

The authors present an investigation on the spatial properties of an oil reservoir based on of Detrended Fluctuation Analysis (DFA) technique. Such fluctuation analysis was performed on well log data of an off-shore exploration field in Brazil. Data from 54 wells have been considered. In each well, the fluctuation of several physical properties were analyzed and characterized by the Hurst exponent H . The optimal situation would be if values of H for each of the several physical measures present some correlation. In such case, petro-physical properties of the rocks in the geological layers could be inferred to regions between the wells, in analogy to geostatistical analysis.

The authors use Mantel test and k-core clustering algorithms to help identify correlation patterns. They conclude DFA might be used for the proposed task, but the answer is “without enthusiasm”.

To my opinion, this work resumes the analysis presented by the majority of the authors in a previous paper [Ref. 33]. Several paragraphs in sections 1, 2.1, and 2.2 are strongly based (in some cases, largely coincide) with the text of the quoted work. The authors should act more carefully to avoid copy-paste matters.

I consider the text provides a somewhat weak comparison between the results in the two works. Previously, they concluded that DFA should not be used for this task. It does not become clear for the reader why they evolved from a “no” to a “yes without enthusiasm”. Once the DFA results are the same, can the new statistical treatments actually lead to an improvement of the drawn conclusions? In which aspects the Mantel test and the k-cluster analysis actually improved the results to justify this change? In my opinion, the results continue to be poor: the correlation between sonic and density was already known by several authors; is the new finding about the correlation between porosity and resistivity an artifact? What were the results for this pair of variables in the previous work?

I think these issues should be addressed and discussed properly.

Minor issues:

- 1) The quantity $\Delta \alpha'$ is mentioned in subsection 2.3.1 but is defined in subsection 2.3.2.
- 2) Several spelling and grammar flaws must be corrected.

I strongly suggest the authors modify the text according to these recommendations. I would like to have access to the new version before recommending publication in NPG.