

PS Petroleum Prospects in the Fold-Thrust Zones of the Sinop-Samsun Basin, Central Black Sea Continental Margin of Turkey*

Samil Sen¹

Search and Discovery Article #50547 (2012)

Posted February 13, 2012

¹Istanbul University, Geology Department, Istanbul, Turkey (samilsen@istanbul.edu.tr)

*Adapted from poster presentation at AAPG International Conference and Exhibition, Milan, Italy, October 23-26, 2011

Abstract

The Sinop-Samsun Basin is located in the Central Black Sea Continental Margin of Turkey. North of the Sinop-Samsun Basin, there is Western Black Sea Basin and Mid Black Sea High. Basement of the basin is represented by the Pre-Jurassic Paleotethys Ocean remnants. South margin of the basin is restricted by the Neotethys Ocean ophiolites and ophiolitic mélange of Late Cretaceous. The Sinop- Samsun Basin consists of the Upper Jurassic-Present sediments, nearly 7000 meters thick. The basin formed as a complex basin from passive continental margin and rift basin to arc basins and retro arc foreland basin.

Sinop-Samsun basin is a prospect area of the petroleum exploration. The Lower Cretaceous the Caglayan Formation in the basin has good oil and gas source rock potential and the Lower Eocene the Kusuri formation has moderate gas source rock potential. The basin has oil and gas seeps. The basin has many potential structural traps, which represented by anticlines and thrusts related collisional tectonics. The generated hydrocarbons from those formations may be accumulated the traps in the folds and thrusts. Although thirteen exploration wells were drilled in 1960s to 1980s in the basin, no oil or gas were discovered. The analysis of the drillings suggest that the wells have been drilled near the Ekinveren, Erikli and Ballifaki thrusts, where structurally complex and oil and gas seeps areas. However, unfortunately the exploration wells were not drilled in the most prospect fold traps, especially near the eastern areas.



Petroleum prospects in the fold-thrust zones of the Sinop-Samsun Basin, Central Black Sea Continental Margin of Turkey

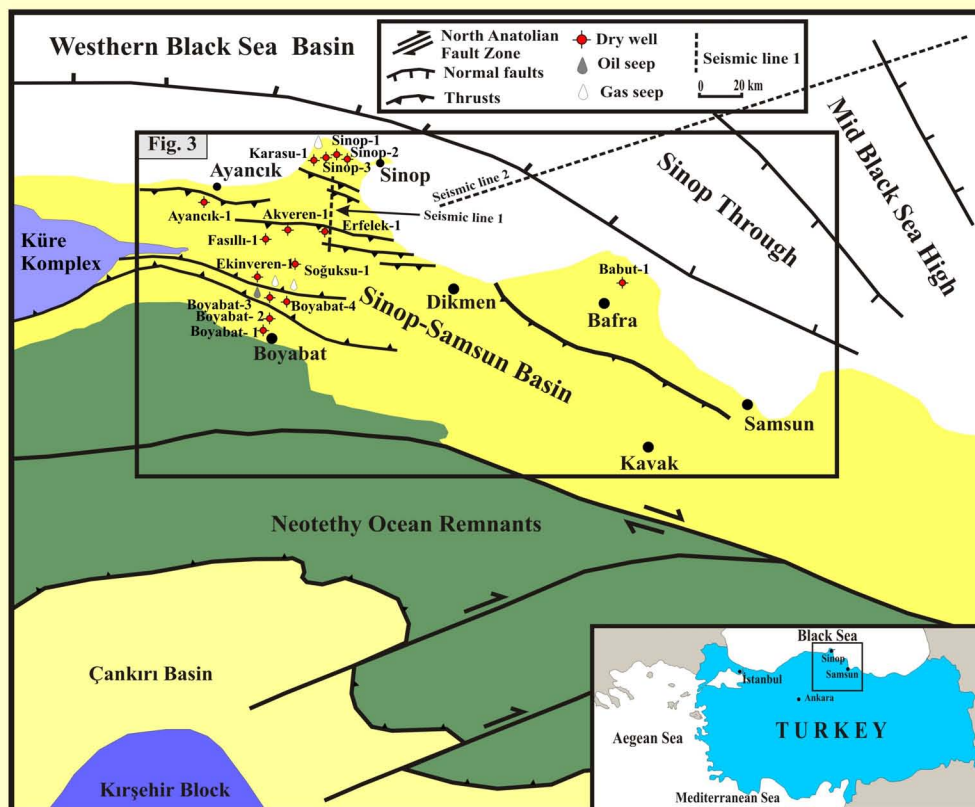
Şamil Şen

samilsen@istanbul.edu.tr

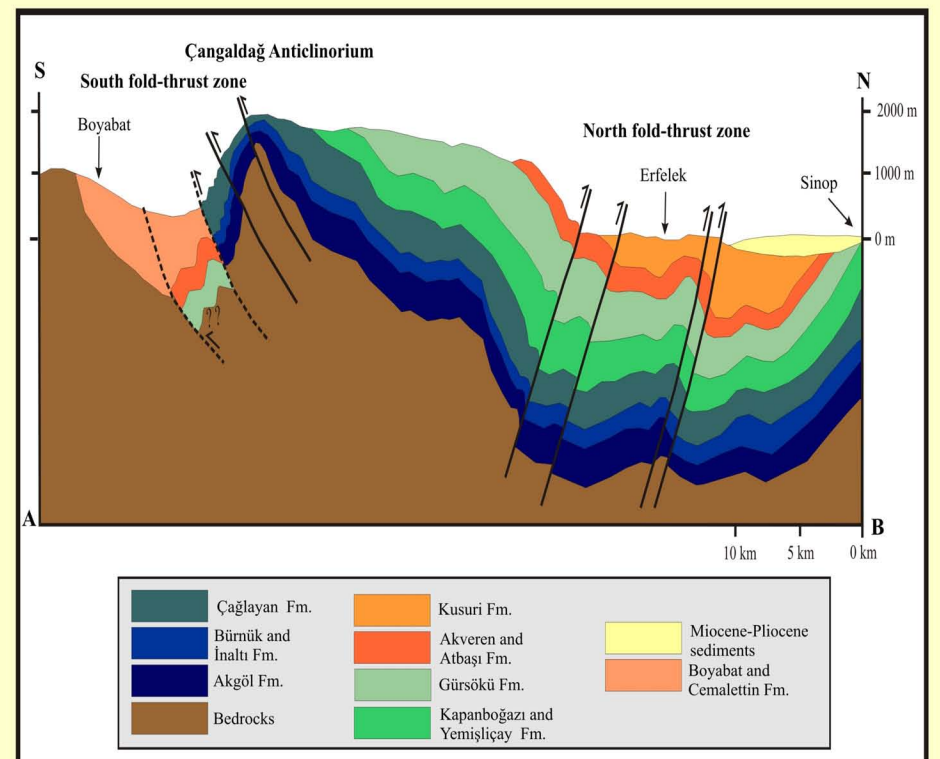
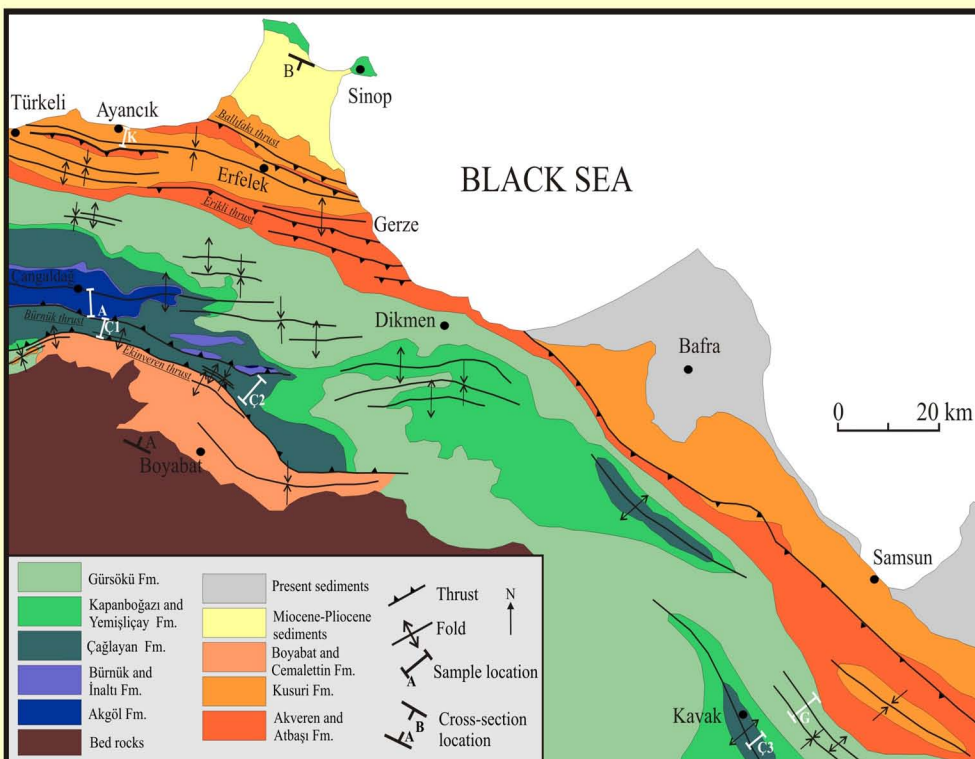
Istanbul University, Department of Geology, Avcılar, Istanbul, 34850, Turkey

Introduction

The Black Sea Basins are currently an area of increased interest for the petroleum industry. Exploration wells have recently been drilled by Exxonmobil, British Petroleum and Petrobras with Turkish Petroleum Company co-operations. Chevron has exploration license agreement. The Sinop-Samsun Basin in the central Black Sea of Turkey is a prospect area for petroleum exploration. This study analyzes reasons exploration in the basin has been unsuccessful to date and defines potential for future exploration opportunities.



AGE	FORMATION	THICKNESS (m)	LITHOLOGY	EXPLANATION	PETROLEUM GEOLOGY
Quaternary	Alv.	30		Pebble, sand and mud	
Miocene-Pliocene	Sinop	350		Mudstone, sandstone and pebbles	
				Unconformity	
Eocene	Canakkale	100		Mudstone, sandstone and pebbles	
	Boyabat	250		Turbiditic sandstone and shale	Limited source rock and reservoir
				Reefal limestone	
				Local unconformity	
	Atbaşı	200		Shale, marl and limestone	
	Akveren	600		Calcareous sediments	
	Çitradı	250		Turbiditic sandstone and shale with marl-limestone	
	Yemişliçay	1000		Volcanoclastic sediments	Seal
	Kapanboğazi	40		Pelagic limestone	Seal
	Çağlayan	2000		Turbiditic sandstone and shale with blocks	Source rock and reservoir
				Local unconformity	
Late Jurassic	İnaltı	800		Massif, thick bedded reefal limestone	Reservoir
	Bürnük	270		Fluvial pebbles and sandstone	Reservoir
				Unconformity	
Late Triassic-Early Jurassic	Akgöl	900		Shale with intrusive rocks, volcanics and ophiolite slices	Source rock



Petroleum Prospects of the Sinop-Samsun Basin

The Late Triassic-Early Jurassic Akgöl and the Lower Cretaceous Çağlayan Formations in the basin have fair to good hydrocarbon source rock potential and the Middle Eocene Kusuri Formation has limited hydrocarbon source rock potential. The basin has oil and gas seeps. There are many large structures associated with compressional tectonics that could be traps for hydrocarbons. Fifteen exploration wells were drilled in the Sinop-Samsun Basin in 1960s to 1990s, but none of them found commercial quantities of hydrocarbons.

No	TOC	S ₁	S ₂	S ₃	Tmax	HI	OI	PI	RC (%)	PC (%)	MINC (%)
CD 1	0.53	0.01	0.02	0.06	343	4	11	0.37	0.52	0.01	0.25
CD 2	0.65	0.01	0.01	0.40	597	2	62	0.33	0.64	0.01	0.02
CD 3	0.76	0.03	0.43	0.56	442	57	74	0.06	0.70	0.06	0.04
CD 4	0.38	0.01	0.00	0.21	u/d*	0	55	0.60	0.37	0.01	0.02
CD 5	1.15	0.09	1.38	0.05	437	120	4	0.06	1.02	0.13	0.07
CD 6	1.25	0.05	1.06	0.40	438	85	32	0.05	1.14	0.11	0.07
CD 7	0.31	0.00	0.01	0.13	605	3	42	0.34	0.31	0.00	0.03
CD 8	0.51	0.01	0.01	0.28	604	2	55	0.54	0.50	0.01	0.03
CD 9	1.33	0.15	2.26	0.06	440	170	5	0.06	1.12	0.21	0.63
CD 10	1.17	0.14	1.63	0.03	442	139	3	0.08	1.02	0.15	0.69
CD 11	1.08	0.01	0.52	0.91	445	48	84	0.02	1.00	0.08	0.09
CD 12	1.15	0.01	0.81	0.88	440	70	77	0.02	1.05	0.10	0.48
CD 13	0.88	0.11	2.76	0.19	432	314	22	0.04	0.62	0.26	4.74
CD 14	1.50	0.08	4.12	0.33	431	275	22	0.02	1.13	0.37	1.07
CD 15	1.59	0.07	4.28	0.41	430	269	26	0.02	1.20	0.39	1.10
BY 1	0.96	0.02	1.21	0.18	431	126	19	0.01	0.84	0.12	0.84
BY 2	1.02	0.01	1.45	0.20	433	142	20	0.01	0.88	0.14	1.51
BY 3	1.07	0.05	1.60	0.04	431	150	4	0.03	0.93	0.14	0.81
BY 4	1.19	0.04	1.36	0.04	433	114	3	0.03	1.07	0.12	0.65
BY 5	1.17	0.05	2.48	0.06	430	212	5	0.02	0.95	0.22	0.90
BY 6	1.36	0.09	2.61	0.10	430	192	7	0.04	1.12	0.24	0.87
BY 7	1.18	0.15	2.98	0.03	432	253	3	0.05	0.91	0.27	0.50
BY 8	1.16	0.08	2.58	0.19	428	222	16	0.03	0.93	0.23	1.13
BY 9	0.97	0.07	1.29	0.04	430	133	4	0.05	0.85	0.12	0.69
BY 10	1.10	0.06	2.39	0.04	430	217	4	0.03	0.89	0.21	1.18
BY 11	1.27	0.10	3.11	0.22	430	245	17	0.03	0.99	0.28	0.96
BY 12	1.46	0.12	3.95	0.40	428	271	27	0.03	1.09	0.37	0.96
BY 13	1.00	0.06	2.27	0.12	431	227	12	0.03	0.79	0.21	0.98
BY 15	1.04	0.06	1.97	0.34	428	189	33	0.03	0.85	0.19	1.04
BY 16	1.28	0.07	2.67	0.16	432	209	12	0.03	1.03	0.25	0.65
DB 1	0.13	0.00	0.03	0.50	434	23	385	0.12	0.11	0.02	4.49
DB 2	0.55	0.01	0.26	0.51	448	47	93	0.04	0.50	0.05	3.05
DB 3	0.34	0.01	0.13	0.22	445	38	65	0.06	0.32	0.02	2.62
DB 4	0.21	0.01	0.05	0.68	462	24	324	0.09	0.18	0.03	1.76
DB 5	0.40	0.01	0.22	0.49	441	55	122	0.04	0.36	0.04	3.24
DB 6	0.23	0.01	0.13	0.74	434	57	322	0.08	0.19	0.04	6.18
DB 7	0.27	0.01	0.12	0.21	443	44	78	0.09	0.25	0.02	3.42
DB 8	0.12	0.00	0.02	0.32	476	17	267	0.09	0.11	0.01	4.78
DB 9	0.26	0.01	0.09	0.43	435	35	165	0.10	0.23	0.03	3.32
DB 10	0.26	0.00	0.02	0.22	473	8	85	0.08	0.25	0.01	2.70
DB 11	0.19	0.00	0.02	0.37	477	11	195	0.16	0.18	0.01	2.97
DB 12	0.18	0.01	0.02	0.23	482	11	128	0.43	0.17	0.01	3.14
KV 1	0.61	0.03	0.23	0.04	466	38	7	0.11	0.58	0.03	0.06
KV 2	0.54	0.04	0.23	0.01	455	43	2	0.14	0.51	0.03	0.03



Conclusions

Although sixteen exploration wells were drilled in the Sinop-Samsun basin from the 1960s to 1990, oil or gas has yet to be discovered. Well log assessments suggest that eleven of these wells did not penetrate any potential reservoir due mainly to the 5,000-meter thickness of the Kusuri, Gürsökö and Yemişliçay Formations. Only three wells penetrated potential reservoirs; however, seal rocks in these wells were eroded and traps were disrupted by thrusts. Due to the thick sediments of the Kusuri, Atbaşı, Akveren and Gürsökö Formations that were eroded from the anticlines around Kavak and northwest of Bafra, reservoirs of the Çağlayan and İnaltı Formations are prospects for future exploration.