

Influence of thermobaric conditions on changes in acoustic characteristics of terrigenous rocks in Upper Devonian sediments

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INTRODUCTION

One of the main objectives of core research is to obtain interpretive models required for qualitative and quantitative interpretation of well logging data (WL). Petrophysical correlations are utilized to develop such models. However, in order to consider the obtained dependencies as interpretive models, core studies must be conducted under reservoir conditions. This work is devoted to laboratory studies of the acoustic properties of the samples.

SUBJECT OF RESEARCH

Within the scope of this study, a series of laboratory experiments was conducted to determine elastic characteristics of terrigenous rocks retrieved from Upper Devonian sediments.



Fig. 1– The sample originating from Upper Devonian sedimentary deposits



Fig. 2– Acoustic Property Measurement System «PIK-US-EP» (Geologika JSC, Novosibirsk)

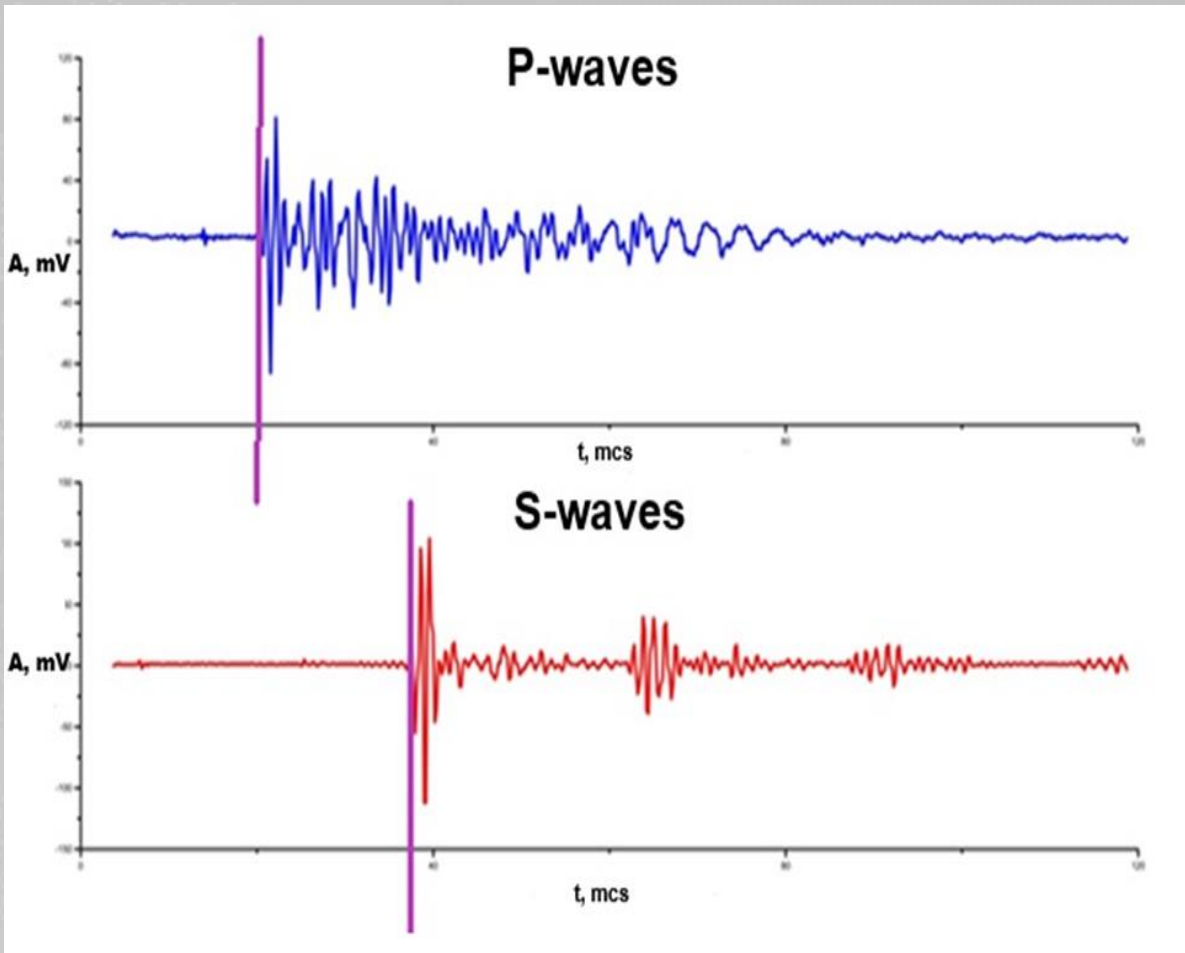


Fig. 3– Example of Registration of First Arrivals of P and S -waves

Based on the obtained acoustic wave velocity values, elastic moduli for the studied samples were calculated, and petrophysical correlations were constructed

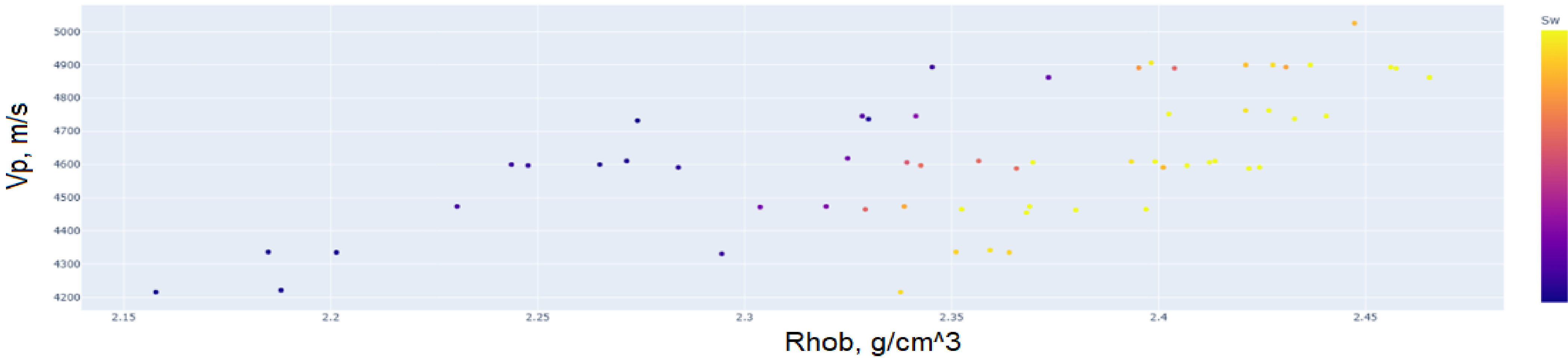


Fig. 4– Separation of data by bound water content

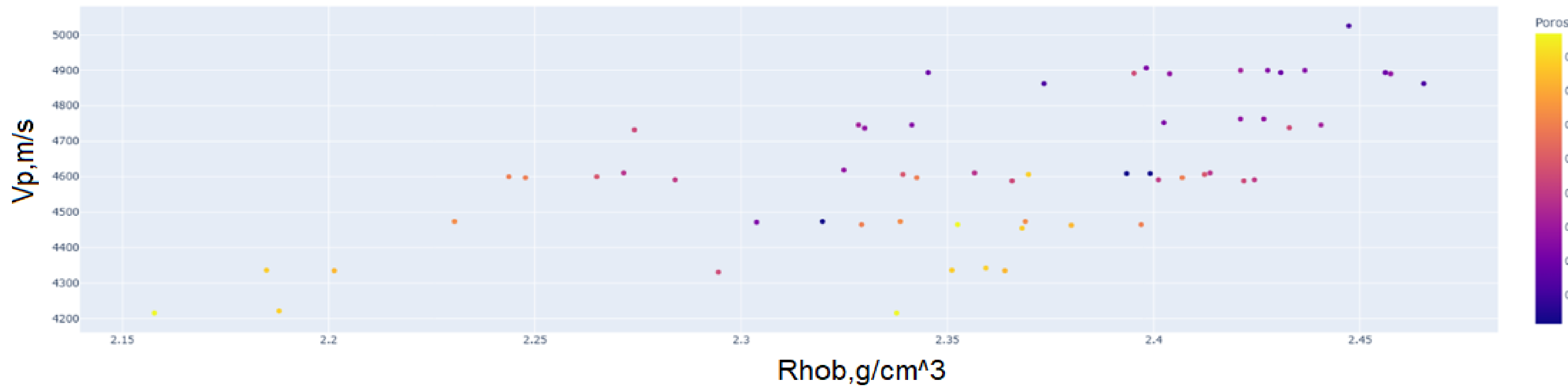


Fig. 5– Analysis of the value of Young's modulus E on the water saturation of core samples

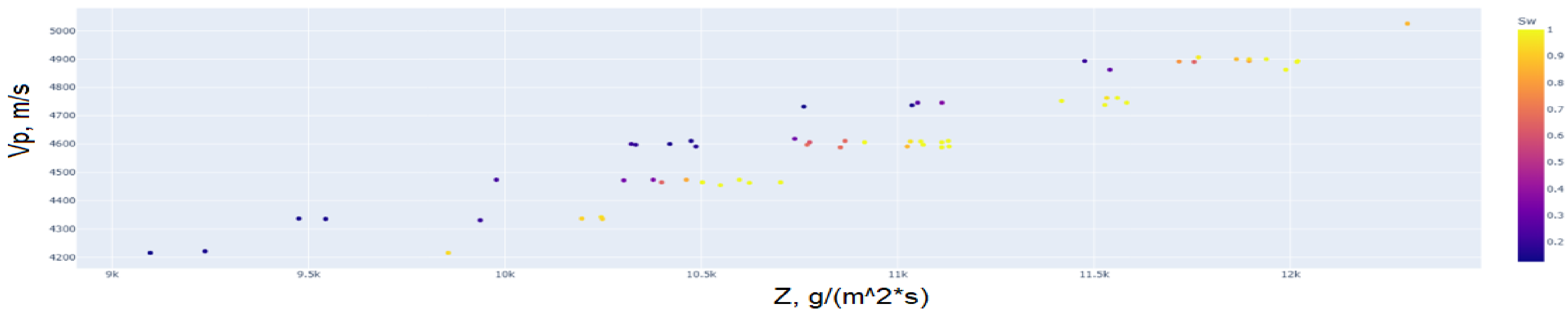


Fig. 6– Separation by acoustic impedance from the water saturation of core samples

RESULT:

It was experimentally demonstrated the nature of the relationship between water content in core samples and elastic moduli

CONCLUSIONS

In this scientific study, the data on bound water content are divided into three distinct clusters of points. However, no clear dependencies on porosity are observed. The Young's modulus (E) exhibits a direct proportionality to water saturation. The separation is evident based on the dependence of velocity on acoustic impedance.

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