
Markov Chains for the Reconstruction of Sedimentary Environments

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Markov process is a process that has an element of randomness or unpredictability but in which a past event has an influence on a subsequent. A Markov chain is one form of Markov process and described as a "one-dimensional" sequence of discrete states in time or space.

In many geological investigations data sequences consisted of ordered successions of mutually exclusive states may be created. For example, in a stratigraphic sequence sedimentary rocks are formed as layers (bedding types or lithologies) and can be classified basing on their nature and identified as states of stochastic process. Sandstones, Siltstones, Mudstones and Claystones in a lithological column are some examples of such states. A vertical section of a stratigraphic sequence can be considered a realization of a stochastic process, and appropriate model can be developed.

The main goal of this research was to prove mathematically that cyclicity in Lower Pliocene Productive Series suites observed and reveal most statistically often occurred sequences for each suite.

Obtained results have shown statistically significant tendency (proved by χ^2 test) for certain states to be preferentially followed by certain other states and allowed us: to interpret the paleo-depositional environments, to compare Paleo-Volga (Absheron peninsula and adjacent area) and Paleo-Kura (Low-Kura Depression) depositional systems, to reveal the similarity and difference between sedimentation processes in both regions and to estimate the influence of such factors as paleo-rivers discharge, subsidence of the basin, sea level fluctuations.

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