Characterization of the Late Cretaceous Oil Shale Member, southern Tethys, Negev Israel inferred from organic geochemistry and stable isotopes

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Coastal upwelling
Late Cretaceous coastal upwelling

Glenn, 1994
Lithostratigraphy of the Late Cretaceous high productivity sequence, Negev, Israel
Bein et al, 1990

ZIN VALLEY

% Organic Carbon

Depth [m]

0 20 40 60 80 100

Depth [m]

0 4 8 12 16 20 24 28

Organic Carbon %
Objectives

• To study the C & N isotopes of the bulk organic matter together with the CaCO₃ and C concentration as proxies for paleoproductivity at the last phase of the Late Cretaceous upwelling system.

• To combine between geochemistry and micropaleontology records, as part of an interdisciplinary research.
The entire Oil shale sequence was deposit in 1Ma based on foraminifera biostartigraphy
Research area

Fresh, unaltered rocks from the Oil Shale unit, its lower contact a Phosphate unit and upper contact with a Marl unit (49 meters) were sampled from an open quarry located at Mishor Rotem.

Shahar & Wurzburger, 1967
Methods

• Geochemical analysis of the high productivity sequence from bulk organic matter measuring:

% CaCO3, TOC, TON, $\delta^{13}C_{org}$ and $\delta^{15}N_{org}$.

• Isotope samples were combusted in the Elemental Analyzer in line to Finnigan MAT 252 Isotopic Ratio Mass Spectrometer for dual measurement of $\delta^{13}C$ and $\delta^{15}N$. 
Isotopes as paleoenvironmental proxies:

• $\delta^{13}C$ of bulk organic matter - productivity, $[CO2]_{aq}$, post-burial processes.

• $\delta^{15}N$ of bulk organic matter - nutrient utilization or denitrification processes.
Oil Shale – Marl transition

$CaCO_3$ vs. TOC, TON
Oil Shale – Marl transition

Isotopes C, N & CaCO₃
Oil Shale Member

$\text{CaCO}_3$ vs. TOC, TON

![Graph showing the relationship between $\% \text{CaCO}_3$, TOC, and TON across different depths.](Graph.png)
Oil Shale Member
Isotopes C, N & CaCO$_3$
Phosphate - Oil Shale transition

$\text{CaCO}_3 \text{ vs. TOC, TON}$
Conclusion

• The phosphate-Oil Shale transition indicates a shift from oxygen poor environment to high accumulation of organic matter and an increase in sea-level.

• The Oil Shale-Marl transition indicates a decrease in nutrient supply and in sedimentation rate, suggesting cessation of the upwelling system.

• The Oil Shale section implies weakening of the upwelling system with time (going up in the section).
Thank you for listening