

# **PS Shale Gas Potential and Gas Characteristics in Mesozoic Mohe Basin, Northernmost China\***

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## **Abstract**

The Mohe basin, located in northeast China, has well developed thick dark mudstones and shales in Middle Jurassic lacustrine Mohe Formation, which shows good accumulation conditions of shale gas. However, the basin is still in low shale gas exploration degree and no exploration breakthrough has been made. In this study, hundreds of source rocks and gas samples from the drilled cores in the basin were analyzed. We obtained the following results. The source rock samples contain high TOC contents (average 5.3%) and the organic matter of the source rocks is mainly composed of gas-prone Type II-III kerogen. The Tmax values (average 472°C) and Ro values (average 2.3%) reveal high maturity, which are favorable for gas generating. The desorption gas from the cores in the shallow part (<1200m) is dominated by biogas. Mixed gas mainly exists at the depth of 1200-2300m and the pyrolysis gas shall occur in deeper formations. The analysis results suggest that the Mohe Basin is qualified to have thermogenic shale gas generation potential and the shallow area may have the presence of microbial shale gas. The Mk-4 area, one of the wells of this study is supposed to be the most potential shale gas generation area in the basin for the biggest source rock thickness, the most appropriate maturity and the most beneficial preservation environment. The targets of future exploration should be focused on the block with deep burying and favourable preservation to explore shale gas.

# Shale Gas Potential and Gas Characteristics in Mesozoic Mohe Basin, Northernmost China

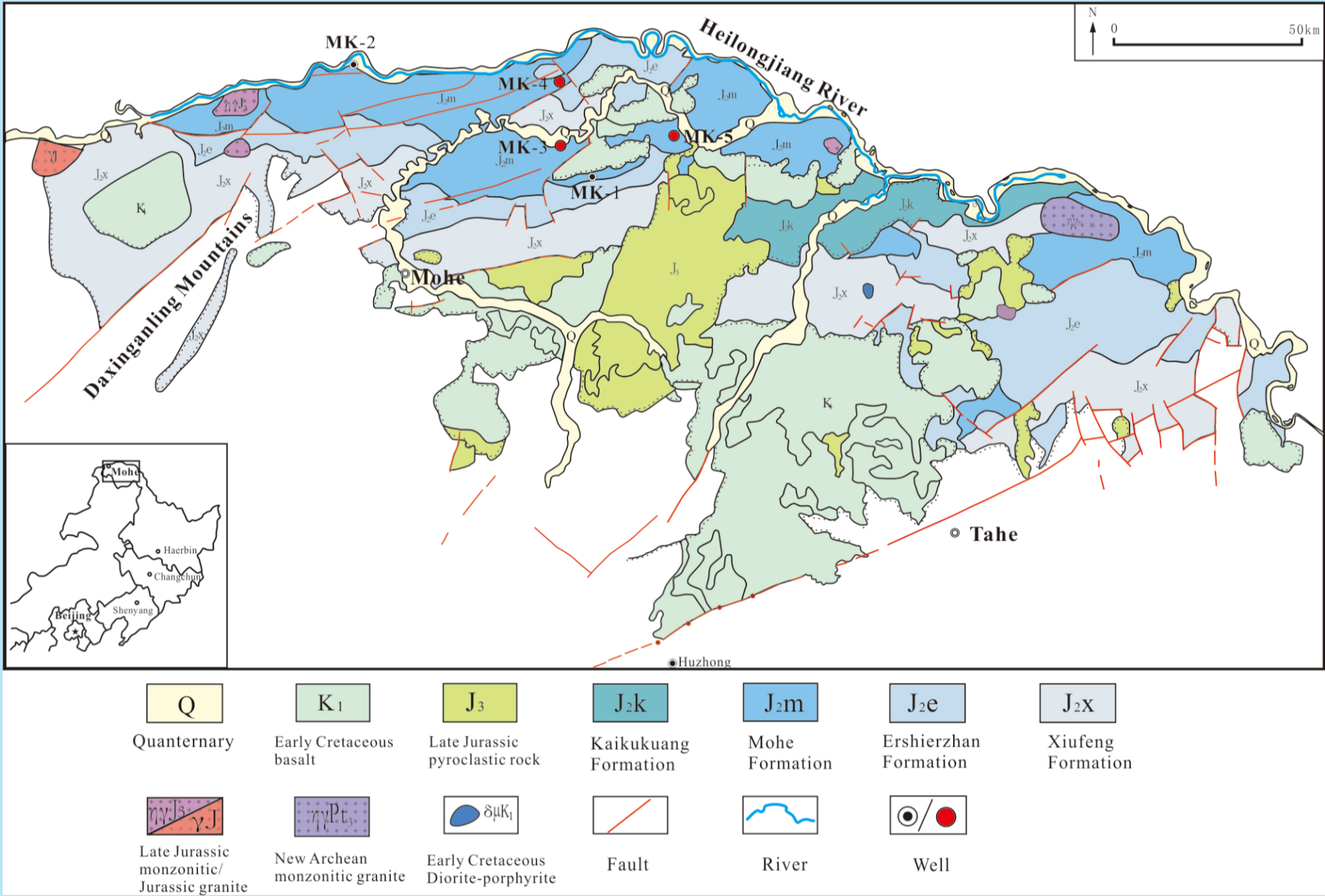
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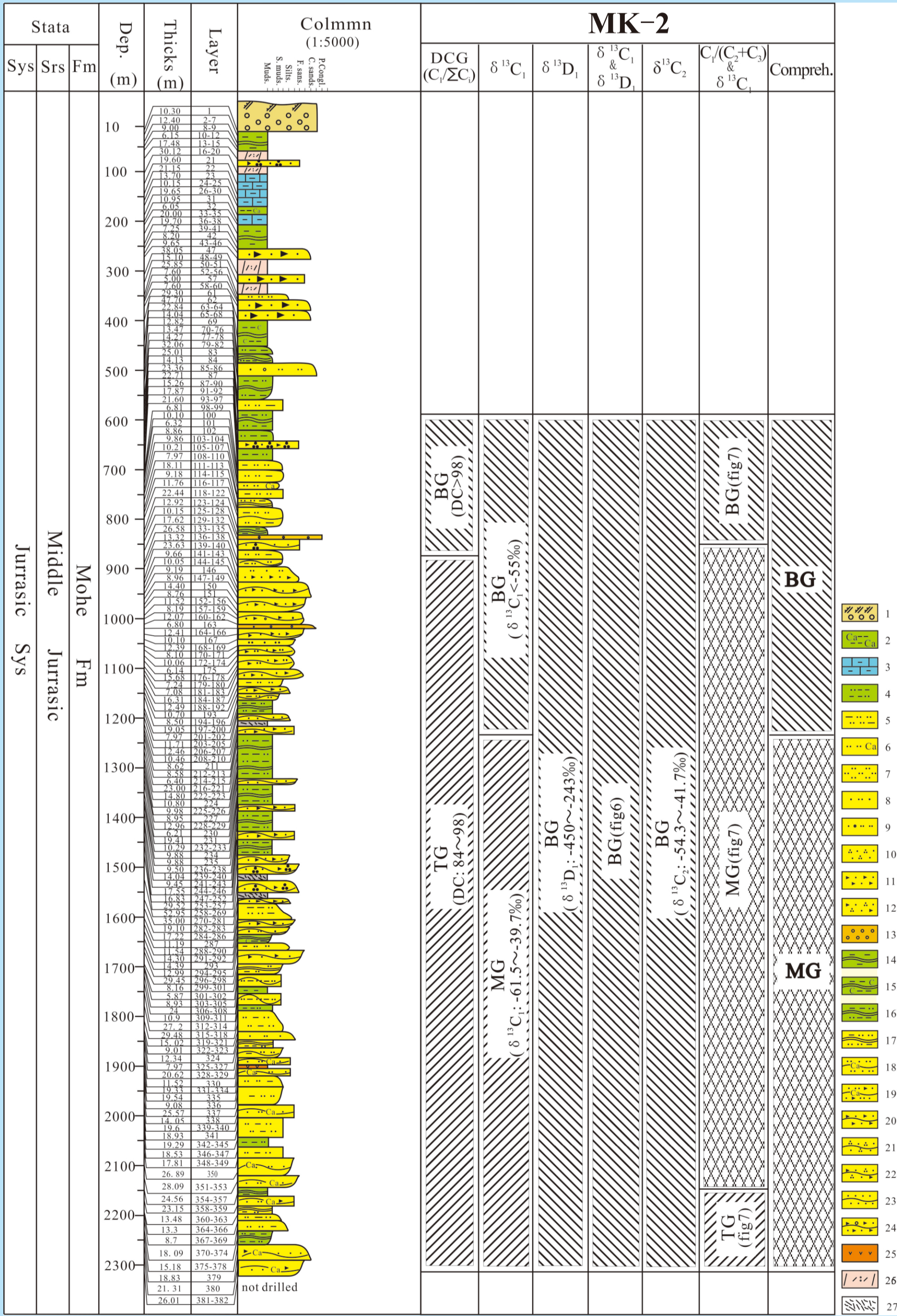
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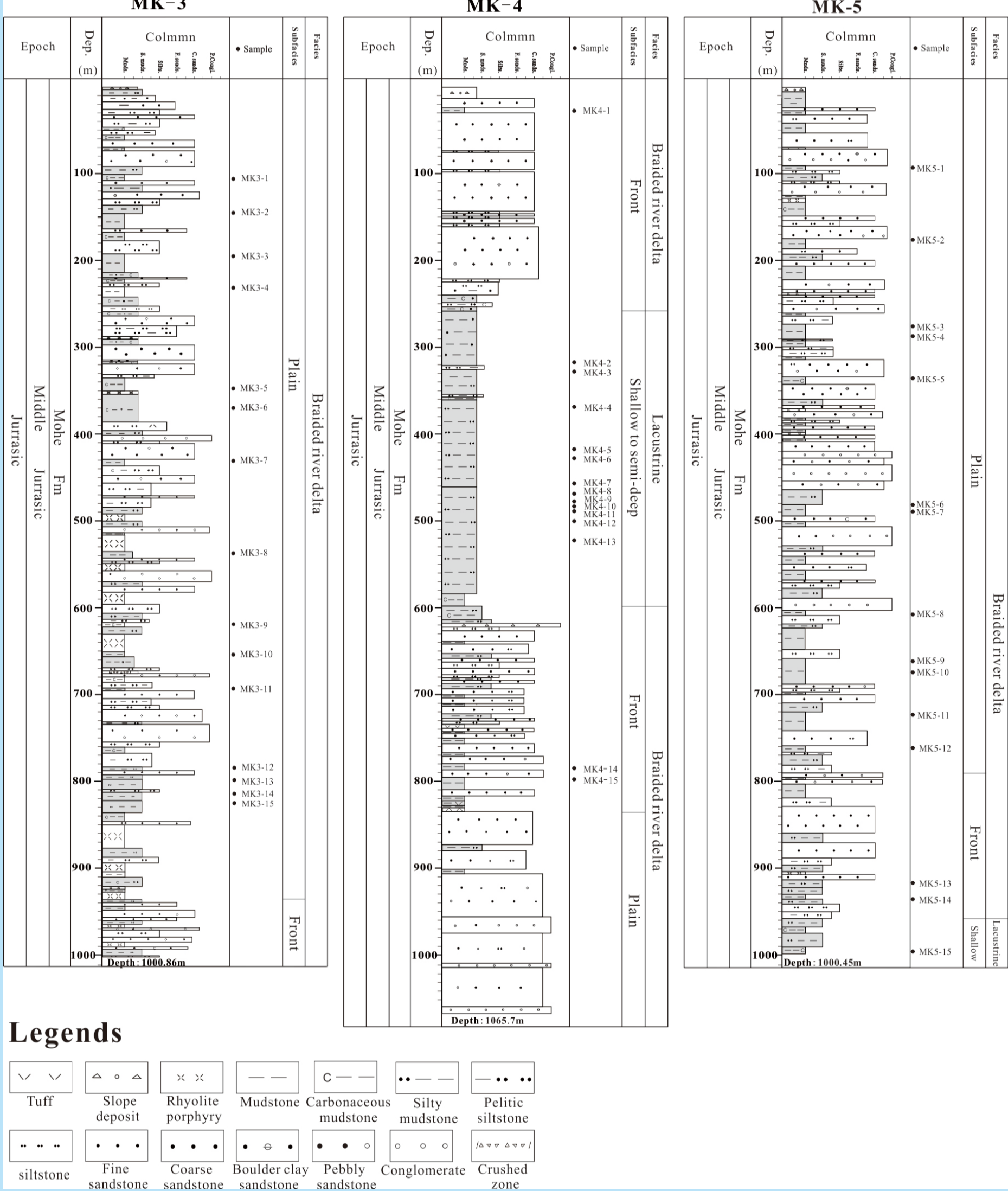
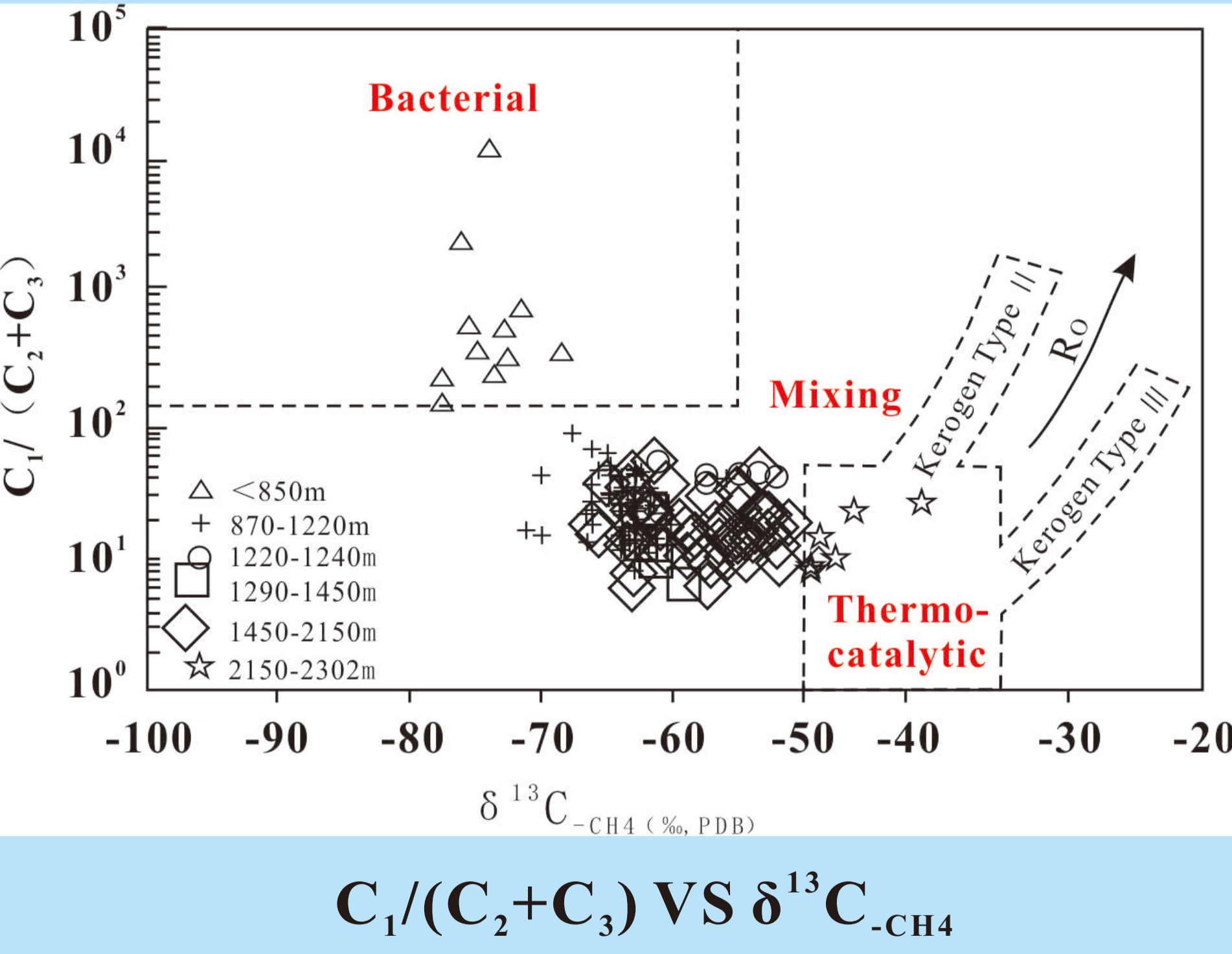
The Mohe basin, located in northeast China, has well developed thick dark mudstones and shales in Middle Jurassic lacustrine Mohe Formation, which showing good accumulation conditions of shale gas. However, The Basin is still in low shale gas exploration degree and no exploration breakthrough has been made. In this study, hundreds of source rocks and gas sample from the drilled cores in the Basin were analyzed. The following results were obtained. The source rock samples contain high TOC contents (average 5.3%) and the organic matter of the source rocks is mainly composed of gas-prone Type II-III kerogen. The Tmax values (average 472℃) and Ro values (average 2.3%) reveal high maturity, which are favorable for gas generating. The desorption gas from the cores in the shallow part (<1200m) is dominated by biogas. Mixed gas mainly exists at the depth of 1200-2300m and the pyrolysis gas shall occur in deeper formations. The analysis results suggest that the Mohe Basin is qualified to have thermogenic shale gas generation potential and the shallow area may have the presence of microbial shale gas. The Mk-4 area, one of the wells of this study is supposed to be the most potential shale gas generation area in the basin for the biggest source rock thickness, the most appropriate maturity and the most beneficial preservation environment. The targets of future exploration should be focused on the block with deep burying and favourable preservation to explore shale gas.



Sketch geological map of Mohe area, northeastern China



The type of desorption gas of MK-2



Geological section of MK-3, MK-4 and MK-5

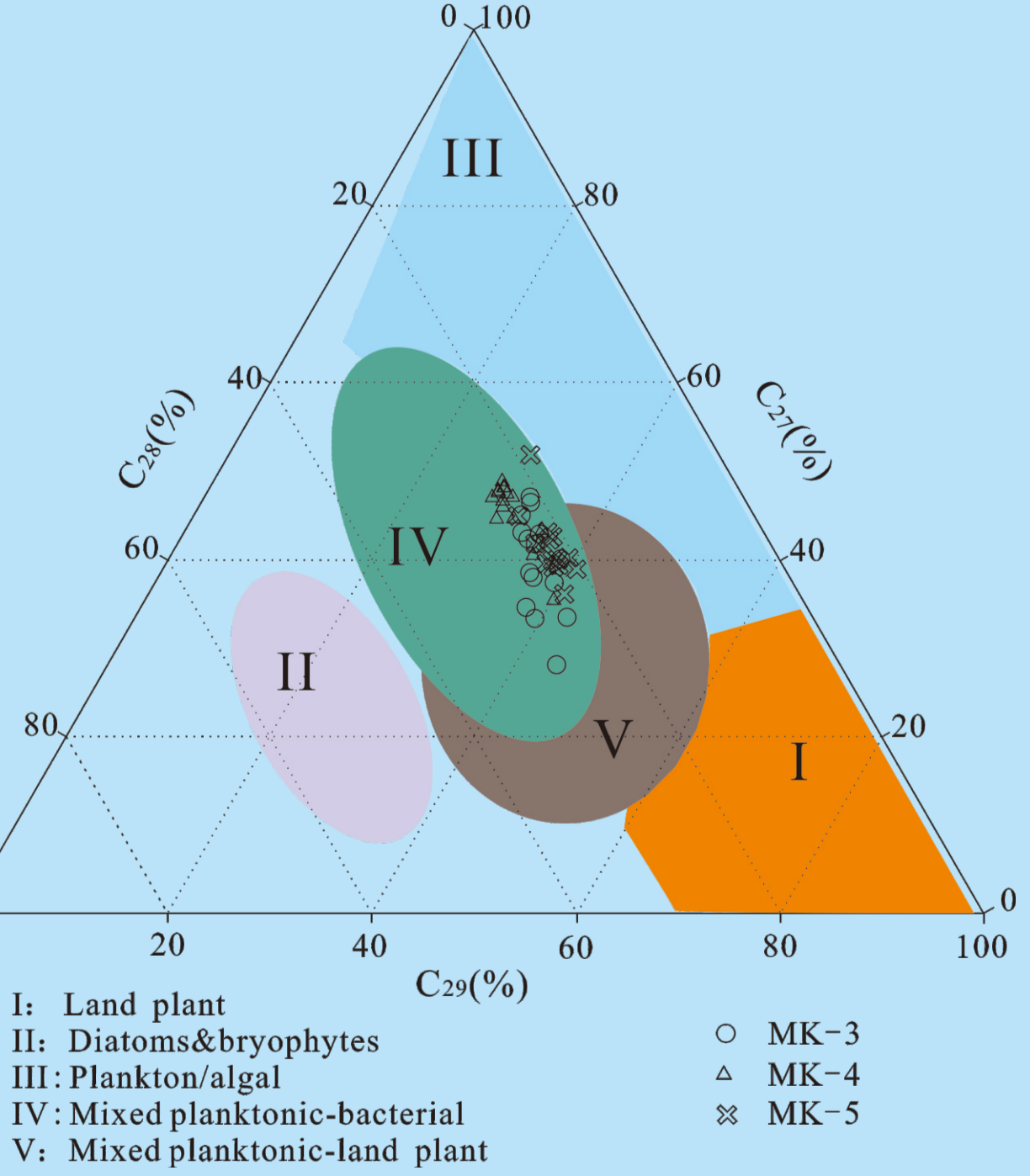
Wells & Sample No.	Depth (m)	TOC w(%)	Tmax (°C)	Ro (%)	a	b	c
MK3-1	108.1	8.20	490	1.25	47.32	21.15	31.53
MK3-2	157.2	4.74	525	-	42.91	22.54	34.55
MK3-3	192.4	11.89	504	1.83	46.65	21.47	31.88
MK3-4	235.0	14.60	515	-	34.62	27.84	37.54
MK3-5	349.7	7.36	541	-	45.23	23.13	31.64
MK3-6	385.7	33.22	386	2.94	38.05	25.61	36.34
MK3-7	433.6	16.89	527	2.13	38.66	25.48	35.85
MK3-8	539.6	0.97	373	-	43.19	24.03	32.78
MK3-9	615.6	4.14	547	-	42.55	23.84	33.62
MK3-10	656.5	4.84	553	2.15	28.19	28.12	43.69
MK3-11	680.0	19.90	548	2.11	33.55	27.60	38.85
MK3-12	770.0	0.99	372	-	41.87	23.43	34.70
MK3-13	796.0	42.43	560	1.71	33.43	24.35	42.22
MK3-14	810.8	1.79	576	2.52	37.48	23.83	38.69
MK3-15	823.0	2.25	373	-	40.24	21.68	38.08
Arithmetic means	11.61	492.7	2.08	39.60	24.27	36.13	
MK4-1	27.2	0.65	499	-	43.60	21.76	34.64
MK4-2	316.2	0.62	552	1.65	47.46	22.89	29.65
MK4-3	326.6	0.61	546	2.3	48.41	23.77	27.82
MK4-4	369.7	0.74	369	-	49.25	22.98	27.77
MK4-5	417.5	0.60	352	1.77	47.30	24.81	27.89
MK4-6	428.1	0.68	367	1.85	47.44	24.49	28.07
MK4-7	456.1	0.76	367	-	46.42	24.31	29.27
MK4-8	468.6	0.69	368	-	48.49	23.26	28.25
MK4-9	472.2	0.52	367	2.77	47.17	24.20	28.63
MK4-10	480.7	1.17	372	-	45.09	23.67	31.25
MK4-11	487.9	1.03	552	2.53	44.95	25.58	29.47
MK4-12	499.8	0.54	373	-	47.91	24.27	27.82
MK4-13	520.4	0.58	545	-	48.27	23.06	28.67
MK4-14	785.4	0.83	387	3.03	35.77	24.60	39.64
MK4-15	796.0	1.02	481	2.82	40.95	24.07	34.98
Arithmetic means	0.74	433.1	2.34	45.90	23.85	30.25	
MK5-1	91.2	0.85	472	-	41.35	23.05	35.60
MK5-2	180.7	0.64	546	1.62	40.25	20.98	38.77
MK5-3	273.6	1.33	480	2.18	42.44	21.58	35.98
MK5-4	285.4	1.06	462	-	41.48	23.68	34.84
MK5-5	361.3	2.39	570	-	36.24	23.48	40.28
MK5-6	477.4	1.56	428	2.25	38.90	20.81	40.29
MK5-7	490.2	1.46	550	-	43.01	21.27	35.72
MK5-8	605.1	17.76	556	-	45.28	23.18	31.34
MK5-9	659.3	3.87	583	2.91	42.47	22.16	35.37
MK5-10	679.8	2.27	567	-	40.35	21.84	37.81

a: C<sub>27</sub>%: C<sub>27</sub>/(C<sub>27</sub>+C<sub>28</sub>+C<sub>29</sub>) steranes %;

b: C<sub>28</sub>%: C<sub>28</sub>/(C<sub>27</sub>+C<sub>28</sub>+C<sub>29</sub>) steranes %;

c: C<sub>29</sub>%: C<sub>29</sub>/(C<sub>27</sub>+C<sub>28</sub>+C<sub>29</sub>) steranes %;

The analyze data of MK-3, MK-4 and MK-5



Ternary diagram of the composition of the regular steranes



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