

Petroleum Exploration on Sukhbaatar Block in Eastern Mongolia*

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Abstract

Mongolia contains several under-explored sedimentary basins. These basins are geologically similar to highly productive basins in China. No basins had been previously identified on the Sukhbaatar Block which covers approximately 22,600 square kilometers in Eastern Mongolia. An interdisciplinary approach was used to evaluate the block. Land-based gravity and magnetic surveys were conducted, processed and used to define the location of the Cretaceous lacustrine rift basins. A remote sensing study included structural, lithologic and alteration mineral interpretation utilizing enhanced multispectral satellite imagery and digital elevation model data. Approximately 450 line kilometers of 2D seismic was conducted, processed and interpreted, further defining the basin location. A hydrocarbon geochemical survey was conducted using the seismic shot hole sediments, results indicate that volatile and liquid hydrocarbon microseeps are evident at the basin margins and at the surface expression of faults. Integrating these studies along with geologic field mapping has resulted in several prospects/leads to be drilled.

Selected References

Badarch, Gombosuren, W. Dickson Cunningham, and Brian F. Windley, 2002, A new terrane subdivision for Mongolia: implications for the Phanerozoic crustal growth of Central Asia: *Journal of Asian Earth Sciences*, v. 21, p. 87-110.

Johnson, C.L., and B.D. Ritts, 2012, Plate Interior Polyphase Basins, *in* C. Busby, and A. Azor, eds., *Recent Advances in Tectonics of Sedimentary Basins*, Blackwell Science, Ch 28, p. 567-582.



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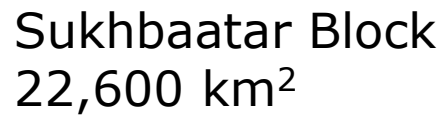
Petroleum Exploration on Sukhbaatar Block in Eastern Mongolia

AAPG Annual Conference
May 31- June 3, 2015

Outline

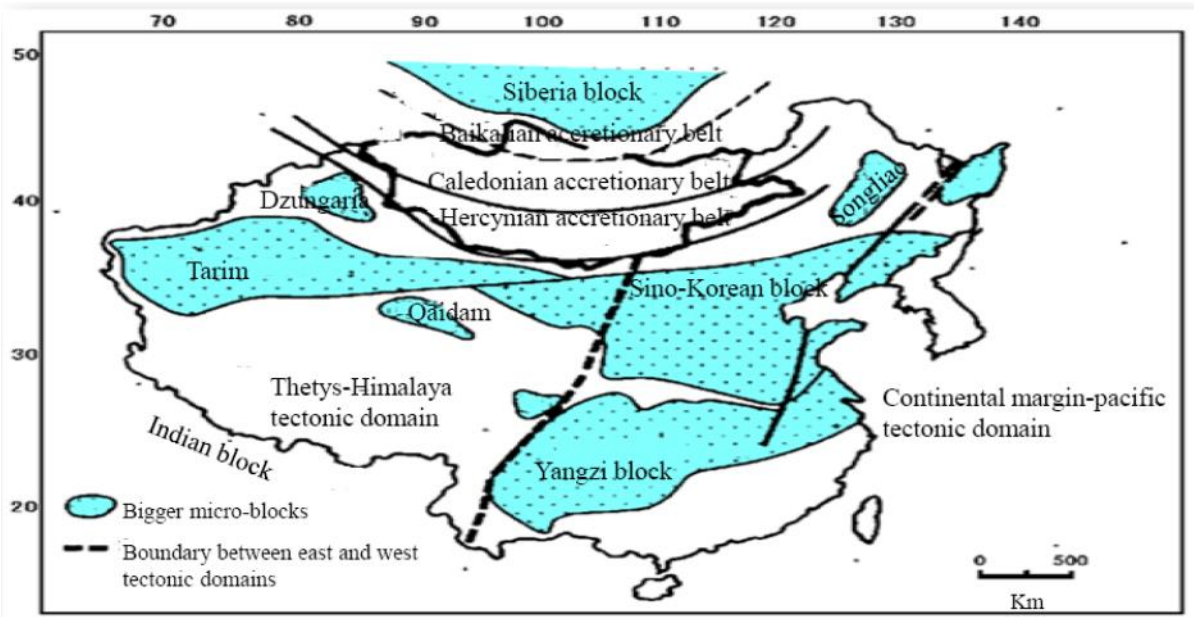
- Geologic Setting
- Exploration Program
 - Phase 1
 - Gravity and Magnetics
 - Remote sensing
 - Field Mapping
 - Phase 2
 - 2D Seismic
 - Geochemistry
- Conclusions





Recent Activity

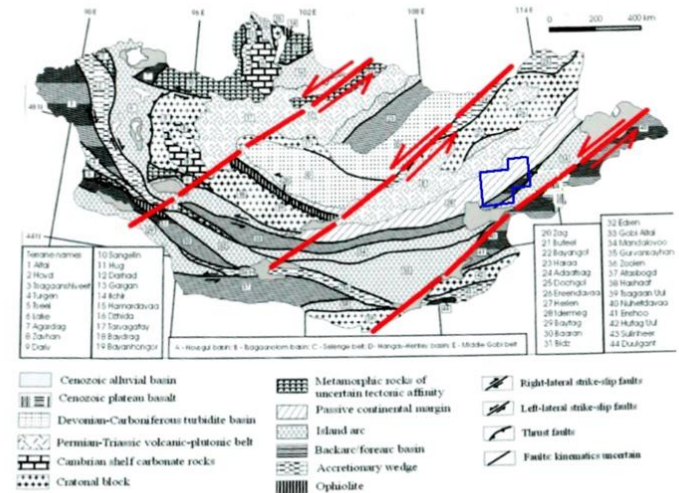
Structural Setting



Accretionary & amalgamation complex

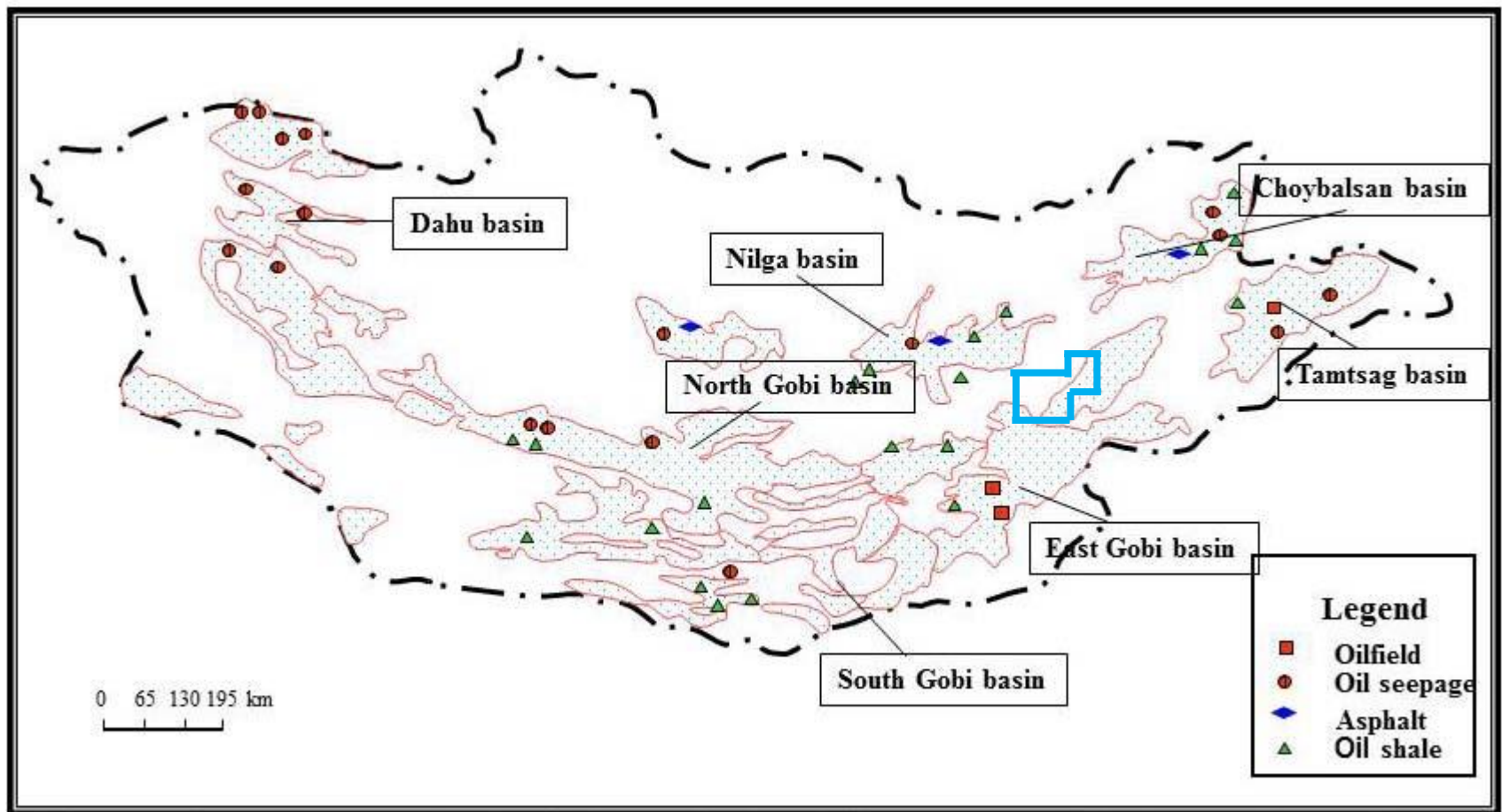
Yonghong, 2004

Structural complex with
44 terranes & 3 mega-shear
zones identified

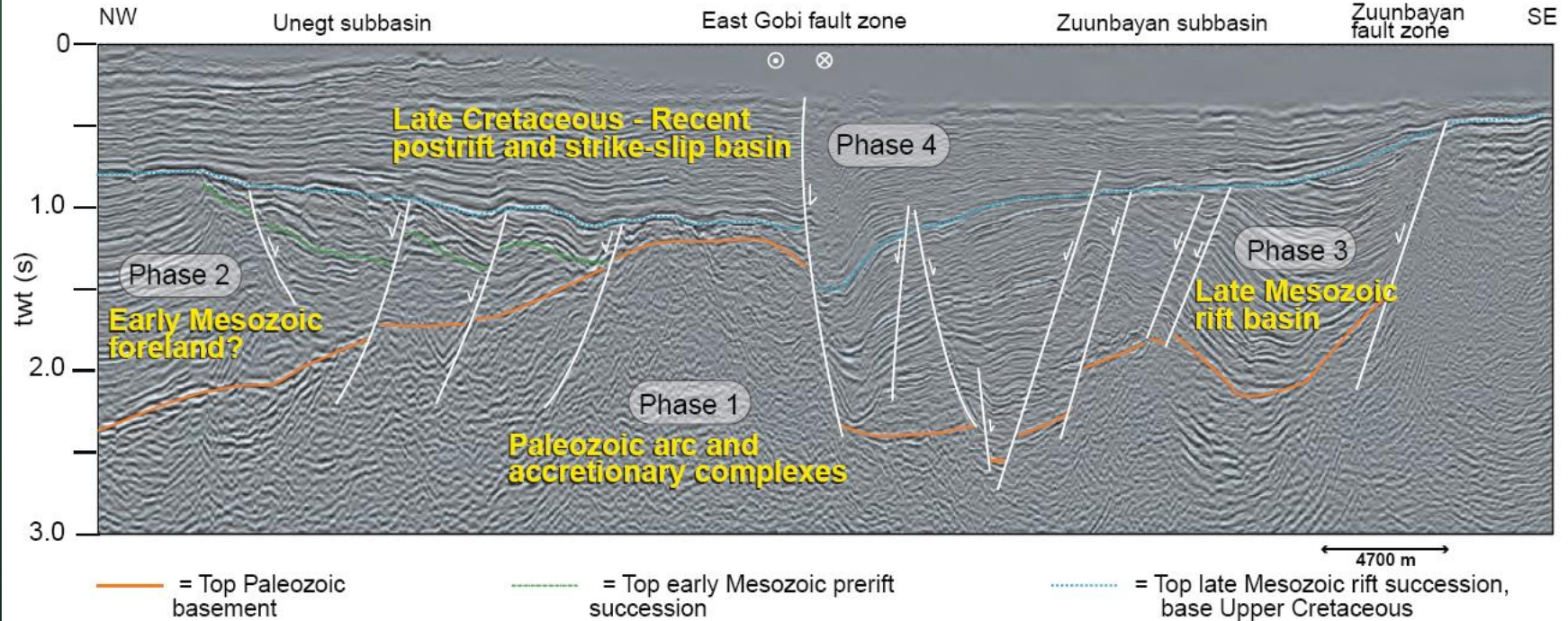


Badarch, 2002

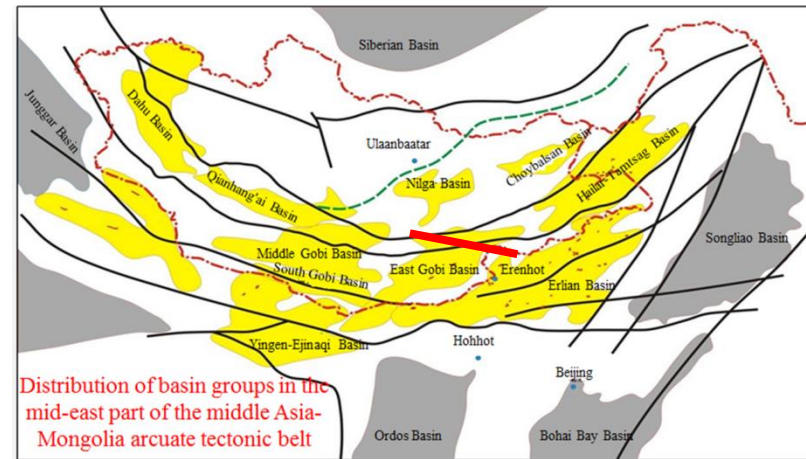
Cretaceous Lacustrine Rift Basins



Major tectonic phases in E Mongolia



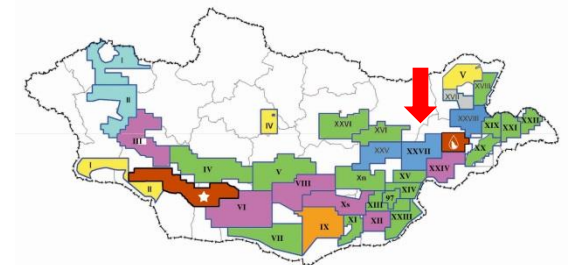
Complex history of extension and inversion of pre-existing faulting



Johnson, 2012

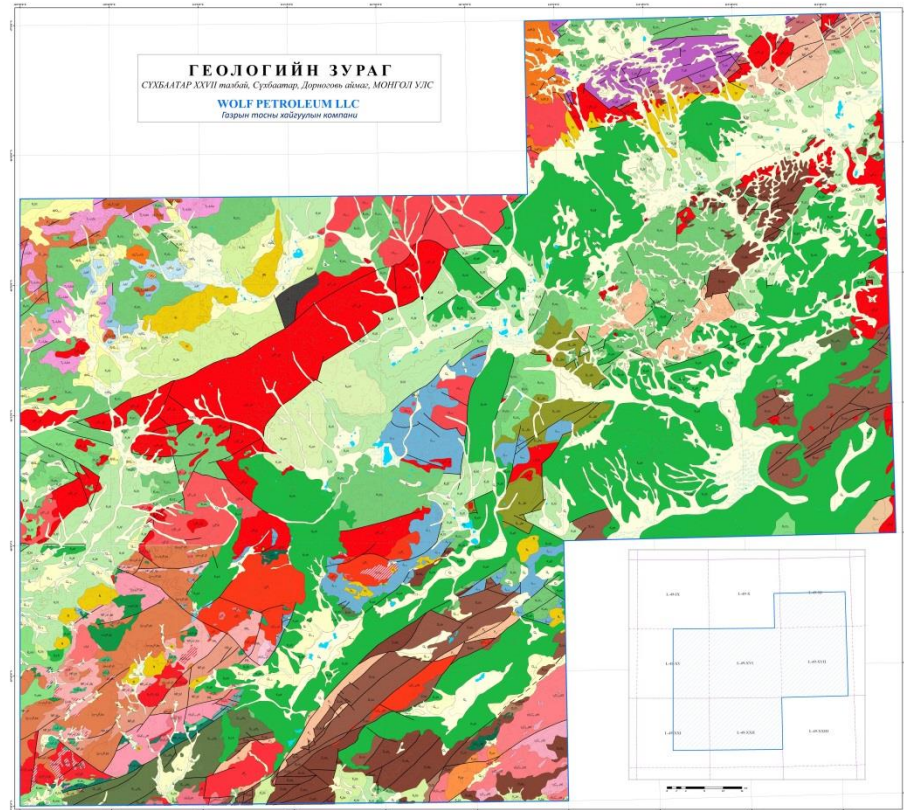
Exploration Program Phase 1

- Location of the rift basins unknown
 - Surface geologic map, based on Russian mapping from 1950-60's reconnaissance
- Gravity and magnetic data acquired and reprocessed from land based survey to help define sub-basin/basin areas
- Remote sensing study- integrated gravity & magnetic data, multispectral satellite imagery, DEM, structural interpretation & alteration mineral modelling

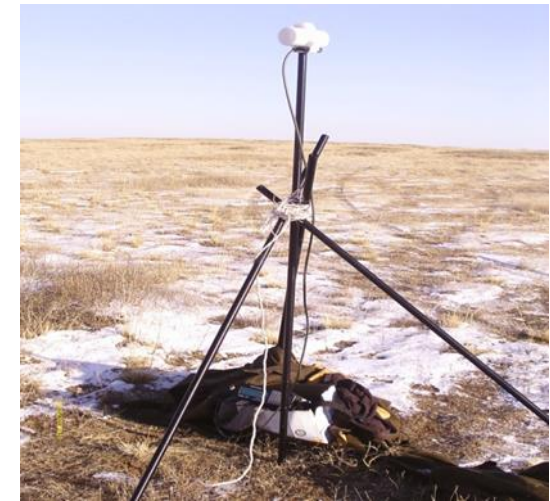
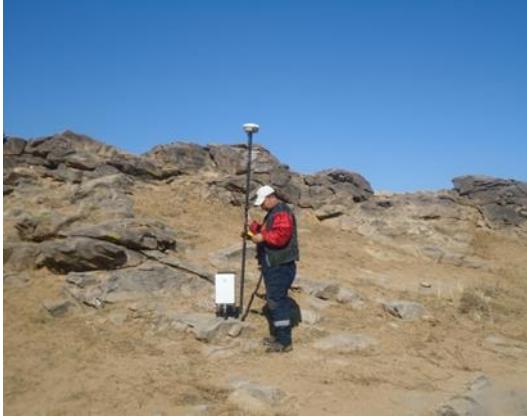


Stratigraphy and Surface Geology

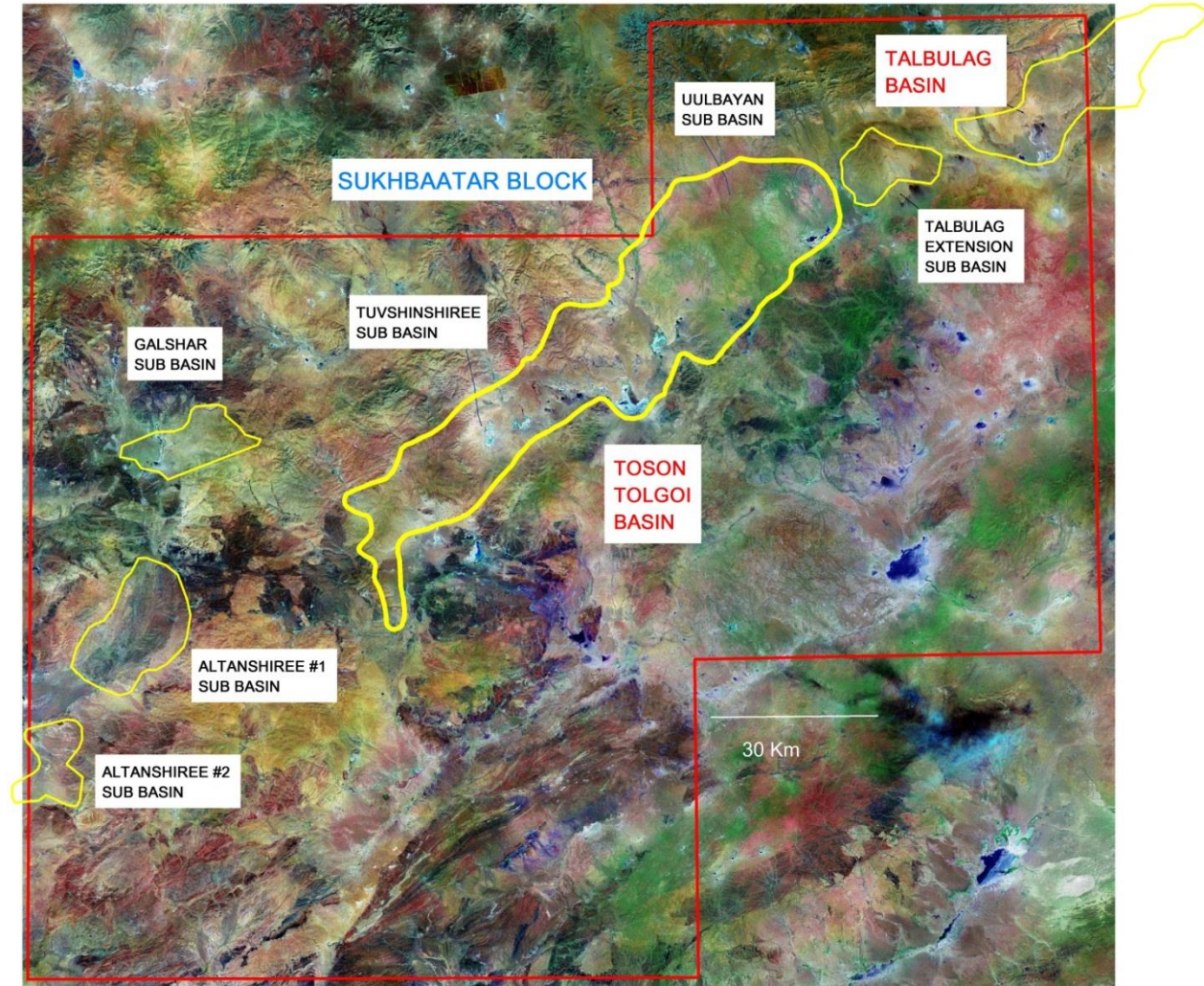
Cenozoic	Tertiary	Neogene	N
	Cretaceous	Sainshand Formation	K ₂ ss
		Upper Zunnbayan Formation	K ₁ zb upper
		Lower Zunnbayan Formation	K ₁ zb lower
		Tsagaantsav Formation	K ₁ cc
	Jurassic	Sharil Formation	J ₂ or
	Triassic	Unknown	
Paleozoic		Basement - Age Unknown	



Gravity and Magnetic survey – Jan 2013



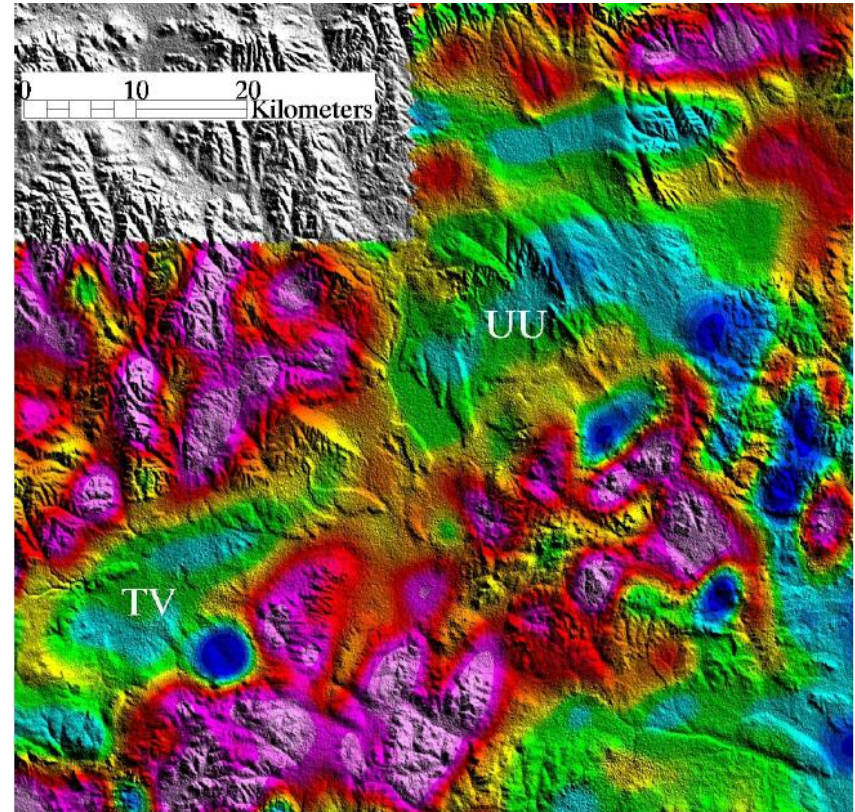
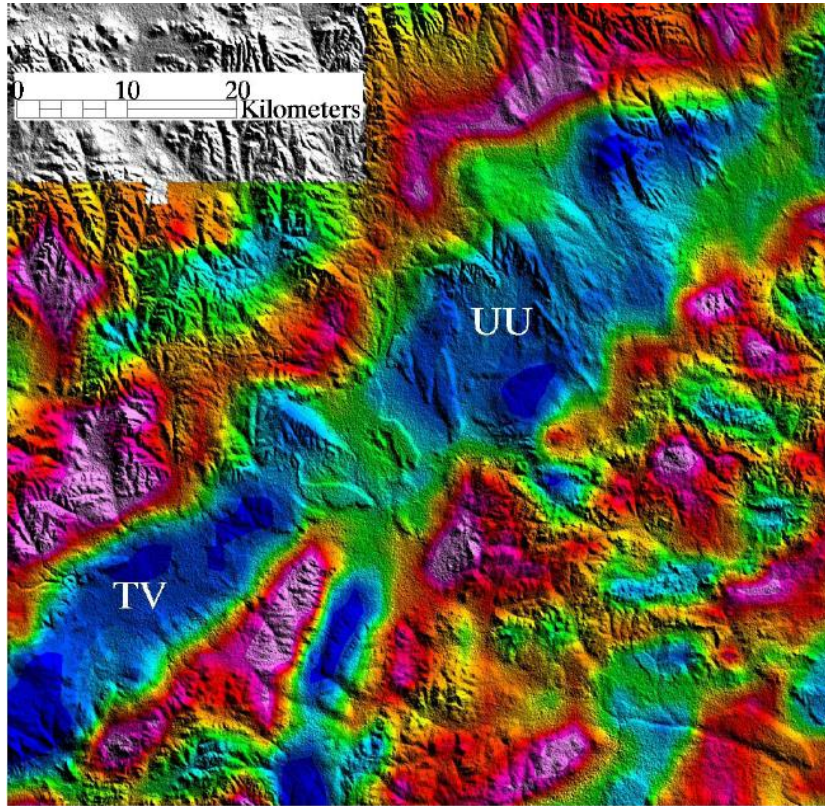
Identified Basins on Landsat Imagery

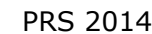


Landsat enhanced
true color 2013

Gravity and Magnetic data

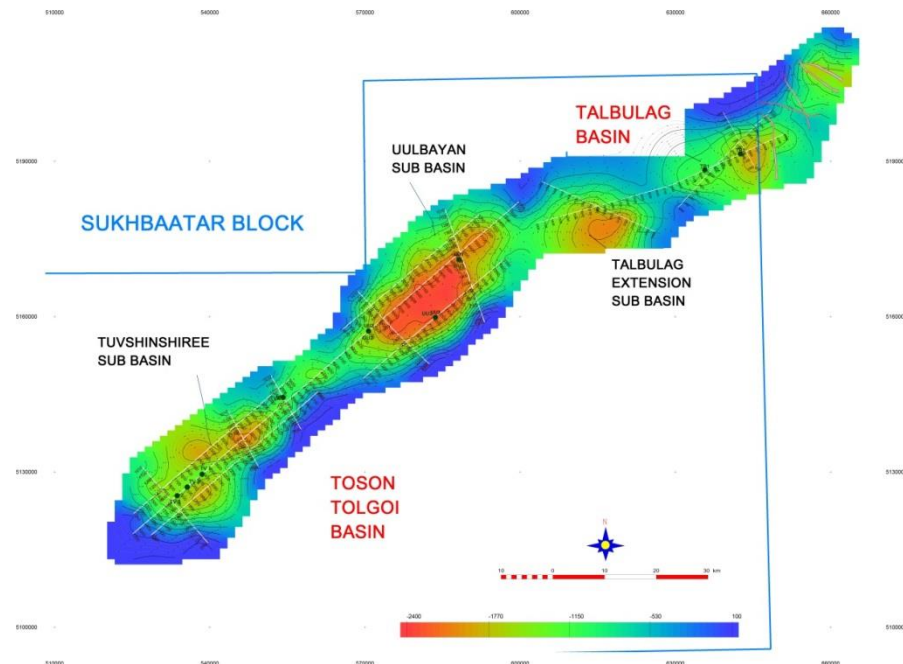
- Gravity(1VD) on DEM
- Magnetic data (RTP) on DEM





Phase 2 Exploration Program

- 2D Seismic approximately 450 Km (dynamite)
- Shot hole sampling for geochemical analysis (639 shot hole samples analyzed 84)
- Interpretation of seismic, geochemical and remote sensing

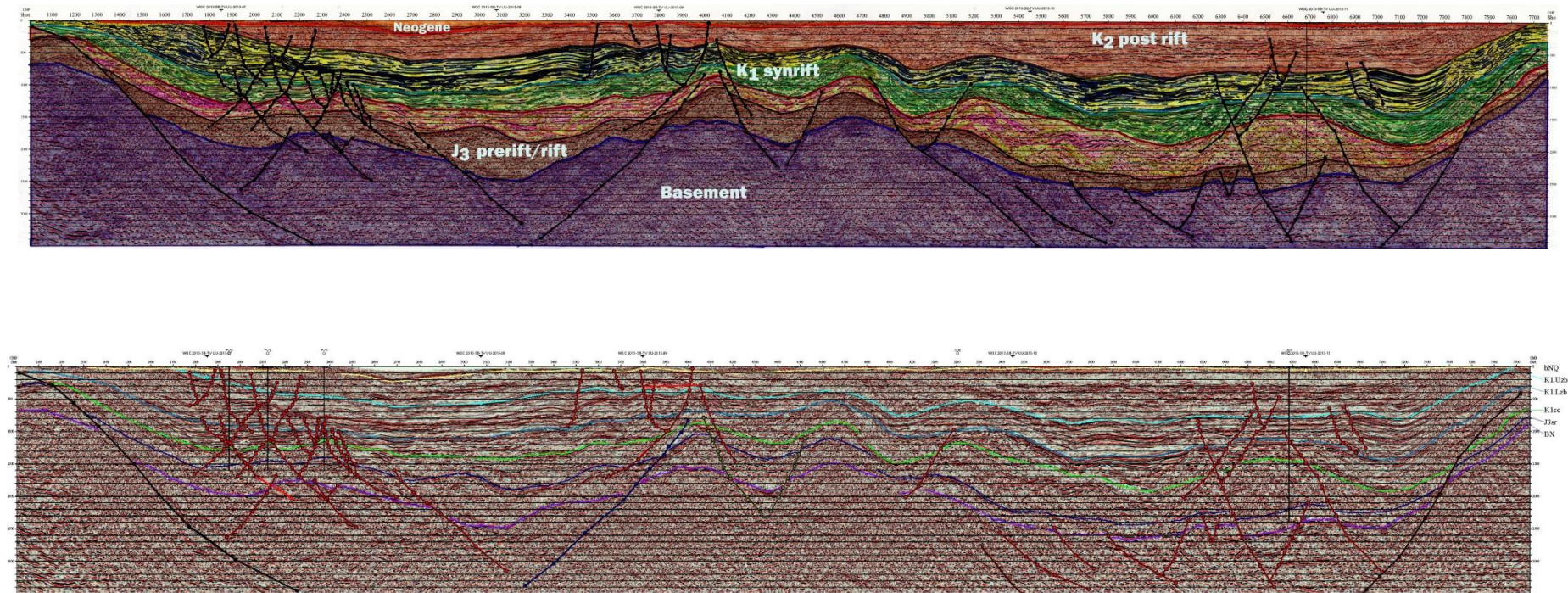


TVDSS Basement

UU and TV Basins

Tuvshinshiree Sub basin

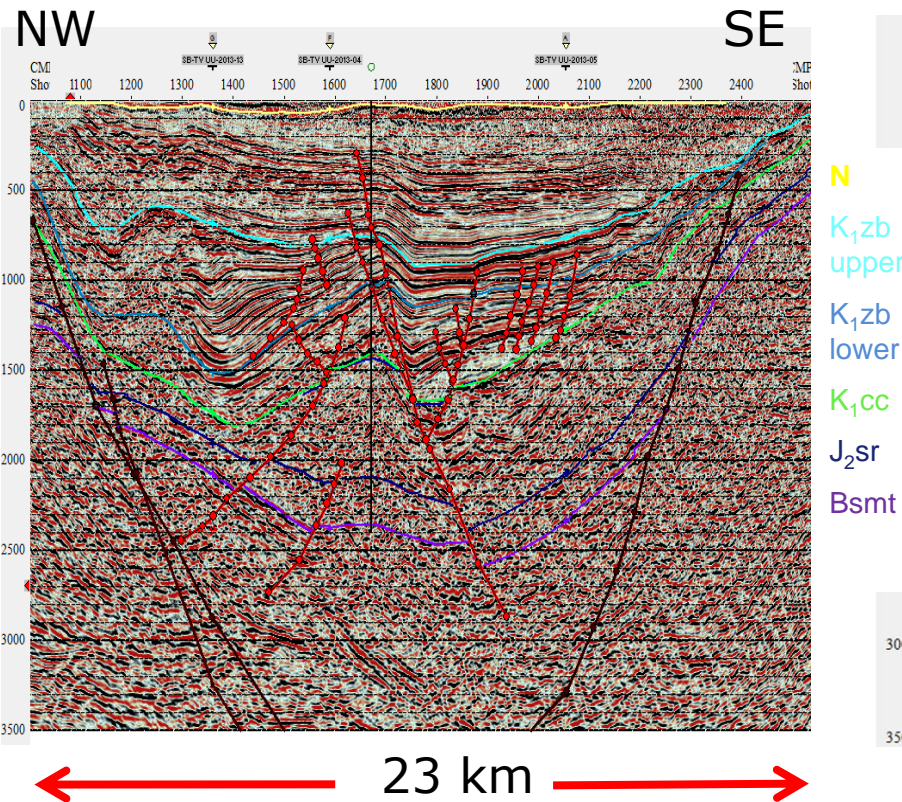
Uulbayan Sub basin



← 110 Km →

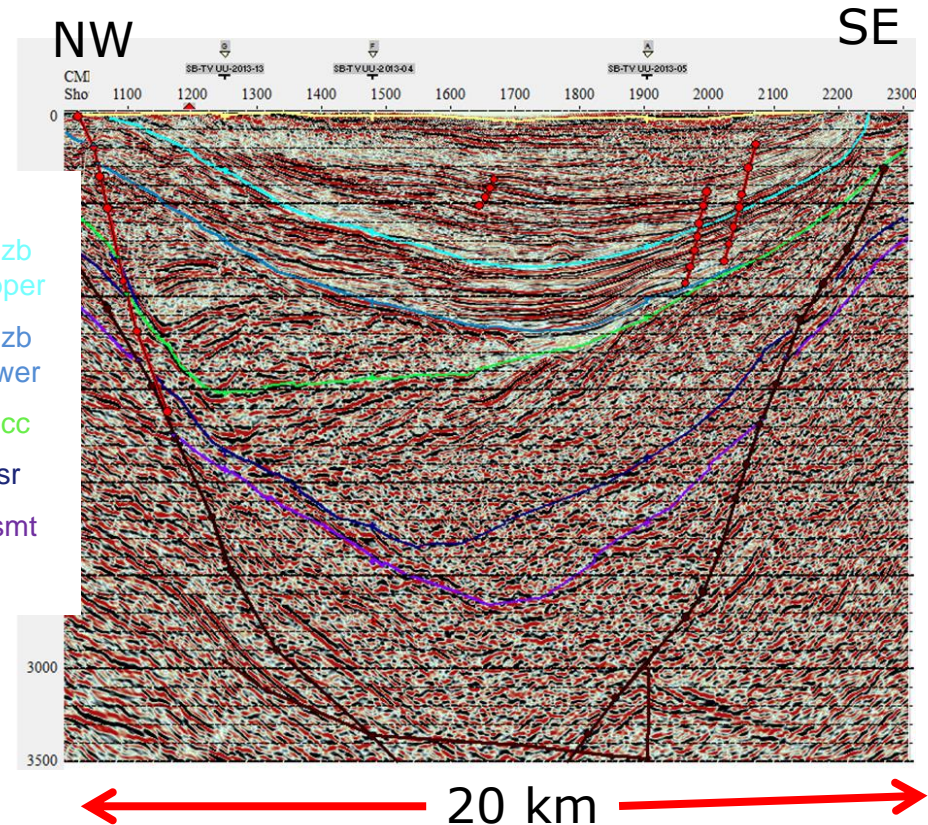
Types of Traps

■ Structural



- Roll over into faults
- Horst blocks
- Tilted fault blocks

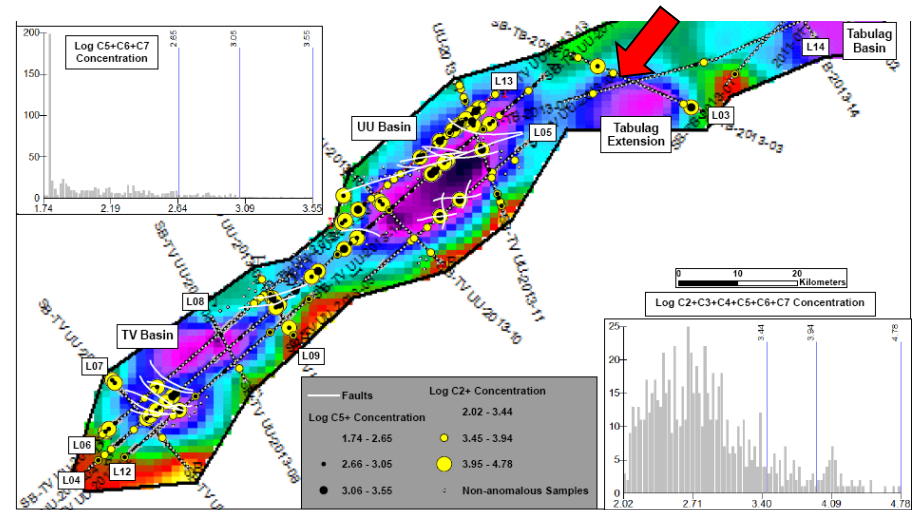
■ Stratigraphic



- Unconformities
- Pinchouts
- Thickening and thinning

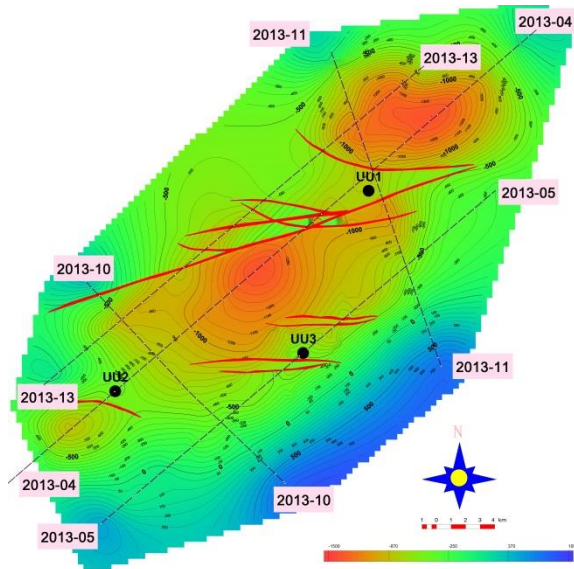


- 16



Drilling Targets

- Structure Tsagaantsav
UU sub basin



- Source Rocks

- Reservoirs

- Pyroclastic
- Turbidites
- Deltas
- Fluvial
- Alluvial Fans

- Depths

- 2000-3000 meters

- Seals

- Shales
- Faults

Conclusions

- Frontier exploration characterization using multi-disciplines (gravity, mag, satellite imagery, geochem and seismic)
- Numerous trap types identified
 - Structural
 - Stratigraphic
 - Combined structural/stratigraphic
- Potential for stacked reservoirs
- Petroleum system identified
- Analogous setting to existing Mongolian production



Acknowledgements

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- Dave Seneshen  **AMPLIFIED
GEOCHEMICAL
IMAGING, LLC**

