



UNIVERSITY OF SOUTH ALABAMA

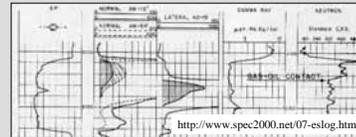
## GY 305: Geophysics

Lecture 9:  
Isopach Maps  
Top of Formation maps

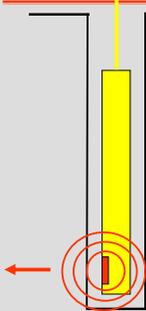
## Last Time (before the test)

### Electric Logs 3

- Porosity Logs
- Neutron Logs
- Density Logs



## Neutron Logs

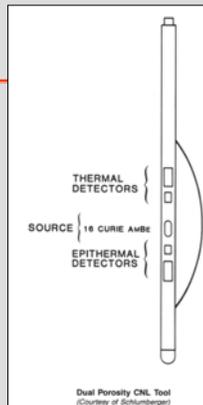


...Neutron Logs also distinguish **hydrogen concentration**.

The more H, the more adsorption.

High counts=low adsorption (Low porosity)

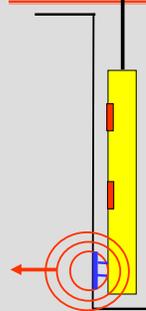
Low counts=high adsorption (high porosity)



Dual Porosity CNL Tool (Courtesy of Schlumberger)

[http://www.spe.org/library\\_info/glossary/reference/gloss/images/glog1311.pdf](http://www.spe.org/library_info/glossary/reference/gloss/images/glog1311.pdf)

## Density Logs



•gamma rays interact with electrons clouds of atoms,  
•the gamma ray "flux" decreases with increasing numbers of electrons in the formation adjacent to the emitter

### CH 100:

electrons = protons (Z)

Atomic number (A) = protons+neutrons

if you assume  $Z/A = 0.5$ ,  
then you can then estimate **apparent formation density**

Reported in  $g/cm^3$  or  $kg/m^3$

## Logs used in Combination

•The "crossover" effect as a gas indicator

- CNL: Neutron Log
- FDC: Density Log

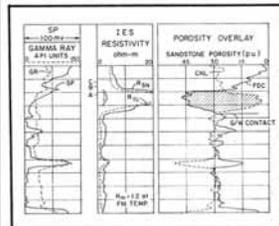


Fig. 3-4 — CNL-FDC overlay showing gas zone in cleaner part of sand. As shown by Gamma Ray the upper part of the interval is shaly. (From Ref. 1, courtesy of SPWLA.)

<http://www.gso.wvu.edu/~jono/PetroleumReview%203.html>

## Today's Agenda

### Isopach and TOF Maps (short lecture)

- What they are
- Examples of isopach and TOF maps
- How to make them

## Isopach Maps

**Isopach:** A contour line joining points of equal thickness in a rock layer.

- can be done on surface exposures or subsurface strata
- should reflect true thickness (not estimated; use real data)
- isopach maps follow all normal rules for maps in general

## Top of Formation Maps

TOF Maps: As the names implies, a map showing the depth from the surface to the formation top.

- these maps are usually corrected for surface topography
- consequently, they reflect **original depositional topography**

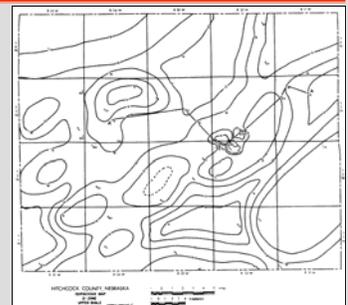
## Isopach Maps

Volcanic ash thickness



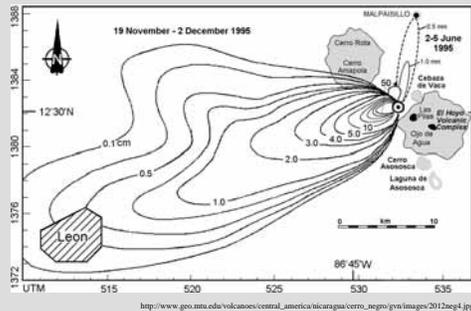
## Isopach Maps

Basic formation thickness



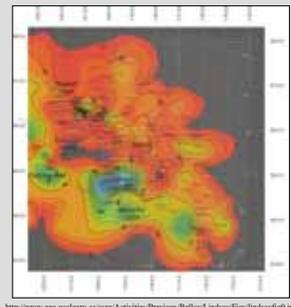
## Isopach maps

Air fall tephra thickness; Cerro Negro Volcano, Nicaragua (Nov 1995)



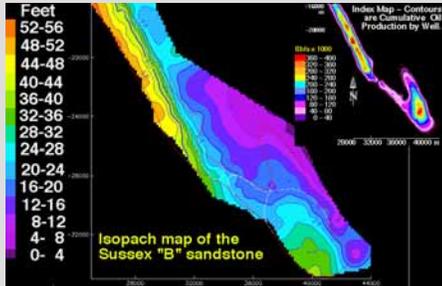
## Isopach maps

Isopach maps give information pertaining to formation thickness



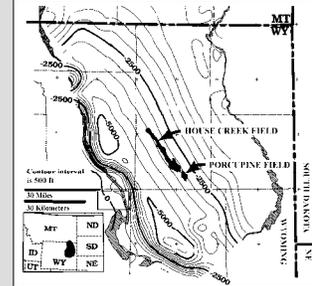
## Isopach maps

Petroleum geology of the Sussex "B" Sandstone



## Top of Formation Maps

Index and structure contour map of the Powder River Basin, Wyoming and Montana. Location of the House Creek oil field is shown. Contours are structure on the top of the Sussex Sandstone Member and approximate age equivalents. Datum is mean sea level. Shaded fill outlining the basin are outcrops of Lance Formation and Fox Hills Sandstone.



## How to Make Isopach and TOF Maps

Chalk Board

## Upcoming Stuff

**Thursday Lab:**  
SP and Gamma Ray Correlations Due at 2:00 PM  
Part 3 (final) of lab assignment issued

**Next Monday Lecture**  
tests returned  
Fence Post diagrams