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Preliminary results for the possibility of Lower Cretaceous Vigla shales to be a major source formation for the production of hydrocarbons in the Ionian basin

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Introduction – Geological setting

The field observations of the Lower Cretaceous "Vigla formation" in NW Peloponnesus (Gianniskari beach) and according to Bourli et al., (2019), indicate a fault-controlled formation that was accumulated into restricted basins. These basins were formed from normal faults with NNW-SSE direction and were influenced from ENE-WSW directed transfer faults. According to Bourli et al., 2019 the subdivision of the Ionian basin into asymmetric grabens resulted in variations in geometry and water depth and thus, sedimentary successions with different thicknesses were accumulated. The deeper deposits occur in the central part of each asymmetric graben, where the "Vigla shales" were deposited. The Lower Cretaceous "Vigla formation", along the Gianiskari beach consists of two different members, the lower one made of "Vigla limestones" and the upper one made of strongly deformed "Vigla shales". Vigla shales consist of thinly interbedded chert and shales, up to 60 m thick. The chert is mostly reddish but is also black or green, that characterizes in general cherts. Synsedimentary faults produced slumping within Vigla shales, during sedimentation. This slumping is up to 30m long and up to 40cm relief high. Synsedimentary faults have a general southward direction and strong deformation internally to the deposits. Finally, some of the faults produced also flower structures producing accommodation space that was filled up by successive deposits.

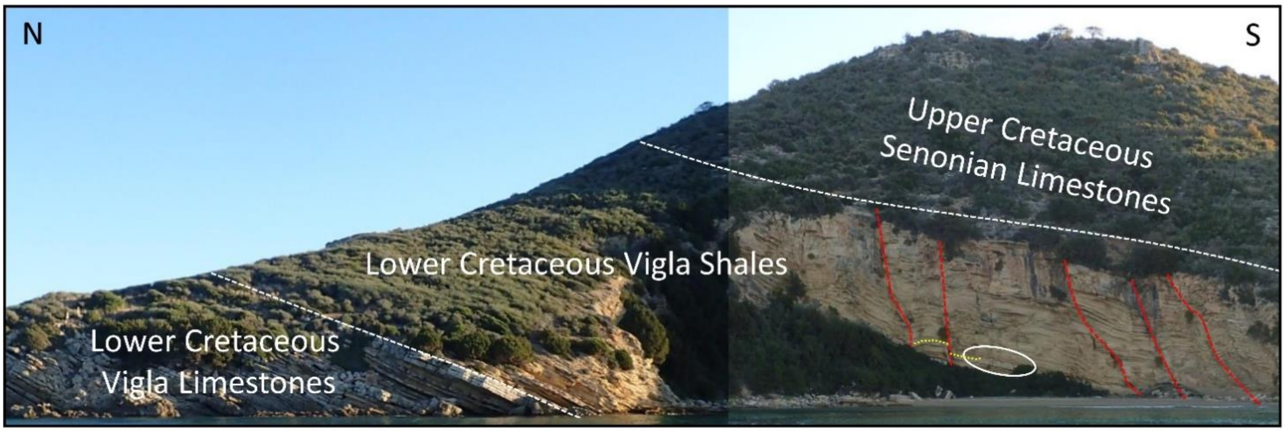

Figure 1. The studied outcrop along the Gianiskari coast with the lower Cretaceous "Vigla Shales" overlying lower Cretaceous "Vigla limestones" and underlying the upper Cretaceous "Senonian limestones" (white dashed lines mark the two boundaries). Many normal faults cross-cut the sedimentary association of Vigla shales (red dashed lines) during sedimentation producing synsedimentary slumps (white circle).

Data analysis - Results

Geochemical analysis in 31 samples with Rock-Eval VI, from the up to 60m thick succession, showed that there are at least eight (8) samples with more or close to 0.50% TOC (Table 1). From these results and according to the analytical restriction (when S2 is <0.2 then Tmax is not considered accurate), we concentrate on the Tmax values of three samples (G1R, G4 and G5).They indicate that the contained organic matter is immature.

Although there are samples with high enough TOC content, the respective S1 and S2 values are very low. The visual inspection of the FID pyrolysis signals of the samples revealed a wide pattern of the S2 peak in most samples, without a clear maximum point. In several samples two different distributions may be identified within the S2 peak, corresponding to immature and over-mature organic matter. These distributions are shown for the samples G10 and G30 in Fig. 2. The presence of the over-mature kerogen may be attributed to transported reworked material before deposition in the current location. The low concentration of kerogen in the studied samples does not allow for the reliable determination of its origin and therefore a more detailed study is advisable to reveal the sedimentation history of the studied Vigla shales samples.

Considering the above results and taking into account that Vigla shales are proposed as one of the possible sources for hydrocarbon production in the Ionian basin, further studies are needed to document their real hydrocarbon generation potential.

Table 1: The Rock Evall VI geochemical results from 31 samples along the Gianiskari coast in NW Peloponnesus

Sample	Qty - (mg)	S1 - (mg/g)	S2 - (mg/g)	Tmax(°C)	S3 - (mg/g)	TOC(%)	MINC(%)
G1	63.4	0.01	0.04	370	0.55	0.04	5.94
G2	67.9	0.00	0.00		0.00	0.20	7.68
G3	63.8	0.02	0.03		0.33	0.07	1.95
G4	64.9	0.01	0.12	370	0.62	0.38	2.43
G5	62.3	0.01	0.07	372	0.28	0.16	0.65
G6	69.7	0.00	0.03		0.31	0.45	6.96
G7	68.4	0.00	0.01		0.34	0.59	7.47
G8	64.4	0.00	0.02		0.53	0.22	5.87
G9	62.4	0.02	0.04		0.24	0.03	5.73
G10	65.1	0.00	0.04		0.41	0.07	5.38
G11	58.8	0.02	0.06		1.90	0.13	3.06
G12	63.5	0.04	0.07		1.48	0.14	5.56
G13	69.6	0.01	0.03		0.43	0.56	7.96
G14	61.1	0.01	0.00		0.21	0.28	7.25
G15	67.5	0.02	0.06		0.59	0.53	7.36
G16	69.4	0.00	0.03		0.39	0.29	7.57
G17	60.7	0.05	0.07		0.55	0.52	7.42
G18	66.9	0.04	0.12		0.38	0.16	7.34
G19	67.3	0.02	0.05		0.43	0.33	7.00
G20	63.8	0.02	0.08		0.78	0.03	3.94
G21	63.3	0.01	0.03		0.34	0.09	6.64
G22	59.6	0.00	0.01		0.66	0.12	5.66
G23	60.4	0.01	0.02		0.86	0.13	5.86
G24	64	0.00	0.01		0.64	0.12	5.20
G25	69.6	0.00	0.00		1.08	0.24	6.42
G26	65.4	0.00	0.00		0.51	0.01	5.39
G27	62.4	0.00	0.01		0.23	0.08	5.67
G28	64.1	0.00	0.00		0.23	0.01	5.32
G29	64.5	0.00	0.00		0.71	0.19	6.04
G30	64.9	0.01	0.09		0.65	0.13	4.93
G31	63.2	0.01	0.02		0.60	0.72	6.83

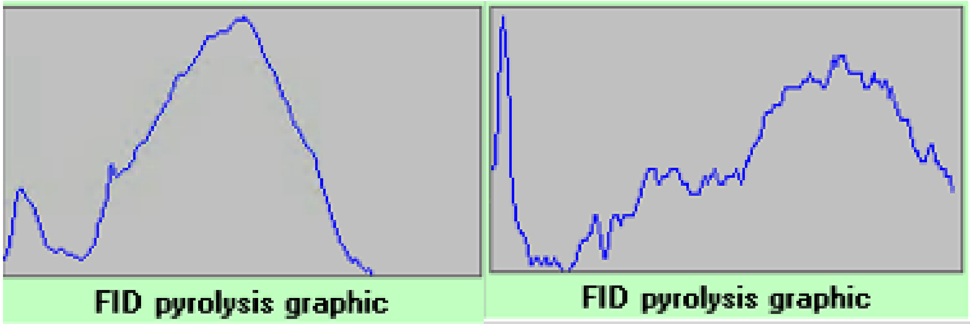

Figure 2: S.1 and S2 images for G30 and G10 samples showing immature and overmature-reworked kerogen respectively

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References

Bourli, N., Pantopoulos, G., Maravelis, A.G., Zoumpoulis, E., Iliopoulos, G., Pomoni-Papaioannou, F., Kostopoulou, S., Zelilidis, A., 2019. Late Cretaceous to Early Eocene geological history of the eastern Ionian Basin, southwestern Greece: An integrated sedimentological and bed thickness statistics analysis. Cretaceous Research 98, 47-71.