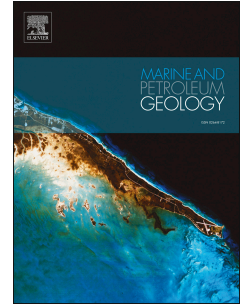


# Accepted Manuscript

The effect of thermal maturity on geomechanical properties in shale reservoirs:  
An example from the Upper Devonian Duvernay Formation, Western Canada  
Sedimentary Basin

Tian Dong, Nicholas B. Harris, Levi J. Knapp, Julia M. McMillan, David L. Bish



PII: S0264-8172(18)30285-X

DOI: [10.1016/j.marpetgeo.2018.07.007](https://doi.org/10.1016/j.marpetgeo.2018.07.007)

Reference: JMPG 3411

To appear in: *Marine and Petroleum Geology*

Received Date: 22 October 2017

Revised Date: 8 June 2018

Accepted Date: 9 July 2018

Please cite this article as: Dong, T., Harris, N.B., Knapp, L.J., McMillan, J.M., Bish, D.L., The effect of thermal maturity on geomechanical properties in shale reservoirs: An example from the Upper Devonian Duvernay Formation, Western Canada Sedimentary Basin, *Marine and Petroleum Geology* (2018), doi: 10.1016/j.marpetgeo.2018.07.007.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 **The effect of thermal maturity on geomechanical properties in shale**  
2 **reservoirs: An example from the Upper Devonian Duvernay**  
3 **Formation, Western Canada Sedimentary Basin**

4 Tian Dong<sup>ab</sup>, Nicholas B. Harris<sup>b</sup>, Levi J. Knapp<sup>b</sup>, Julia M. McMillan<sup>b</sup>, David L. Bish<sup>c</sup>

5 a. Key Laboratory of Tectonics and Petroleum Resources, China University of Geosciences  
6 (Wuhan), Ministry of Education, Wuhan, 430074, China

7 b. Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, Canada,  
8 T6G2E3

9 c. Department of Geological Sciences, Indiana University, 1001 East 10th Street, Bloomington,  
10 Indiana, USA, 47405

11 Corresponding author: Tian Dong, td2@ualberta.ca

12

13 **Abstract:** Shale reservoirs are characterized by low matrix permeability and therefore require  
14 effective models of geomechanical properties to optimize drilling and hydraulic fracturing  
15 strategies. Both initial rock composition and thermal maturity are potentially critical controls on  
16 geomechanical properties. We investigate the Upper Devonian Duvernay Formation, Western  
17 Canada Sedimentary Basin, a major shale gas target that spans a wide range in rock compositions  
18 and thermal maturity to identify relationships between these parameters and geomechanical  
19 properties. Core hardness measurements and dipole sonic and density log data were used to  
20 characterize the geomechanical properties. Major element chemical analysis, X-ray diffraction  
21 analysis and LECO combustion were used to determine mineralogy, bulk rock chemistry and total  
22 organic carbon (TOC) content and to distinguish biogenic from detrital silica. Scanning electron  
23 microscopy (SEM) images with complementary energy-dispersive spectroscopy (EDS) maps were  
24 obtained for representative samples to document the rock fabric and distribution of organic matter  
25 and minerals.

26 Hardness and Al<sub>2</sub>O<sub>3</sub> concentrations are strongly negatively correlated in all cores, regardless of  
27 thermal maturity, suggesting that clay minerals are the most significant factor controlling  
28 geomechanical properties. Biogenic silica is positively correlated to hardness. Detrital silica is  
29 negatively correlated to hardness, an artifact of the positive correlation between detrital clay  
30 minerals and detrital quartz. The positive correlations between CaO content and hardness in all

Download English Version:

<https://daneshyari.com/en/article/8908952>

Download Persian Version:

<https://daneshyari.com/article/8908952>

[Daneshyari.com](https://daneshyari.com)