





DID POCKMARK-LIKE STRUCTURES FORM DUE TO FLUID DISCHARGE?

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Several large and well-defined 76 40 30 pockmarks were discovered by USGC during 2003 HEALY-0302 cruise in a 76 39 45 shallow region of the Chukchi Cap. 76 39 00 Further geophysical studies revealed relationship an apparent 76 38 15 to subsurface faulting but the nature of 76 37 30 this relationship was need further 76 36 45 study.

-163 30 00

-163 37 29

Blue lines – SSS and SBP tracks Black stars – coring stations Pockmarks sampled

GD-6

-164 00 00

CG-18

-164 07 29

GD-7

GD

-164 00 00

-163 52 29

-163 45 00

-163 52 29 -163 45 00

-163 37 29

-163 30 00

-163 22 30

Mayer et al., 2009

-163 (

-163 15 8

76 41 15

76 36 00

76 35 15

76 34 30

76 33 45

76 33 00

76 32 15

850

75.0

7.0.0

-163 22 30



Results of modeling:

 $\Omega < 0$ --- dissolution

 $\Omega > 0$ --- precipitation

The coefficients of pore water saturation in respect to carbonates (aragonite, calcite, dolomite) under the temperature of -1.5°C [*Miyake et al., 1994*] were calculated for HCG-13 and HCG-18 cores

HCG-13

HCG-18

Dissonnon

-1,0

-0.5

0,0

0.5

-1.5

Dolomite

0

Saturation Index
$$\Omega = \lg \frac{\left[Me^{2+}\right] \bullet \left[CO_3^{2-}\right]}{Ksp}$$
, (Log (Ion Activity Product / Ksp))

20 20 40 40 Subottom depth, cm 60 60 -80 Dissolution 80 100 100 -120 The calculations were 120 carried out by the 140 PHREEQC program for Windows [Parkhurst and 160 140 -1.5 -0,5 Ω -2,0 -2,0 -1.0 0,0 0.5 Appelo, 1999]. Calcite Aragonite

0

Results of the major element water chemistry :



Results:

Results of the geochemical and isotope studies: GD-1 structure





Results of the geochemical and isotope studies: GD-7 structure



bitumoides (HC, resins, paraffines and asphaltenes): **Origin indicators** OEP27-31 1,5 OEP17-19 Cralc + Sterane indexes of the maturity (20S/20S+20R **Maturity indicators** C29) evidence about postdiagenetic stage of DOM 0.5 transformation Pr/Ph Ts/Ts+Tm 0 + Calculated hopane coefficients of the DOM MSMAS XAR C31 maturity testifying a mix origin and considerable post-diagenetic level of MPI1 the OM maturity + Phenanthrene and its alky-Reference homologies are characterized by αβ/(αβ+βα) C30 anomalously high content Anomaly and obtained high value of MPI1 index testifies high degree of maturity of the OM

Results of quantitative chromatographic analysis of component-group composition of

Conclusions:

Pockmarks at the Chukchi Cap

- Anomalies in major-ions content distribution
- Variations of Mg/CI ratio
- Enhanced values of oxygen-18 isotopes
- Sterane indexes of the maturity (20S/20S+20R C29)
- Specific character of composition and distribution of HC biomarkers
- Increase of the Corg content and decrease of the C¹³ values
- Aromatic HC markers represented mostly by phenanthrene and its alky-homologies and characterize by anomalously high content (> 3000 ng/g) at the uppermost sediments

Upward water infiltration

Post- diagenetic stage of DOM transformation

High level of OM maturity

Mixed OM origin

The source of the high maturated OM supply may be resulted from: (1) ice rafting, (2) suspended organic material transported by river run-off or (3) mud flows from deeply buried sediments.