229

Full Title: EGI Oceans | Central & North Atlantic Evaluation of the Stratigraphy & Petroleum Systems

Investment & Timetable: \$180k (USD) per Sponsor for the 2.5 year project
\$60k(USD) – Upon signing \$60k(USD) – Start of year 2 \$60k(USD) – Start of year 3
Projected Start Date: Q4 2015 Duration: 30 months (2.5 years)

EGI Contacts:

Dr. Sudeep Kanungo | Research Assistant Professor | Principal Investigator
Tel: (801) 585-7852 | Fax: (801) 585-3540 | Email: skanungo@egi.utah.edu

Mr. David Thul | Manager of Petroleum Systems & Geochemistry | Principal Investigator
Tel: (720) 232-5798 | Email: dthul@egi.utah.edu

Project Rationale & Significance:

The region has significant license rounds within the forthcoming 1–6 years. This research project is a timely opportunity to leverage critical well data and analysis in advance of evaluating new acreage in the region.

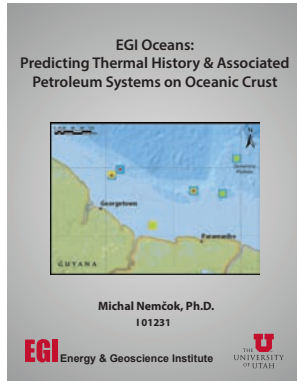
- Recalibrating the stratigraphy and evaluating petroleum systems of the Central & North Atlantic Ocean conjugate margin.
- A carefully selected array of 40 wells (COST – Continental Offshore Stratigraphic Test plus commercial wells) and DSDP-ODP-IODP sites, recommended by EGI corporate members.
- Both in-house and affiliate scientist expertise and partnerships with 12 international institutes and governmental agencies in the evaluation of the Atlantic margins.
- COST well data already acquired by EGI through collaboration and agreement.
- Unique world class capability in high resolution chronostratigraphy via composite standards calibrated to the 2012 global time scale, and novel analytical techniques in petroleum geochemistry (e.g., Hydrocarbon Analyzer with Kinetics (HAWK™) pyrolysis).
- ArcGIS delivery platform for results.

Deliverables:

- Multi-disciplinary age and paleoenvironmental interpretation: Annotated graphic correlation charts for each study well showing biostratigraphic datums (foraminifera, nannofossils, palynomorphs).
- Wheeler diagrams (chronostratigraphic cross-sections) illustrating the regional chronostratigraphy and distribution of biofacies.
- Integrated sedimentology data and paleofacies maps for key time horizons relevant to major source rock intervals including generation and maturation.
- Source rock characterization for richness, maturity, kerogen type, and kinetics
- Source (kerogen) type integrated with depositional environment
- Petroleum systems integration
- Anhydrous pyrolysis kinetic values for elected source intervals
- Progression onshore on conjugate margins of both segments in terms of uplift amount/ uplift rate and timing using apatite fission track analysis. This is key to understanding source to sink, sediment pathways and provenance.

9 EGI Oceans – Oceanic Petroleum Systems

In Development | For Sponsorship



I 01231

Full Title: EGI Oceans | Predicting Thermal History & Associated Petroleum Systems on Oceanic Crust

Investment & Timetable: \$74k (USD) per Sponsor

Projected Start Date: 2015-16

Duration: 12 months

EGI Contacts:

Dr. Michal Nemčok | Research Professor | Principal Investigator

Tel. 421 254 630 337 (Bratislava, Slovakia) | Email: mnemcok@egi.utah.edu

Project Rationale & Significance:

Due to a current lack of predictive tools to determine thermal history and associated petroleum system development, the oceanic crust remains one of the most intriguing frontiers on the Earth. A project such as this establishes knowledge about the parts of the oceanic source rock strata that have had time to reach hydrocarbon expulsion without distinct delta and fan systems developed by major rivers entering the oceanic basins.

Value:

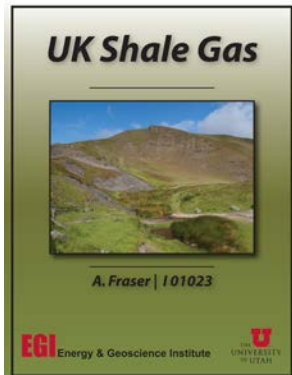
- A detailed understanding of thermal histories of individual oceanic crust tiles, each of them accreted over a 5 Ma-long interval (this understanding includes identification of any extra thermal events added on top of each tile's cooling history);
- A detailed understanding of the radiator effect of the thinner oceanic crust associated with the tile-dividing oceanic fracture zones; and
- A definition of regions affected by a dysoxic event, done for several selected stratigraphies (this definition includes both well-derived analytical proofs for individual tiles and regional extrapolations).
- A scientific and competitive advantage for EGI Corporate Associates exploring in this frontier region.
- A comprehensive exploration manual for understanding the thermal history of the Central and North Atlantic region that can be used for other oceanic basin settings worldwide by EGI Corporate Associates not currently active in exploring this region.

Deliverables

- A present-day map of oceanic crust tiles color-coded according to their accretion speed category (ultra-slow, slow, intermediate and fast).
- Map of zonal representation of oceanic fracture zones including their individual main troughs and ridges.
- Map of oceanic crust tiles with anomalous thermal histories including hyperlinked texts describing the reasons for their abnormality.
- Attempted map of radiator effect of thinned oceanic crust of oceanic fracture zones.
- Raw maps of specific tiles proving the existence of dysoxic event for a set of chosen stratigraphic intervals.
- Extrapolated maps of rough areal extents of identified dysoxic events made for each of the chosen stratigraphic intervals.

10 UK Shales

Completed | Available for Immediate Delivery



I 01023

Full Title: UK Shale Gas

Investment & Timetable: \$51k (USD) per Sponsor
Project Completion: Q1 2016

EGI Contacts:

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Dr. Raymond Levey | EGI Director | Research Professor | Principal Investigator
Tel. (801) 585-3826 | Email: rlevey@egi.utah.edu

Project Rationale & Significance:

The EGI/Imperial joint UK Shale Gas project has been designed to build on the depth of UK geological knowledge residing at Imperial College and the skills and techniques in shale oil and gas evaluation developed and employed by EGI Scientists at the University of Utah. With the impending UK onshore 14th licence round it was felt that an independent (from government) assessment of the UK Shale Gas resource potential be undertaken. Phase 1 of the project was specifically targeted at the Carboniferous shales of northern England and the Jurassic shales of southern England that had previously been identified as the source of conventional petroleum fields in the onshore UK.

An extensive geological sampling program was undertaken at the BGS Core Store facilities in Keyworth in Nottinghamshire. The samples were sent to EGI in Salt Lake City for geochemical and petrological/mineralogical analyses using state of the art pyrolysis and petrological investigation techniques. The results of this analysis were combined with an extensive literature and 2D seismic based mapping to derive maps of 'Sweet spot' locations for Shale oil and gas potential in the UK. The database has been captured using the ArcGIS software platform.

The new geochemical and mineralogical data has provided critical information regarding the potential for shale oil and gas resources in the UK. Previous understanding of these Jurassic and Carboniferous shales has been reviewed and revised models for their distribution and effectiveness have been presented. The resource estimates provided by the BGS & DECC in advance of the 14th UK Onshore Licence Round have been compared with the results of this study that has concluded that some significant revisions in resource estimates may be required.

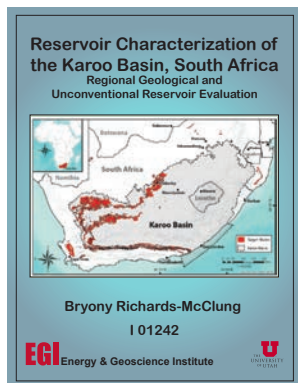
Deliverables:

Over 200 samples were collected from the BGS Core Store in Keyworth Nottinghamshire, England. The majority of the samples were 5 cm diameter core chips collected at half-meter intervals through key zones of interest. In the absence of core material selected cuttings were sampled for completeness.

- ArcGIS project of wells, seismic and maps from previous onshore UK conventional studies
- 2D seismic from UKOGL database
- Analysis of organic rich shales of the Carboniferous & Jurassic
 - » Presence, Richness, Maturity, Burial & uplift history, Documentation

11 Karoo Basin Reservoir Characterization

In Development | For Sponsorship



I 01242

Full Title: Reservoir Characterization of the Karoo Basin, South Africa | Regional Geological & Unconventional Reservoir Evaluation

Estimated Investment & Timetable: \$80k (USD) per Sponsor
Projected Start: 2015-16 Duration: 24 months

EGI Contacts:

Dr. Bryony Richards-McClung | Research Scientist | Principal Investigator
Tel. (801) 585-0599 | Email: brmcclung@egi.utah.edu

Project Rationale & Significance:

Recent estimates of unconventional resources in the Karoo Basin, suggest widely variable recoverable shale gas in-place from ~30 Tcf to ~500 Tcf (i.e. Decker and Marot, 2012). Potentially large gas reserves; coupled with the present energy shortfall in South Africa, has led to shale gas becoming an attractive new energy prospect, with much of the renewed exploration focus falling on the Karoo Basin shales.

Value

- The integration of three key technical areas to establish an unparalleled understanding of shale resources in South Africa's Karoo Basin.
- Core through Pore™ Integrated Petrological Workflow for cutting-edge interpretation of composition, texture, fabric, porosity, permeability, micro-tectonics, micro-facies/depositional evolution and diagenetic history.
- Geophysical & Petrophysical Data: integrated within the gross tectonic structural framework, taking into account the correlation of available gravity and magnetic data within the fundamental sequence stratigraphic framework of the basin.
- Organic Petrology: Evaluation of key samples using rock-Eval, TOC, and biomarkers with the integration of inorganic (petrological) analyses and regional (geophysical/petrophysical) data.

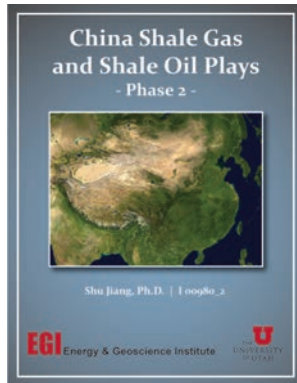
Deliverables:

Project deliverables are proposed to focus on the critical assessment of potential shales in key areas of the basin, using available literature, geological modeling and new analyses of samples, including:

- Comprehensive petrological analyses using the Core through Pore™ integrated analytical approach using optical microscopy, XRD, XRF, QEMSCAN®, SEM, FIB-SEM and TEM/STEM.
- Geochemical and petrological databases and charts (Excel).
- Integrated assessment of analysis with available well log and magnetic data.
- Delivered on ArcGIS platform with GIS catalog delivered in Excel format.
- Analog table containing key shale parameters and potential analogous North American reservoirs (Excel).
- Documentation from interim and final project presentations

12 China Shale, Phase 2

Completed | Available for Immediate Delivery



I 00980_2

Full Title: China Shale Gas and Shale Oil Plays | Phase 2: Integrated Shale Reservoir Characterization in Primary Basins

Investment & Timetable: \$75k (USD) per Sponsor
Project Completion: Q2 2015

EGI Contacts:

Dr. Shu Jiang | Research Assistant Professor | Principal Investigator
Tel. (801) 585-9816 | Email: sjiang@egi.utah.edu

Project Rationale & Significance:

Enhance the geologic understanding of the most promising marine and lacustrine shales from four primary basins/regions (Sichuan (key marine gas-producing basin), Yangtze Platform outside Sichuan (area of interest and bidding blocks), Ordos (key lacustrine oil and transitional gas-producing basin), and Bohai Bay (key lacustrine oil-producing basin) by acquiring new samples and expanding the tests performed on the new and existing samples. Laboratory evaluation of marine and lacustrine shales using traditional assessment tools and new testing tools, procedures, and measurements to characterize geochemistry, mineralogy, petrophysical properties, gas and/or oil content and brittle response/"fracability" of Chinese shales, especially for the lacustrine shales.

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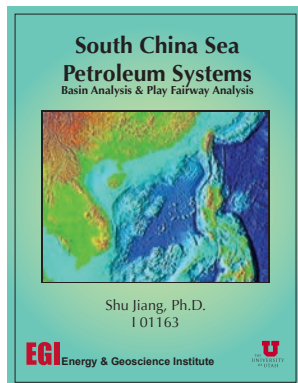
- Catalog characteristics from seismic reflections, well logs, image logs, mineralogy, and geomechanical properties (where possible) for typical, recently drilled shale wells.
- Correlate geologic properties and geomechanical measurements; e.g., relationships between mineralogy, rock fabric, storage capacity, and geomechanical parameters.
- Conduct representative hydraulic fracturing simulations/fracture propagation forecasts for representative marine and lacustrine shales. Interrelate these with geological characteristics. The goal is to attempt to establish differences between vertical and aerial fracture growth behavior and fracture potential/morphology (natural and induced) for various marine and lacustrine shales.
- Develop relationships (between similar and dissimilar shales) employing the database that has/is being developed to aid in evaluation and inference of various shale properties.
- Provide detailed quantitative and qualitative comparisons between properties of U.S. producing marine shales and China's most promising marine and lacustrine shales to understand the merits and potential downsides.
- Expand the database by including new core and outcrop sample testing and revise interpretations that will guide the appraisal and exploitation of Chinese shales.

Deliverables:

- Digital ArcGIS product with detailed database of measured properties and attributes.
- Presentations from project review meetings.
- Final report delivered in print and electronic formats.

13 South China Sea Petroleum Systems

In Development | For Sponsorship



I 01163

Full Title: South China Sea Petroleum Systems | Basin Analysis & Play Fairway Analysis

Estimated Investment & Timetable: \$99k (USD) per Sponsor
Projected Start Date: 2016 Duration: 24 months

EGI Contacts:

Dr. Shu Jiang | Research Assistant Professor | Principal Investigator
Tel. (801) 585-9816 | Email: sjiang@egi.utah.edu

Project Rationale & Significance:

Recent discoveries in Yinggehai Basin and Pearl River Mouth Basin located in the northern continental margin, Cuu Long in western SCS, and Reed Bank in southeastern SCS have spurred exploration efforts in the region. The current exploration status differs from basin to basin due to the variety of geologic settings, and a lack of regional studies to characterize the differences in those basins. The study objectives are to understand the regional tectonic and depositional evolution and petroleum systems in SCS, and predict the future exploration opportunities based on integrated study and play fairway analysis.

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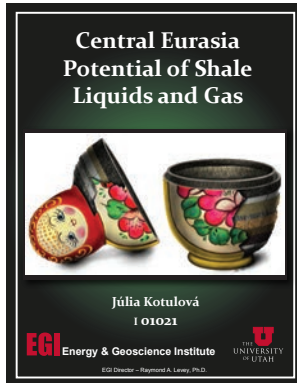
- An expanded understanding for the regional geology and petroleum systems including yet to find resources of the South China Sea.
- Catalog the parameters of producing reservoirs including porosity, permeability, net/gross, reservoir type, depositional facies, hydrocarbon type, trap type, and size.
- Quantify key parameters for discovered fields and a re-examination of previously failed exploration areas.
- Develop the petroleum system models across parts of SCS using Chinese and English literature, theses, dissertations, research of multi-national institutes, and our original studies.
- Assess potential and predict future hydrocarbon resources based on an integrated study including a comprehensive play fairway analysis.

Deliverables:

- Catalog of the parameters of producing reservoirs including porosity, permeability, net/gross, reservoir type, depositional facies, hydrocarbon type, trap type, and size
- Petroleum system models across different regions of the South China Sea Stratigraphic charts, structural and depositional evolution maps
- Atlas of oil/gas fields
- Potential prospects in time and space
- Petroleum system elements and play fairway maps (e.g., source rock, reservoir, caprock)
- Digital and ArcGIS based reports and PDF files.

14 Central Eurasia Shales

Completed | Available for Immediate Delivery



I 01021

Full Title: Central Eurasia Potential of Shale Liquids and Gas

Investment & Timetable: \$80k (USD) per Sponsor

Project Completion: Q4 2015

EGI Contacts:

Dr. Júlia Kotulová | Research Scientist | Lead Investigator

Tel: 421-2-544 10 569 (Slovakia) | E-mail: jkotulova@egi.utah.edu

Dr. Raymond Levey | EGI Director | Research Professor | Principal Investigator

Tel. (801) 585-3826 | Email: rlevey@egi.utah.edu

Project Rationale & Significance:

Modern concepts of shale stratigraphy indicate highly variable depositional conditions that lead to heterogeneous grain size, composition, and variable organic matter preservation. This project collected a significant number of new samples representing 10 initially identified basins eventually narrowed to four key basins (West Siberia, Timan Pechora, Volga Urals and Dniepr Donets) for in-depth evaluation.

Value:

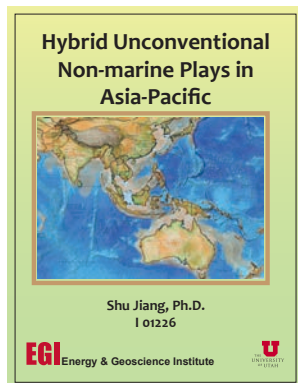
- Evaluated more than 1000 new and existing analytical samples (comprising organic geochemistry, mineralogy and petrology);
- Evaluated fourteen (14) 1D calibrated geohistorical and petroleum system models;
- Evaluated seven (7) interpreted regional seismic surfaces;
- Created a number of new databases from data gathered from the public domain for each basin;
- Translation of key scientific literature;
- Interpretation of new analytical results;
- Comprehensive summaries for each of the four key basins;
- Comparison of key parameters of shale liquid and gas rich resources from the four studied basins with those from some of the most successful USA shale plays;
- Strategic advantage in the evaluation of major shale systems in Central Eurasia

Deliverables:

- Digital Arc GIS product with detailed database of measured properties and attributes and final report
- Summary of each of the 10 initially identified basins and comprehensive description, summary, analysis, and conclusions for the four basins selected for further detailed study;
- Sample passports hyperlinked to individual point feature classes in ArcGIS including comprehensive instant information about organic matter, mineralogy, and petrology;
- Unified ArcGIS library representing collected data and new analyses

15 Asia-Pacific Hybrid Unconventional Non-marine Plays

In Development | For Sponsorship



I 01226

Full Title: Hybrid Unconventional Non-marine Plays in Asia-Pacific | Geology, Play Identification & Hydrocarbon Systems in China, Indonesia & Australia

Investment & Timetable: \$175k (USD) per Sponsor for two-year project
 \$89k (USD) – Due upon signing \$86k (USD) – Start of year 2
 Projected Start Date: 2016 Duration: 24 months

EGI Contacts:

Dr. Shu Jiang | Research Assistant Professor | Principal Investigator
 Tel. (801) 585-9816 | Email: sjiang@egi.utah.edu

Project Rationale & Significance:

The Asia-Pacific region ranks No. 1 in terms of remaining, technically recoverable, unconventional gas plays (shale gas, CBM, tight gas). The most prospective tight sands, coal beds and organic-rich shales were deposited in non-marine settings and are stratigraphically associated. Huge unconventional resource potentials, proven producing basins, primary unconventional production, high demand, existing infrastructure, favorable policies and high domestic gas price high-grade China, Indonesia and Australia as three countries on which to focus our research. Recent production from Jurassic lacustrine shale and associated tight carbonate reservoirs in the Sichuan Basin (southwest China) and preliminary production from Permian lacustrine shale in Cooper Basin imply the huge, untapped potential of coexisting hybrid unconventional plays in lacustrine basins.

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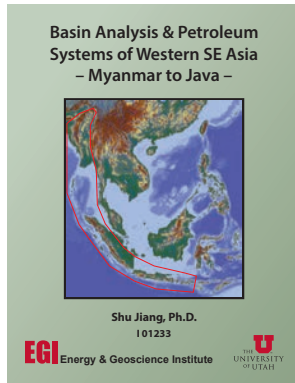
- An integrated study providing an expanded understanding for basin-specific geologic, geochemical and mineralogical knowledge of non-marine strata in major producing Asia-Pacific onshore basins with producing or potential unconventional plays.
- Define basin evolution and the development of non-marine petroleum system elements including prioritized geological controls related to unconventional accumulation and production.
- Generate predictive non-marine models for play habitat of stratigraphically associated hybrid unconventional tight sand/carbonate, shale and CBM hydrocarbon systems.
- Characterization of unconventional plays via data integration, interpretation, analysis of sample tests and comparisons U.S. analog unconventional plays.
- An evaluation of unconventional non-marine play opportunities.

Deliverables:

- ArcGIS based database including map layers and excel spreadsheet.
- Project report with text, figures, and meeting presentations.
- Stratigraphic charts, structural and depositional evolution maps.
- Petroleum system components.
- Play fairways maps for hybrid unconventional plays.
- Reservoir characterization of representative hybrid unconventional non-marine plays.

16 Myanmar to Java – Basin Analysis & Petroleum Systems

In Development | For Sponsorship



101233

Full Title: Basin Analysis & Petroleum Systems of Western SE Asia – Myanmar to Java

Estimated Investment & Timetable: \$76.5k (USD) per Sponsor
Projected Start Date: 2016 Duration: 12 months

EGI Contacts:

Dr. Shu Jiang | Research Assistant Professor | Principal Investigator
Tel. (801) 585-9816 | Email: sjiang@egi.utah.edu

Project Rationale & Significance:

The expertise and knowledge of EGI's researchers and reports from previous studies in SE Asia and basins with similar geology, interpretation, and integrated analysis from new data combined with previous data will make this high quality research project feasible. Sponsors will benefit from a prioritized list of potential exploration targets in both unexplored/underexplored basins and basins considered mature from an exploration standpoint. For companies that are not active in SE Asia, our systematic and comparative study will help help them use the knowledge learned from SE Asia as analogs for basin evolution and petroleum systems in other basins with similar tectonic settings.

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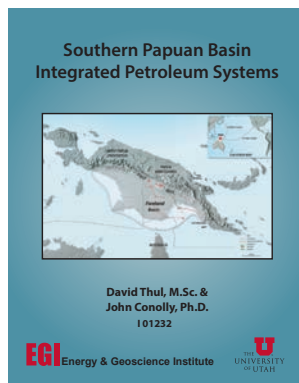
- Summary for the regional tectonics and basin evolution in western SE Asia, running North – South, from Myanmar to Java Island region.
- Comparison of the geology and petroleum systems of back-arc, fore-arc and fore-deep basins on a regional basis.
- Recommended play exploration opportunities in both frontier basins and exploration mature basins.
- Compendium with predictive models addressing the similarities and dissimilarities of petroleum systems in back-arc, fore-arc and fore-deep basins in different tectonic settings prioritized for exploration strategy or as analogs for exploration in other similar basins in the world.

Deliverables:

- ArcGIS based database including regional tectonic and depositional maps, stratigraphic charts and stratigraphic cross sections for each basin and/or sub-basins, maps of Petroleum system elements and chart, modeled burial and thermal history and hydrocarbon migration and accumulation results, play maps, potential plays, examples and models for basins in trench-slope fore-deep, fore-arc and back-arc settings.
- Interim data uploads (2 to 3) during the course of the research.
- Meeting presentations and project report (both digital and hardcopy).
- Reliable bibliographic database

17 Southern Papuan Basin Petroleum Systems

In Progress | Open for Sponsorship



I 01232

Full Title: Southern Papuan Basin Integrated Petroleum Systems

Investment & Timetable: \$75k (USD) per Sponsor

Project Start Date: Q4 2015

Duration: 16 months

EGI Contacts:

Mr. David Thul | Manager of Petroleum Systems & Geochemistry | Principal Investigator | Tel. (720) 232-5798 | Email: dthul@egi.utah.edu

Dr. John Conolly | EGI Affiliate Research Scientist | Petrofocus Consulting | Australian Geology Expertise | Cell: 61-418486239

Project Rationale & Significance:

The shift in Papuan Basin exploration focus from known oil and gas accumulations in the fold belt to frontier areas of the foreland basin creates a unique opportunity for bottom-up, play fairway analysis using state of the art potential fields interpretation and high-resolution geochemistry. Vast amounts of open file data are held by the PNG Department of Petroleum and Energy (DPE) and ancillary data are available through trades and acquisition.

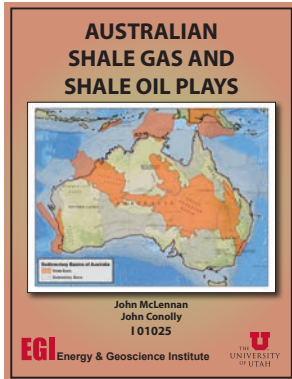
- Redefine basin architecture, new play types, source rocks and reservoirs in the southern (foreland) sections of the Papuan Basin covering parts of Papua New Guinea (PNG), Indonesia and Iran Jaya.
- Define and quantify source and reservoir potential using available open file samples of outcrop, shallow boreholes, drill cores, side wall cores and drill chips
- Define and quantify available oil and gas samples from existing oil well samples and oil and gas seeps in situ
- Evaluate the stratigraphic and paleoenvironmental geological controls and parameters of source and reservoir intervals of the southern Papuan Basin
- Quantify the geochemical, petrophysical and geophysical attributes of the source rock and reservoir intervals of the southern Papuan Basin
- Evaluate the gas/liquid potential of the southern Papuan Basin
- Assess potential gas/liquid resources in place

Deliverables

- ArcGIS database including geographic information, satellite imagery, basin outline and structure, surface geological map, well locations, typical seismic imagery, structural cross sections, oil and gas seep locations, oil and gas field data and sample locations with interpretation
- ArcGIS based report on stratigraphy, sedimentology, tectonic setting, burial history, petroleum system analysis, geochemical and petrophysical properties of source rock intervals
- Conceptual target ranking including multivariate geostatistical analysis based on the key parameters identified in each gas/liquid province.

18 Australian Shales

In Development | For Sponsorship



I 01025

Full Title: Australian Shale Gas & Shale Oil Plays

Estimated Investment & Timetable: \$55–\$85k (USD) per Sponsor

Projected Start Date: TBD

Duration: TBD

EGI Contacts:

Dr. John McLennan | Principal Investigator | Associate Professor, Dept of Chemical Engineering | Tel. (801) 587 7925 | Email: jmclennan@egi.utah.edu

Dr. John Conolly | EGI Affiliate Research Scientist | Petrofocus Consulting | Australian Geology Expertise | Cell: 61-418486239

Project Rationale & Significance:

- To provide new integrated geologic and geomechanical analysis of core from prospective shale gas systems in selected Australian Basins
- Link geologic and geomechanical properties in order to determine geologic predictors of engineering

However, critical geologic data are missing, such as basic sedimentologic and stratigraphic description, thickness, lateral extent, TOC, Rock-Eval, kerogen type, inorganic mineralogy, porosity, and permeability.

Geomechanical parameters that determine hydraulic fracture potential ("fracability"/ brittleness), such as Young's modulus, Poisson's ratio, stress, and shear modulus are also lacking.

Deliverables:

- Current state-of-knowledge
- Summary report and ArcGIS database of physical properties of shales
- Integrated sedimentary and geochemical core analysis
- Geomechanical core testing
- Predictive relationships between geological and geomechanical characteristics

19(1) Sheared Margins of Western Australia, Phase 1

Completed | Available for Immediate Delivery



I 01069

Full Title: Sheared Margins of Western Australia | Initial Phase of the Australia and New Zealand Margins Initiative

Investment & Timetable: \$69k (USD) per Sponsor
Project Completion: Q4 2015

EGI Contacts:

Dr. Michal Nemčok | Research Professor | Principal Investigator
Tel. 421 254 630 337 (Bratislava, Slovakia) | Email: mnemcok@egi.utah.edu

Dr. John Conolly | EGI Affiliate Research Scientist | Australian Geology Expertise | Cell: 61-418486239 | Email: john.conolly@bigpond.com

Project Rationale & Significance:

This project refined the existing general timing of break-up of large margin segments with detailed break-up propagation timing, associated different vertical movement histories of different margin segments, and addressed associated thermal histories of individual margin segments.

Value

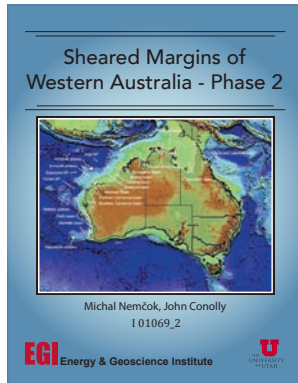
- A refined timing of break-up for large margin segments with detailed break-up propagation timing, associated distinct vertical movement histories of different margin segments, and a better understanding of the associated depositional histories of individual margin segments.
- Identified exact locations of extensional and sheared margin segments along the Western Australian margins and determined their exact break-up propagation with time, associated uplift histories, magmatism and depositional histories;
- Ascertained their role in the petroleum system to facilitate development of hydrocarbon exploration models.

Deliverables:

- ArcGIS formatted databases and full documentation.
- A folio with integrated write-ups, figures, tables, maps, and cross sections in print and electronic formats
- Structural architecture maps with indication of break-up trajectory advance with time along both extensional and sheared margin segments extending from the Browse Basin (Scott Plateau) in the North to the Perth Basin (Naturaliste Plateau) in the South
- Magmatic product distribution maps; exhumation histories of all involved margin segments with indication of sedimentary response to exhuming areas
- Map of sediment entry points and five pseudowells with expulsion timing covering all involved margin segments

19(2) Sheared Margins of Western Australia, Phase 2

In Development | For Sponsorship



101069_2

Full Title: Sheared Margins of Western Australia | Phase 2 of the Australia and New Zealand Margins Initiative

Investment & Timetable: \$69k (USD) per Sponsor
Project Start: 2016 Duration: 12 months

EGI Contacts:

Dr. Michal Nemčok | Research Professor | Principal Investigator
Tel. 421 254 630 337 (Bratislava, Slovakia) | Email: mnemcok@egi.utah.edu

Dr. John Conolly | EGI Affiliate Research Scientist | Australian Geology Expertise | Cell: 61-418486239 | Email: john.conolly@bigpond.com

Dr. Júlia Kotulová | Research Scientist
Tel: 421-2-544 10 569 (Slovakia) | E-mail: jkotulova@egi.utah.edu

Project Rationale & Significance:

To understand thermal regimes associated with transform margins and develop large-scale thermal history models for the main West Australian transform margins in 3D and time. The understanding will be based on three-dimensional finite-element modeling done in time by a thermomechanical coupled simulation. The new thermal models will replace the existing thermal models that were developed by tools originally designed for rifted margins. Thus, the new modeling will replace the simple thermal models, which are characterized by rift and break-up related thermal peak and subsequent cooling, with realistic models that contain the effect of thermal transients developed along the transform fault systems during their oceanic/continental stage.

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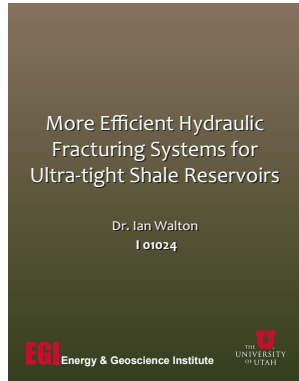
- The identification of pull-apart regions whose source rocks reached an oil window without adequate burial, but with the help of thermal transients controlled by transform fault-associated factors,
- New thermal models to replace existing thermal models that were developed by tools originally designed for rifted margins.
- Identify the regions where the source rock kitchens may have reached the hydrocarbon expulsion stage under the burial that would not be sufficient in the case of rifted margins.

Deliverables

- ArcGIS formatted databases and full documentation,
- Map of continental crust thickness distribution, set of maps on stratigraphic gaps associated with erosional unconformities spanning from the mid-Jurassic to Turonian unconformities,
- Set of maps on fault activity timing and type distribution; maps on magmatic rock lithology and emplacement timing distribution; map of pull-apart basin distribution,
- Two 3D finite-element models of thermal history in time for the Zeewyk-Houtman and Joey Wombat transform margins, and
- 1D source rock maturation models made for several clusters of pseudo-wells targeting distinct pull-apart areas located in the regions of calculated 3D models.

20 More Efficient Hydraulic Fracturing Systems – Ultra-tight

Completed | Available for Immediate Delivery



I 01024

Full Title: More Efficient Hydraulic Fracturing Systems for Ultra-tight Shale Reservoirs

Investment & Timetable: \$40k (USD) per Sponsor
Project Completion: Q1 2016

EGI Contacts:

Dr. Ian Walton | Senior Research Scientist | Principal Investigator
Phone: 801-581-8497 | Cell: 281-381-5295 | E-mail: iwalton@egi.utah.edu

Project Rationale & Significance:

Commercial exploitation of low mobility gas reservoirs has been improved by multi-stage hydraulic fracturing of long horizontal wells. Favorable exploitation has been correlated with large fracture surface area in contact with the shale matrix – this surface area being created by high rate and high volume injection of low viscosity water-based fluids. The environmental and economic implications of using large volumes of water (millions of gallons per well) are attracting considerable stakeholder and regulatory attention.

Our previous investigation of shale gas production has suggested that:

- The primary (propped) fractures are the main channels for gas production.
- The secondary (unpropped) fracture network contributes little towards gas production. It remains as a primary depository of the fracturing fluid, but this is of little benefit. Since most of the fracturing fluid enters the secondary fracture network (from which it is probably imbibed into the shale matrix), it is perhaps not surprising that only 20 to 30% of the treatment fluid is returned during well clean-up and early production.
- Large scale slickwater fracturing is very inefficient: the volume of the productive fractures represents only a small percentage of the volume of the fluid pumped.

We now propose a new project that will develop an alternate perspective on the impact of controllable fracturing parameters on the productivity of shale reservoirs. These can include pump rate and pressure and fluid type and viscosity, for example. The investigation will use semi-analytical and numerical techniques to model fracture development, and include specifically the role played by the natural fractures and pressure-sensitive leakoff from the main fractures. The proposed methodology is similar in principle to that adopted in our earlier investigation of shale gas production characteristics. Using analytic techniques wherever possible, we seek a middle path between empirical correlations on the one hand and large-scale numerical simulations on the other.

We envisage three levels of modeling:

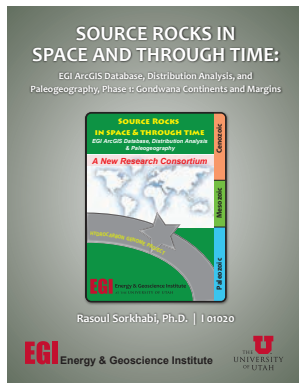
- An isolated, individual secondary fracture opening from a main primary hydraulic fracture
- Primary fracture development, including pressure-sensitive leakoff, to an array of secondary fractures
- Primary fracture development incorporating a continuous pressure-sensitive leakoff coefficient

In each of these hierarchical steps in the model development there is interplay between the fluid mechanics of flow in the primary and secondary fractures and the stress field that opposes primary and secondary fracture opening.

Our objective is to identify more efficient fracturing fluids and fracturing protocols that would use a smaller volume of fracturing fluid to achieve a greater productive fracture surface area.

21(1) Source Rocks in Space & through Time, Phase 1

In Progress | Open for Sponsorship



I 01020

Full Title: Source Rocks in Space & through Time | EGI ArcGIS Database, Distribution Analysis, & Paleogeography | Phase 1: Gondwana Continents & Margins

Investment & Timetable: \$87.8k (USD) per Sponsor

Project Start: Q1 2013

Duration: 18 months

EGI Contacts:

Dr. Rasoul Sorkhabi | Research Professor | Principal Investigator

Tel. (801) 587-9070 | Email: rsorkhabi@egi.utah.edu

Project Rationale & Significance:

Sedimentary rocks, which are mature both in terms of their organic carbon content and thermal history, lie at the base of the petroleum system analysis. A quantitative knowledge of the distribution of source rocks in space and through time has important implications not only for the global budget of hydrocarbon resources but also for evaluating the geologic conditions favorable for the generation of oil and gas on a basinal scale. An enormous body of data on source rocks by new analytical techniques and from various basins around the world has been collected in recent decades. EGI, with its four decades of research work in various basins and regions of the world, holds an archive of thousands of reports and documents, which can constitute a valuable database on global source rocks. This research work is also timely in view of the recent trends in the industry to drill directly into source-rock targets. The project is to be conducted as an industry-funded research consortium. Given the wide scale, expectations and implications of the project, active participation of experts from the sponsoring companies in the project work is greatly encouraged.

Value

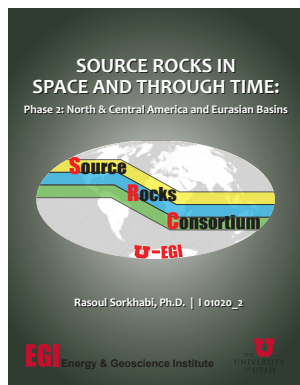
- By better understanding the source rock characteristics of regional and local basins based on a user-friendly database, explorationists can mitigate the risk of charge potential and hydrocarbon generation as part of the overall petroleum system.
- A quick assessment tool for conventional and unconventional play analysis based on source rocks and for assessing data-poor frontier and/or by-passed plays based on regionally correlatable source rocks.

Deliverables

- An ArcGIS database of source rocks across Gondwana's Continents and Margins (South America, African, Arabian Peninsula, India and Australia) including basinal, stratigraphic, sedimentological, and geochemical attributes (e.g. TOC, Ro, Kerogen type, rock eval, etc.) compiled from EGI's proprietary data archive, DSDP-ODP sites as well as from other scientific publications.
- ArcGIS maps highlighting distribution of source rocks in space and through geologic history.

21(2) Source Rocks in Space & through Time, Phase 2

In Development | For Sponsorship



I 01020_2

Full Title: Source Rocks in Space & through Time | Phase 2: North & Central America and Eurasian Basins

Investment & Timetable: \$87k (USD) per Sponsor
Project Start: Q1 2016 Duration: 24 months

EGI Contacts:

Dr. Rasoul Sorkhabi | Research Professor | Principal Investigator
Tel. (801) 587-9070 | Email: rsorkhabi@egi.utah.edu

Project Rationale & Significance:

An appraisal of sedimentary rocks, which are mature both in terms of their organic carbon content and thermal history, lie at the base of the petroleum system analysis and exploration. While the early history of petroleum exploration was characterized by identifying structural targets, the modern exploration workflow incorporates source rock risk factor as an immediate priority. A quantitative knowledge of the distribution of source rocks in space and through time has important implications not only for the global budget of hydrocarbon resources but also for evaluating the geologic conditions favorable for the generation of oil and gas on a basinal scale.

Value

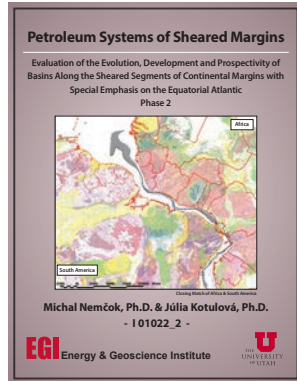
- By better understanding the source rock horizons and characteristics of sedimentary basins equipped with a user-friendly database, explorationists can reduce the risk of charge factor and hydrocarbon generation as part of the overall petroleum system analysis.
- A quick assessment tool for analysis of conventional as well as unconventional (self-sourced reservoir) plays based on source rock data and for assessing data-poor frontier and/or by-passed plays based on regionally correlatable source rocks.

Key Deliverables

- An ArcGIS database of source rocks in North & Central America and Eurasian basins (Central America, USA, Canada, Europe, Caucasus-Caspian region, Central Asia, Russia, China, and Southeast Asia) including basin tectonic, stratigraphy, lithology, depositional facies, and geochemical (TOC, Ro, RockEval, kerogen type, etc.) assembled and digitized from EGI's proprietary data archive, DSDP-ODP-IODP sites as well as from other technical publications.
- ArcGIS geodatabase of source rocks in wells and outcrops and ArcGIS map layers depicting the distribution of source rocks in space and through the geologic history.

23 Petroleum Systems of Sheared Margins, Phase 2

In Development | For Sponsorship



I 01022_2

Full Title: Petroleum Systems of Sheared Margins | Phase 2: Evaluation of the Evolution, Development & Prospectivity of Basins along the Sheared Segments of Continental Margins with Special Emphasis on the Equatorial Atlantic

Estimated Investment & Timetable: \$74k (USD) per Sponsor
Projected Start Date: 2016 Duration: 12 months

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Project Rationale & Significance:

The ongoing research on petroleum systems at sheared margins has created new models, ideas and results that are breaking down barriers and opening up new and previously overlooked frontier regions. Phase 1 proved that sheared margins are an order of magnitude more complex than extensional margins. Instead of being similar everywhere along the strike of the margin, (a well-understood characteristic of extensional margins) sheared margins have well defined spatial and temporal distribution parameters. This fact makes each area locally unique from adjacent locales associated with the same margin.

Phase 2 incorporates all basins of sheared margins (margin segments) worldwide, with special emphasis on the Equatorial Atlantic margin segments, the East Indian margin segments, selected South Atlantic margin segments, selected East African margins segments and selected West Australian margin segments.

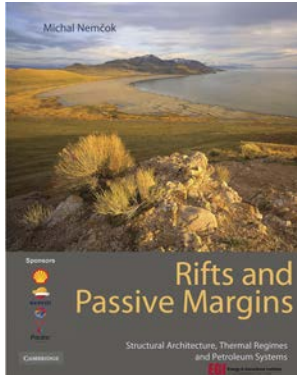
The strategy is to define the significant controlling mechanisms and controlling factors to improve hydrocarbon exploration models available for sheared margins. We aim to develop a new and better appreciation of the factors controlling structural architecture and basin development in sheared margin settings (Module 1). Synthesis of this knowledge combined with Phase 1 insights will be used to tackle the mechanisms and factors controlling depositional systems of sheared margin settings (Module 2). Both modules 1 and 2 feed into development of the thermal models characterizing the sheared margins affected by local magmatism, lower crustal flow, and development of models of systematics of the source rock maturation history patterns typical for sheared margins.

Deliverables:

- Hyperlinked folio with integrated write-up, figures, tables, maps and cross sections, organized in chapters addressing individual points listed as anticipated results
- ArcGIS format documentation of case studies

24 “Rifts & Passive Margins”

Available from Cambridge University Press



Full Title: “*Rifts and Passive Margins – Structural Architecture, Thermal Regimes, and Petroleum Systems,*” Author: Michal Nemčok

Investment & Timetable: A three-tier sponsorship program (details below)
Available: Q1 2016

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Project Rationale & Significance:

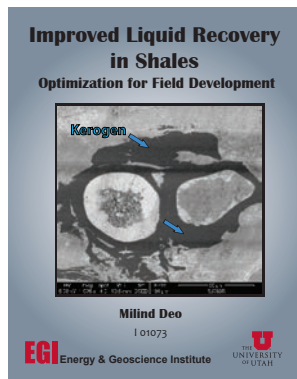
There are more than 10 hydrocarbon fields discovered on oceanic crust in the Gulf of Mexico and Gulf of Guinea. Current academic research indicates that there are several types of oceanic crust and each of them has very different thermodynamic history.

Rifts and passive margins are extremely important for the petroleum industry, as they are areas of high sedimentation and can contain significant oil and gas resources. This book provides a comprehensive understanding of rifts and passive margins as a whole. It synthesises in one volume the existing information devoted to specific aspects of these vitally important hydrocarbon habitats. This collecting together of state-of-the-art information on the topic facilitates the better use of this knowledge to assess the risks of exploring and operating in these settings and the development of systematic and predictive hydrocarbon screening tools. The book will be invaluable for a broad range of readers, from advanced geology students and researchers to exploration geoscientists to exploration managers exploring for and developing hydrocarbon resources in analogous settings.

- The only modern and up-to-date synthesis of the geology and geophysics of rifts and passive margins
- Invaluable for petroleum industry professions searching these important geologic features for resources
- Highly illustrated, with additional color figures available online

25 Improved Liquid Recovery in Shales

In Progress | Open for Sponsorship



I 01073

Full Title: Improved Liquid Recovery in Shales | Optimization for Field Development

Investment & Timetable: \$50k (USD) per Sponsor

Start Date: Q2 2014

Duration: 12 months

EGI Contacts:

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Project Rationale & Significance:

It is evident that liquid recoveries, even under reasonably ideal conditions are only on the order of 10%. Improving these recoveries is extremely important for economic sustainability of producing liquids from shales. Our research in Phase 1 and 2 of Liquids from Shales (EGI reports I 00973) also showed that developing a comprehensive understanding of underlying processes and optimization requires integration of robust geological modeling, hydraulic fracturing representation, and accurate simulation of the stimulated reservoir volume.

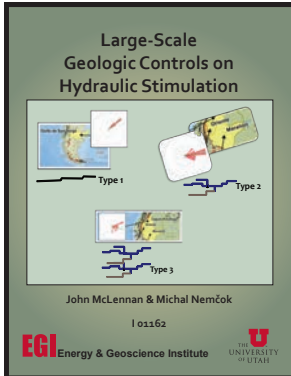
This next generation of research is designed to develop tools for optimizing recovery of fluids in shales and identify improved recovery processes. Project tasks will be focused toward understanding creation, characterization and effect of stimulated reservoir volumes on improved liquid recoveries in unconventional reservoirs. Research will also be performed on understanding the overall logistics of development – hydraulic fracture spacing, well spacing, gas and water injection possibilities, for secondary recovery.

Project Outcomes & Deliverables:

- Optimized Hydraulic Fracturing Parameters – pump rates, water volumes, proppant sizing and loads, number of perforation clusters, spacing, sequencing, etc.
- Effect of different fracture geometries and morphologies on liquids production – including the effect on GOR
- Well development plans – evaluation of water production rates and volumes and optimization of well spacing
- Economically optimum production conditions for shales producing gases and liquids for given geologic conditions and with the best possible representation of hydraulic fracture patterns and the stimulated reservoir volume
- Best practices and guidelines for improved recovery options including infill drilling, pressure maintenance and injection of fluids

26 Large-scale Geologic Controls on Hydraulic Stimulation

In Progress | Open for Sponsorship



I 01162

Full Title: Large-scale Geologic Controls on Hydraulic Stimulation

Investment & Timetable: \$50k* (USD) per Sponsor (based on data*)

Start Date: Q4 2014

Duration: 18 months

EGI Contacts:

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Project Rationale & Significance:

Currently, the ability to estimate OGIP or OOIP often exceeds the ability to economically stimulate and extract this resource. This applies to many tight as well as ultra-low permeability formations, i.e. sands or shales. Improved simulation of hydraulic stimulation, amalgamating geologic texture with controllable engineering parameters could be of value.

Advances in simulation capabilities enable coupling structural geologic data (three-dimensional representation of stresses, natural fractures, and stratigraphy) with decision making processes for stimulation – volumes, rates, fluid types, completion zones. Without this interaction between simulation capabilities and geological information, low permeability formation exploitation may linger on the fringes of real economic viability.

Diagnosis and simulation of hydraulic stimulation should consider the tectonic setting, the uplift history, the inferred fracture and fault configurations, and the relative magnitude and orientation of the principal stresses (all three principal stresses) which can be used to optimize fracture geometry and stimulation programs. With improvements in software, computational capacity, and recognition that in-situ discontinuities are relevant, fully three-dimensional hydraulic simulation is now becoming possible.

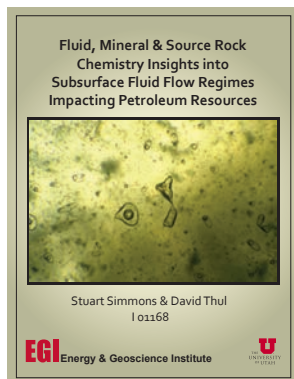
Proposed Deliverables:

Based on sponsor input the deliverables for Phase 1 would include optimized decision tree recommendations for stimulation procedures under various geologic scenarios. They will be based on specific case studies that are evaluated and placed in the context of the range of major geologic controls, and stress regimes. We will develop a summary of the implications of the simulation programs, indicating potential operational insights that relate to well locations, drilling activities (if possible), and stimulation programs (where possible). The development of this interactive decision tree will contain guidelines and range of treatment conditions. It is meant to allow an intelligent first pass design to be combined with secondary options based on early results from pilot drilling. Participant guidance will be essential to outline deliverables.

** Investment per sponsor is based on a two-tier investment system. Sponsors who provide data will participate at \$45,000 (USD) per sponsor. Sponsors who do not provide data will participate at \$50,000 (USD) each. The total number of sponsors will determine how many plays will be evaluated.*

27 Fluid, Mineral & Source Rock Chemistry

In Development | For Sponsorship



I 01168

Full Title: Fluid, Mineral, and Source Rock Chemistry Insights into Subsurface Fluid Flow Regimes Impacting Petroleum Resources

Investment & Timetable: \$25k (USD) per Sponsor

Projected Start Date: TBD

Duration: 6–9 months

EGI Contacts:

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Project Rationale & Significance:

The diversity of metals in mudstones and shales means that there are a large number of potential natural tracers of fluid production and migration. Knowledge of their varied behavior holds the promise of nuanced interpretations that translate into significant commercial value. Advances in analytical techniques over the last decade, mean that these elements such as As, Cd, Cr, Co, Cu, Ga, Ge, In, Mo, Ni, Pb, Re, Sb, Se, Te, Tl, U, V, W, Zn can be analyzed with confidence to ppm and in some cases ppb concentrations at low costs in minerals, rocks and fluids.

Our aim is to develop cost effective geochemical tools, focusing on inorganic metals and compounds to:

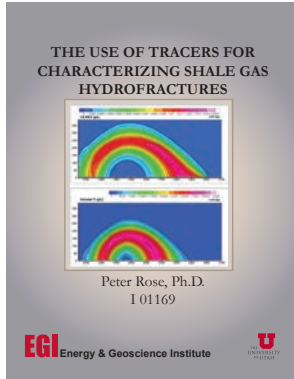
- Characterize source and reservoir rocks
- Monitor stimulation performance and stimulation volumes
- Improve identification of sweet spots
- Enable targeted production from unconventional resources
- Utilize and manage stimulation fluids efficiently

Proposed Outcome & Deliverables:

- Full range of mineralogical, whole rock and water chemical analytical results from source rocks and producing reservoirs
- Logs and maps of metal patterns in reservoir rocks
- Metal compositions of minerals and kerogen
- Assessment of metal mobility due to diagenesis and catagenesis
- Assessment of metal mobility during stimulation
- A suite of cost effective geochemical tools that improve discovery and production of oil and gas resources

28 Tracers for Characterizing Shale Gas Hydrofractures

In Development | For Sponsorship



I 01169

Full Title: The Use of Tracers for Characterizing Shale Gas Hydrofractures

Estimated Investment & Timetable: \$TBDk (USD) per Sponsor

Projected Start Date: TBD

Duration: TBD

EGI Contacts:

Dr. Peter Rose | Research Professor | Principal Investigator

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Project Rationale & Significance:

- Since the early 1980s, EGI has been developing environmentally benign and affordable conservative tracers for geothermal, petroleum, and ground-water applications. Recently, we successfully demonstrated the use of reactive (e.g. reversibly adsorbing) tracers in both packed-column, laboratory experiments and in field tracer studies. These are tracers that adsorb and desorb rapidly as they pass through the formation, slightly retarding their passage relative to those of conservative (e.g. non-adsorbing) tracers. The retardation is a function of the surface area of the rock to which the tracer solution was exposed.
- In combination with appropriately calibrated numerical models, the conservative and reversibly adsorbing tracers can then be used to calculate the newly-created fracture surface area and thereby measure the success of the hydrofracture treatment. This approach was successfully demonstrated in a geothermal reservoir at the Soda Lake, Nevada geothermal field and in a shale-gas hydrofracture at the Dilly Creek (Horn River) project in northeast British Columbia.

Value:

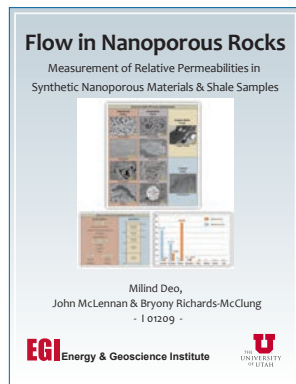
- Provides EGI Corporate Associate sponsors with a robust method for directly measuring the success of hydrofracturing in shale-gas reservoirs.

Deliverables:

- The suitability of candidate conservative and reactive tracers will be determined under reservoir conditions in laboratory studies using drill cuttings obtained from the sponsor's well(s).
- Based upon data emerging from the laboratory studies, a tracer test in the sponsor's shale-gas reservoir will be designed and implemented to map interwell flow patterns.
- The tracer data from the field study will be used as input to a calibrated numerical simulation model to constrain the tracer-contacted, hydrofracture-surface area.

29 Flow in Nanoporous Rocks

In Progress | Open for Sponsorship



I 01209

Full Title: Flow in Nanoporous Rocks | Measurement of Relative Permeabilities in Synthetic Nanoporous Materials & Shale Samples

Investment & Timetable: \$70k (USD) per Sponsor
Start Date: Q1 2015 Duration: 12 months

EGI Contacts:

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Project Rationale & Significance:

In our previous work, we have shown that matrix permeability is one of the most important properties that govern recoveries of liquids from shales. With that background, the importance of measuring absolute, let alone relative permeability, mandate serious consideration of measurements being currently used. The GRI method of measuring permeability in shales consists of crushing the rock, exposing this to pressure and measuring pressure decay. It is not clear how this measurement corresponds to the connected liquid permeability in liquid-bearing shales.

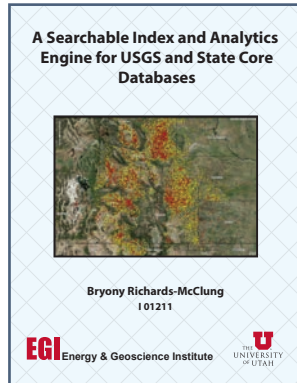
In this project, we will measure permeabilities by different methods to demonstrate and understand relationships between various permeability measurement techniques. Shales producing liquids are under primary production. Even more important is that standard methods only usually provide absolute permeability. Concurrent saturation and flow of oil, gas and water, governed by relative permeabilities of fluids, is essential in establishing produced gas oil ratios (GORs). Variation of GOR over time may be the most important variable impacting economics of a play. There is little relative permeability data on shales because of the difficulty in performing these measurements. EGI has developed equipment and procedures for measuring saturation pressures, and absolute and relative permeabilities. In this project, we will create a relative permeability database for different shale samples with relevant fluid pairs, acknowledging the difficulties an operator would encounter in measuring relative permeability on a routine basis. These measurements might be considered as being close to ground truth at least at a core scale.

Proposed Outcome & Deliverables:

- Detailed characterization of shale samples from various plays. Work will begin with samples from the Bakken, Niobrara and the Permian Basin and will expand to other shales of interest to sponsors.
- Porosity measurements using multiple measurement methods and correlation of the porosity with characterization at the nanoscale.
- Permeability measurements using pressure-pulse and flow-through measurements and comparisons.
- Water-oil and gas-oil relative permeability measurements.
- Anticipated number of samples in the study: 24–30 during the first year.

30 Searchable Index & Analytics Engine for Core Databases

In Development | For Sponsorship



I 01211

Full Title: A Searchable Index and Analytics Engine for USGS and State Core Databases

Estimated Investment & Timetable: \$TBDk (USD) per Sponsor

Start Date: TBD

Duration: 12 months

EGI Contacts:

Dr. Bryony Richards-McClung | Research Scientist | Principal Investigator

Tel. (801) 585-0599 | Email: brmcclung@egi.utah.edu

Project Rationale & Significance:

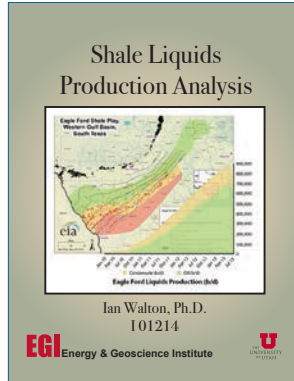
The United States Geological Survey (USGS) and state-based geological surveys have a huge quantity of publicly available core data. However, this data is dispersed in a variety of difficult to access locations in addition to being extremely heterogeneous (i.e. varying file formats, sizes etc.). Core data, although publicly available online, is typically accessible on many non-user friendly websites that provide only primitive search capabilities, and contain a variety of document types including pdf/text-based documents, excel spreadsheets, photographs, etc. This fragmented data accessibility not only makes it extremely difficult to meaningfully extract and use data in time efficient manner, but also increases the chances of errors in collecting the full extent of desired data.

The project is designed to address these data sourcing challenges by building an advanced searchable index and analytics engine for quick and user-friendly access to data available from applicable sites through a web-based search interface similar to that of Google. The construction of the heterogeneous data index will be based on ColumbuScout, a state-of-the-art data search engine developed at the University of Utah. In addition advanced analytics to annotate documents for extracting detailed information; image processing techniques, and highly intuitive visualizations into ColumbuScout will be developed to allow previously inaccessible data to be unlocked.

EGI Corporate Associates who choose to join this project will receive unlimited, password protected access to these capabilities.

31 Shale Liquids Production Analysis

In Development | For Sponsorship



I 01214

Full Title: Shale Liquids Production Analysis

Estimated Investment & Timetable: \$52k (USD) per Sponsor
 Projected Start Date: 2016 Duration: 12 months

EGI Contacts:

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Project Rationale & Significance:

With the current focus on liquids-rich shale plays, there is an increased need to develop reservoir engineering methods to analyze production data and to develop optimal methods of producing such reservoirs. Without careful planning a gas condensate reservoir can choke on its own production. Drawdown below the dew point of the reservoir fluid can result in condensate liquid dropout, particularly close to the wellbore, the sand face or the fracture face. The increased liquid saturation leads to reduced permeability to gas and, in some cases, significant choking back of the gas production. Similar comments apply to oil produced below the bubble point.

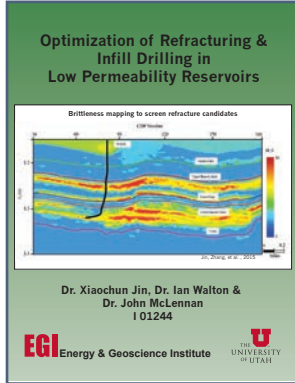
In recent EGI research projects (Shale Gas Production Analysis (SGPA) [Phase 1](#) and [Phase 2](#)), we have developed a mathematical model of the gas production process from shales. In Phase 2 of that project we explored the applicability of the ideas developed in Phase 1 to production of saturated oil from shale reservoirs. The model developed provided a first pass at analyzing the complex processes at play in this two-phase production system. The results were sufficiently encouraging that further development is warranted. In this project proposal we suggest that, first, an extension to gas condensate plays should be considered and second, a more detailed and rigorous mathematical analysis is merited. The emphasis on transient flow will remain.

Scope of Work

- The overall objective is to develop an analytical or semi-analytical model that captures the most important physics of two-phase production from shales. The expected outcomes of this investigation include:
 - » Improved understanding of the major factors that control well performance, including
 - Relative permeability parameters
 - Different gas/oil compositions, including impact on dew point (bubble point)
 - Reservoir properties (permeability and porosity)
 - The relative magnitudes of pressures (bottom hole flowing, dew-point/bubble point, and initial reservoir).
- Assessment of the optimal production strategy to maximize either oil production or condensate production.
- Prediction of future production characteristics. We anticipate that the optimal strategy may depend on the time scale over which production is to be maximized, requiring careful estimate of future production.
- Assessment of recovery factors and drainage area for multi-fractured horizontal well completions.

32 Optimization of Refracturing & Infill Drilling

In Development | For Sponsorship



I 01244

Full Title: Optimization of Refracturing and Infill Drilling in Low Permeability Reservoirs

Estimated Investment & Timetable: \$45k (USD) per Sponsor

Start Date: Q2 2016

Duration: 18 months

EGI Contacts:

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Dr. John McLennan | Co-Principal Investigator | USTAR Associate Professor, Dept. of Chemical Engineering | Tel. (801) 587 7925 | Email: jmcclennan@egi.utah.edu

Project Rationale & Significance:

In an era of low hydrocarbon pricing and low recovery factors in tight reservoirs (independent of pricing), the petroleum industry's focus often migrates from drilling new wells in new plays to improving EUR and reserves in existing scenarios. Advances in technologies and accumulation of production data enable us to screen refracturing/infill drilling candidates more effectively – to identify and access "bypassed" pay. Recognizing the motivation and the issues it is desirable and necessary to develop long-term strategies for refracturing/infill drilling with the latest expertise and a vision for future trends. The proposed project provides this.

Value

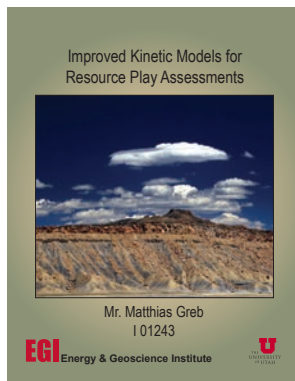
- Provide "selection criteria" to identify best candidate wells/zones.
- Develop optimal strategies to arrest production decline and maximize recovery.
- Identify economic balance between infill drilling and refracturing when both options are feasible.
- Demonstrate and identify opportunities for reducing operational costs.

Key Deliverables:

- Develop a workflow for screening refracturing candidates by analyzing production data and integrating up-to-date representations of geology, geomechanics, formation evaluation, reservoir simulation, well completion and perforating or other isolation techniques, and hydraulic fracturing design in shale/tight plays.
- Develop geologic, production, and "fracability" indices to ensure optimal screening of refracturing candidates.
- Develop an economic model/framework (populated by user) for selecting infill drilling and refracturing candidates; assess the potential benefits of refracturing and infill drilling.
- Provide recommendations for simulating and predicting fracture initiation and propagation during refracturing, including diversion techniques.
- Provide best practices recommendations and guidelines for reservoir-dependent refracturing and/or infill drilling.

33 Improved Kinetic Models for Resource Play Assessment

In Development | For Sponsorship



I 01243

Full Title: Improved Kinetic Models for Resource Play Assessment

Estimated Investment & Timetable: \$75k (USD) per Sponsor

Projected Start Date: Q1 2016

Duration: 12-18 months

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Mr. David Thul | Manager of Petroleum Systems & Geochemistry | Principal Investigator | Tel. (720) 232-5798 | Email: dthul@egi.utah.edu

Project Rationale & Significance:

Kinetic reactions occurring at the source rock level during maturation depend on kerogen composition which plays a major role in the overall genetic potential (type, richness, quantity and net kerogen thickness) of a source rock formation. A high degree of variability can be observed when looking at regional pyrolysis datasets across entire play fairways

- Each sponsor can select one North American resource play to be analyzed from a preselected list of shale formations
- Fundamental understanding of resource play dynamics from a source rock centric standpoint
- Ability to predict resource play fairway extent using custom kinetic models calibrated to measured kerogen conversion behavior
- Ability to link kinetic model results to field derived production data for enhanced fairway prediction, and access to EGI enhanced shale workflow from 'core to log scale'
- Value add through custom 'play specific' kerogen kinetics for predictions critical to resource exploration (kerogen to petroleum transformation ratio, petroleum generation ratio, petroleum system timing, HC volume balance, and HC fluid properties)
- Access to detailed petroleum systems summaries and source rock character descriptions documenting degree of variability and impact on genetic potential
- Statistical analysis of hydrocarbon yield and phase calculations from calibrated kinetic models for resource potential estimates and ranking of North American shale systems

Deliverables

- Detailed petroleum system synopsis for each sponsor selected resource play formation
- Up to 400 new organic geochemistry samples analyzed at EGI lab per sponsoring company
- Access to robust organic geochemistry database compiled from existing EGI reports, public domain and newly analyzed samples for each studied play
- A comprehensive set of empirically derived kinetic models
- Core descriptions, core derived high resolution logs (las format), thin section microscopy images, 1D basin model summaries, and kinetic model sensitivity study results; summary of key source rock formation characteristics