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QUICK-LOOK PETROPHYSICAL DIPMETER

PART 1

WHY DECOMPACT

In tectonically complex areas, sedimentary units may have moved a long distance over or along other strata; this is especially true in compressive and transcurrent tectonic regimes. As a result the present day lateral juxtaposition of facies may be very different from the original one, bringing in some cases shale intervals next to coeval sandstone intervals. Moreover, a change from sand to shale can also occur as a simple lateral facies change; the large distance between wells in sparsely drilled areas may thus show dramatic facies changes between wells.

The idea of making a simple decompaction correction is that soon after deposition muds are compacting very rapidly because of the gradual expulsion of the trapped water. On the other hand, any neighboring sand will barely compact because of their grain supported nature. The simple formula used here can be modified at will (more details on compaction can be found in De Waals, 1986, Giles, 1997 and Fisher et al. 1999. The aim of decompacting is to make sure that we do not to falsely interpret high dips when the comparison is made between sands that will have undergone only some decompaction and shales that will have decompacted a lot (Fig.5).

There is no essential need to correct for the compaction in cases where lateral facies changes are not dramatic; however, a correction is needed if we expect lateral changes from sandstones to shales (e.g., in turbidites, anastomosed river setting or in some tectonically complex areas).

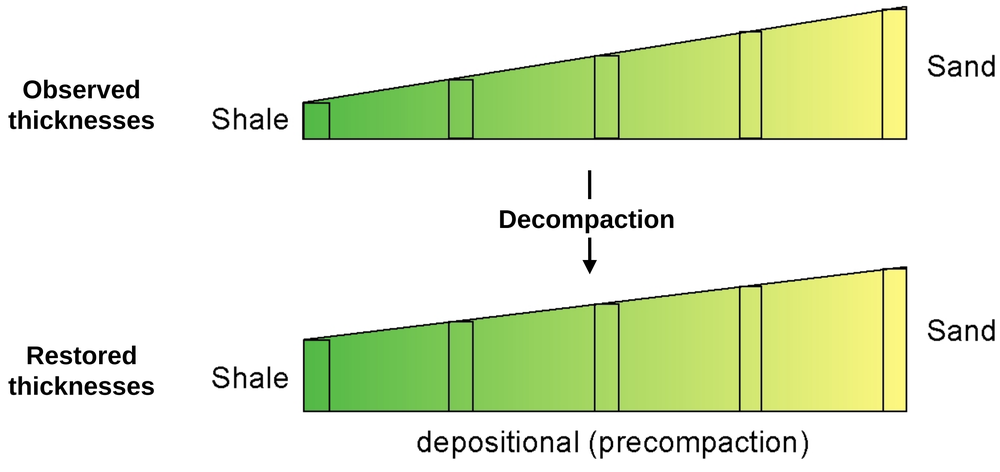

Fig.5 Example of lateral facies and thickness change

METHOD

Decompacted thicknesses have been estimated using the net-to-gross value as a correction factor. It is based on a simple formula that take into account a decompaction factor for a pure sand, a decompaction factor for a pure shale, and the net-to-gross value of the interval considered (Fig.6).

The formula used has been devised such that the correction factor will fluctuate with the value of Net-to-Gross. Different sets of extreme values for the correction might be chosen to reflect variations from one basin to another or from one formation to another.

The use of a gradual fluctuating factor based on the net-to-gross allows a comparison between sands, shales and interbedded sand-shale sequences in one single exercise.

GENERAL FORMULA

$$T_{dec} = [(D_{sd} \times NTG) + D_{sh} (1-NTG)] T_t$$

FORMULA FOR SANTA BARBARA

$$T_{dec} = [1.1\ NTG + 2\ (1 - NTG)]\ T_t$$

T_{dec}	=	Decompacted thickness
T_t	=	Total Thickness
D_{sd}	=	Decompaction factor for a sand
D_{sh}	=	Decompaction factor for a shale
NTG	=	Net-to-Gross

Fig.6

EXAMPLE

Comparing decompacted thicknesses is vital to validate a stratigraphic correlation; thus after decompaction a shaly unit should not be thicker (or very little thicker) than the neighboring coeval sandy unit if no fault is present between these wells. Anomalies of decompacted thicknesses should be systematically reviewed before making isochore or isopach maps.

The association of a crossplot of thickness ratios versus geographic position (Fig. 7) and of a map (Fig. 8) allows one to understand some of the observed thickness anomalies. The abnormally low values (blue circles in a green trend) correspond to missing sections due to faulting.

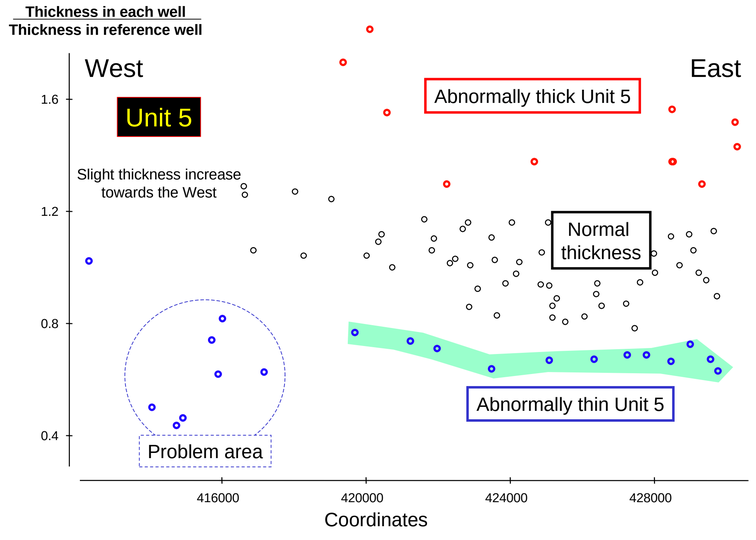

Fig.7

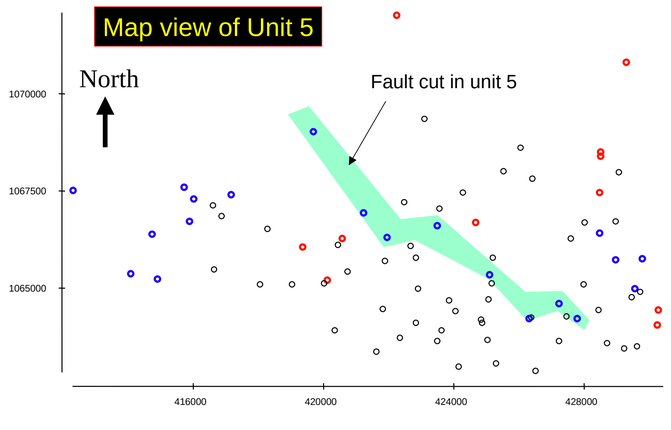

Fig.8

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