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BASIN'S CONTRIBUTION TO ATMOSPHERIC FOSSIL METHANE (CASE STUDY: BLACK SEA)

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EXTENDED ABSTRACT

A new method for evaluation of the detail history of thermogenic hydrocarbon gas masses release and contribution to atmospheric methane is described. The historico-genetic approach is used for estimation of the masses of generated and released gases.

The main advantages of this model method are:

- Receiving the masses of thermogenic gas escapes from the seafloor as a function of time for many sites with different geological cross-sections (4D history) and for the whole basin. The first is important for oil, gas and gas hydrates potential, while the second is base for the global climate change study;
- Climatic conditions of epochs with different methane content in the atmosphere are examples for the future climates.

The example area is the Black Sea – "the world's largest anoxic basin" and "the largest surface water reservoir of dissolved methane" – 96 Tg (Teragrammes; 1 Tg = 1012 g), a mass 2.4-6 times greater than the total annual geological methane contribution to the atmosphere of 16-40 Tg.

The inputs of the different complexes in the total amount of gases generated by the Cenozoic sediments of the Black Sea are: Paleocene-Eocene – 75%, Oligocene - 20%, Miocene - 4%, Pliocene - 1%. Almost all 500 evaluated sites took part in the process of generation during the last 20 to 65 million years when 98% of proto-gases were formed. Approximately 2/3 from the oil mass and 3/4 from the gases are produced in the Paleocene-Eocene sub complex.

The quotas of the main morphological elements of the Black Sea basin in the generated gas masses are: shelf – 0.6 Eg (Exagrammes; 1 Eg = 10^{18} g); slope – 1,4 Eg; rise – 0.5 Eg; abyss – 1,9 Eg.

The average annual mass contributions of methane during the Pliocene, Miocene, Oligocene and Paleocene-Eocene are respectively 0.7, 0.2, 1.6.and 6.8 Gg (Gigagrammes; 1 Gg = 10^9 g).

One of the most impressive results is that the mean value for the Cenozoic period from the shelf of 0.002 Tg.y-1 is 180-800 times lower than the contribution of seeps from the continental shelf according to L. Dimitrov, 2002 – "most probably of biogenic origin".

Key words: global change; hydrocarbons; oil and gas; atmospheric methane; Black Sea; historico-genetic approach