

Micro-structural characteristics of the Haynesville Shale

Graduate Student (MS)
Kwon Taek Oh
Adviser : Kyle Spikes

THE UNIVERSITY OF TEXAS AT AUSTIN

JACKSON

SCHOOL OF GEOSCIENCES

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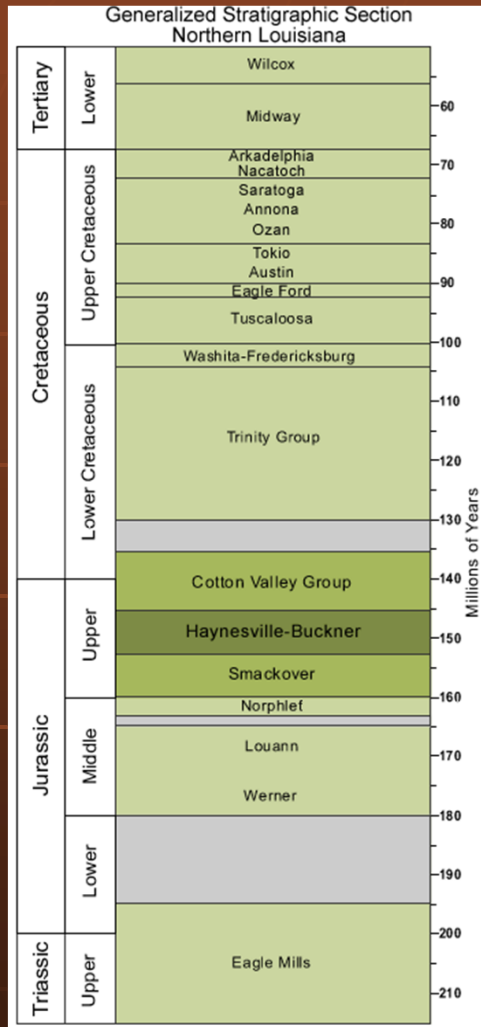
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Where is the Haynesville Shale?



- Located in northwest Louisiana and East Texas
- Lying approximately 10,000 to 13,000 feet sub-surface
- A rock formation containing oil and gas and an important shale-gas resource play
- Also called the Bossier shale

Haynesville Stratigraphy



- The Haynesville Shale, is a black, organic-rich shale of Upper Jurassic age
- It was deposited about 150 million years ago in an offshore environment.
- Marine transgressive to highstand mudrocks within mixed carbonate-clastic depositional systems

[Http://www.geology.com](http://www.geology.com)

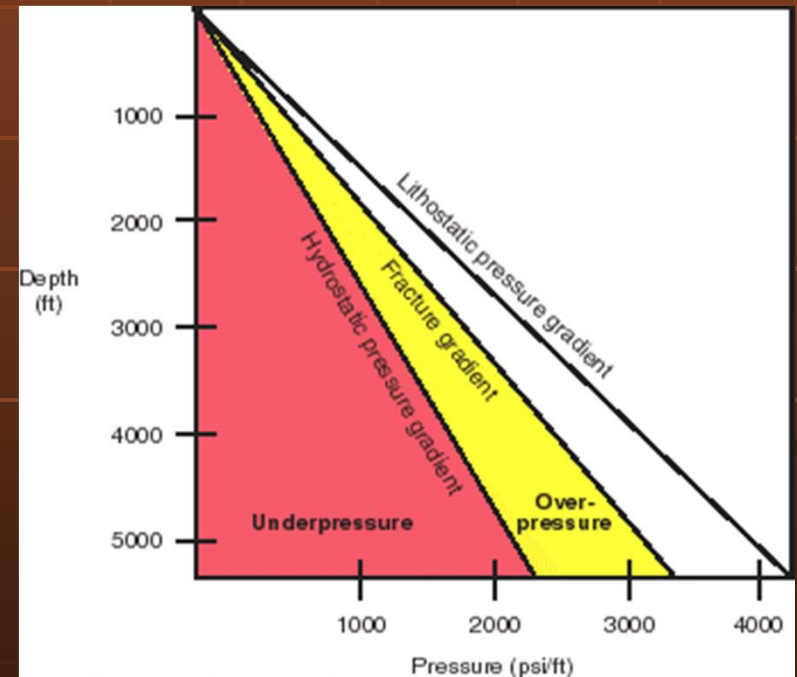
Characteristics of the Haynesville Shale

- Low average permeability (<0.1 md)
- Low average porosity (<8 %)
- Gas saturated (Large OGIP but low RF)
- Overpressure (abnormal pressure)

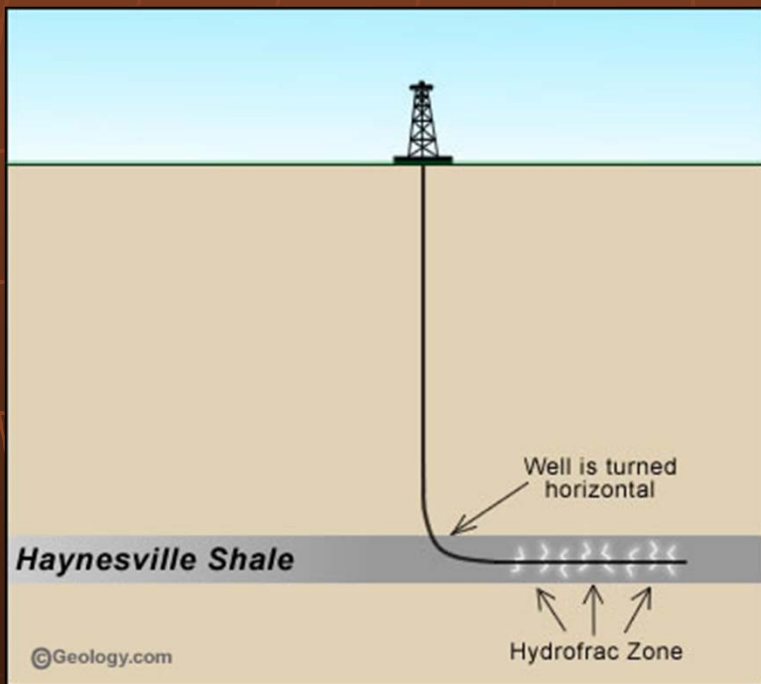
: high pore pressure from
a formation sealing

- Effective pressure : $P_e = P_c - nP_p$
 - P_e : Effective pressure
 - P_c : Confining pressure
 - P_p : Pore pressure
 - n : Effective pressure coefficient

- OGIP : Original Gas in Place
- RF : Recovery Factor

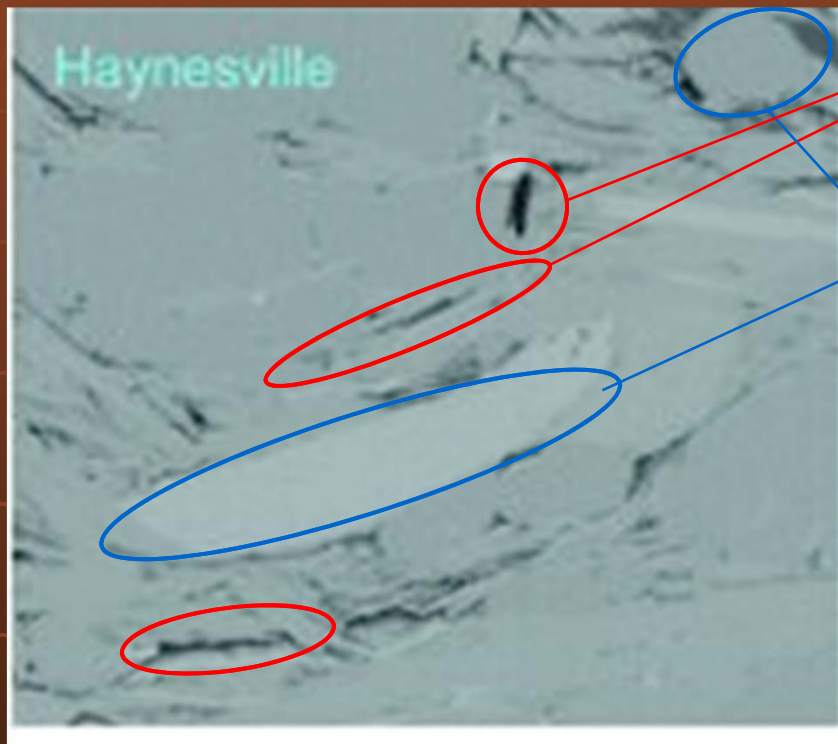


The Haynesville was originally considered to be a gas source rock rather than a gas reservoir because of its low permeability.



- With a hydraulic fracturing and horizontal drilling
- Reserves : 60 Tcf
- Production : about 2.6 Bcf/d

A Micro-structural Image



- Dark is organic material (solid) inside pore.
- Light gray is matrix or grain.
- Most pore shapes are flat (crack-like) : (low aspect ratio).
- Variable grain shapes

← Scale : 10 nanometer →

Images from Sondergeld and Rai:

<http://www.epmag.com/Magazine/2010/9/item66300.php>

Future work

Potential research topics:

- Rock-physics modeling (pressure dependent) of the Haynesville shale
- Depositional and diagenetic controls at the pore scale and their effects on velocity
- Relating microstructure to production rate

Thank You

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