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The research method of the fault activity and the suitable conditions for analysis

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Abstract: Fault activity research methods mainly include fault growth index method, the ancient gap analysis, fault activity rate method and analysis method of fault slip. Various research methods, each have their own conditions of use and the advantages and disadvantages, the fault growth index method to the influence of the deposition rate and denudation rate, fault ancient divide method without considering the factors of time, the fault activity rate method is not starting from the displacement of fault really, ancient slip fault analysis method is relatively reasonable. In the actual application according to the characteristics of fault development in the study area (Angle change, strike-slip, etc.), basin subsidence range (sedimentation rate, etc.), formation and development characteristics (whether by erosion, etc.) to select suitable research methods, also can be used in combination with a variety of methods for analysis and comparison are studied.

Keywords: The fault activity; the fault growth index; the fault activity rate; Fault the gap; the ancient fault slip.

The fault growth index method

The meaning of fault growth index

Fault growth index is defined as a fault on both sides of the same stratigraphic unit drop plate thickness/increase plate thickness, he argues, on the growth index figure to compare different times the size of the fault growth index, can understand the fault activity in different times, as shown in figure 1.

Fault growth index figure can generally:

- The fault activity time to start, or the growth of plate thickness of strata appear most old age;
- The fault activity is the most intense period, namely the downdropped block formation biggest growth;
- At the end of its fault activity, namely downdropped block formation growth in new era.

The size of the fault growth index reflect the strength of the fault activity and growth index is equal to 1, the fault activity; Greater than 1, fault activity, the greater the growth index, fault activity.

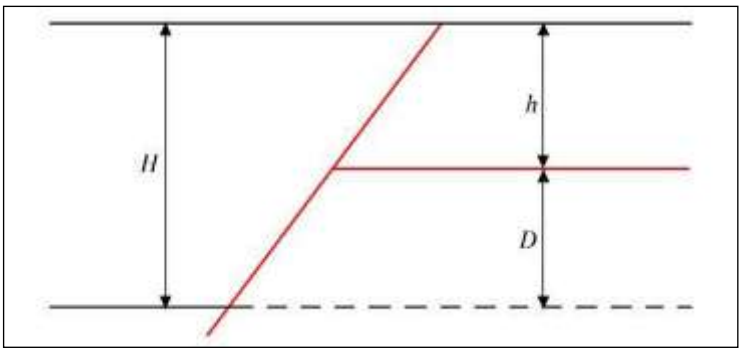

Fig-1: Fault growth index map

The limitations of fault growth index method to use

On both sides of the fault formation thickness difference on both sides of the fault and the average amplitude of basin deposition rate differences, different location in different periods of basin subsidence rate, deposition rate is different, so their growth index and the size of the can not truly reflect the strength of the fault activity

Application growth index reflects the need to have

a premise of fault activity intensity and assumptions, and specific to satisfy the following: (1) assume that during the period of fault activities, deposition, compensation completely in time, sag in different parts of the deposition rate is consistent, otherwise the deposit thickness is not representative in the settlement of fracture. But, in fact, depositional compensation principle is not in any region, any horizon, it affected by sedimentation velocity, provenance of denudation rate and the influence of many factors such as transportation distance.(2) the fault footwall no larger hiatus, did not suffer erosion.(3) the growth index used correctly or not, the precise detail, a considerable extent, depends on the reliability of the stratigraphic correlation and the footwall strata condition. So according to the upper and lower plate can be accurate comparison of stratigraphic unit to calculate the growth index of stratigraphic unit.(4) growth index has not sunk backlog will be real factors into consideration. Therefore, only when the depression in different parts of the deposition rate is consistent, can be used to grow the relative strength index contrast between fault activity; Only each time deposit rate unchanged, to determine the growth index change the intensity of the fault in time evolution. Deposition rate, however, also varies, making on the longitudinal growth index cannot reflect the intensity of fault activity in different eras, on the transverse cannot compare at the same time in different parts of the same fault or different fault activity.

Fault drop method

The meaning of fault ancient divide

Fault throw is also called the vertical fault slip, refer to section on perpendicular to fault strike, fault vertical distance between the two plate quite point (Ha, Hb). It is the calculation method of fault throw can be measured in the geological section and seismic section, also can calculate according to the structure diagram. Fault ancient gap is defined as a certain geological history period of vertical fault slip is defined as a growth fault ancient head, two sets with the same geological period of sedimentary strata thickness difference said the ancient head growth fault during this period. It is the calculation method of the fault on the plate thickness (Dd) minus the lower plate thickness (Du), as shown in figure 2.

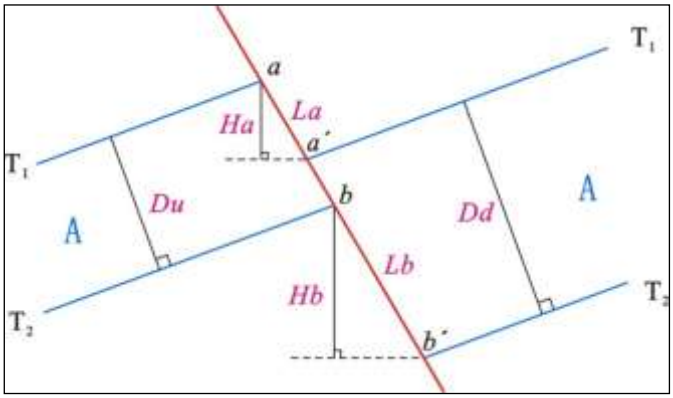

Fig-2: Fault ancient divide schematic diagram

The limitations of fault ancient drop method to use

Because the method USES the vertical component of fault activity as approximate fault throw, so is seriously affected by the fault dip Angle changes, changes in fracture occurrence obvious areas of application is limited by a certain effect. Did not reflect the concept of geologic time, the only reflect a certain geological period of both sides of the fault of lifting the overall difference[1,2], because the time unit such as the division of each geological period are not divided, and fault throw not well reflect the strength of the fault on the timeline.

The fault activity rate method

Fault activity rate refers to a stratigraphic unit in the period of time, due to the fault activities form the gap and the corresponding sedimentary time ratio, namely the activity rate (V) = ancient gap (D)/deposition time (T). Rose plate deposit controlled by basin sedimentation, only decreases plate of sedimentary basin subsidence factor and fault activity rate control together[3,4], therefore, can use both sides of the fault time stratigraphic unit said the thickness difference of fault activity rate.

The ancient slip fault analysis

Ancient meaning slip faults

Ancient slip concept is defined as a certain geological history period of fault slip always defined as ancient slip, namely fault formation in a certain geological history period the difference between the bottom and top interface slip[5,6], Lb - La in the figure. Concept of fault slip rate refers to a stratigraphic unit in a certain period of time, because of the total slip faulting to form and the corresponding sedimentary time ratio, namely the fault slip rate (vL) is equal to the ancient slip (Lb - La) divided by the deposition time (T), as shown in figure 2.

The advantages of the ancient slip fault analysis

Geological meaning more clearly. Slip displacement (true) concept itself is a fault is the expression of fault activity, and the growth index method, the activity rate method and gap analysis is survived by analyzing the formation of sedimentary formation to reverse inference layer active. Slip method, therefore, more direct, geological meaning more clearly[7].

More accurate expression of fault activity. For normal fault in the absence of the strike slip, so that with dip slip (ab) to approximate total slip become a reality. Gap analysis with fault straight slip fault activity study, its accuracy by the change of the fault dip Angle, divide = total slip * sin (β).

Simple data read, small workload. The calculation of normal fault tend to slip need to the level of fault slip and vertical slip as the foundation, for the 3 d seismic coverage area, the level of fault slip and vertical slip is very easy to get.

CONCLUSION

- The research method of the fault activity is mainly fault growth index method, the ancient gap analysis, fault activity rate method and analysis method of fault slip.
- The research methods of fault activity, has its own conditions of use and the advantages and disadvantages, the fault growth index method to the influence of the deposition rate and denudation rate, fault ancient divide method without considering the factors of time, the fault activity rate method is not starting from the displacement of fault really, ancient slip fault analysis method is relatively reasonable.
- Method are chosen according to the fault development characteristics of study area, the basin subsidence, formation development feature selection for research methods in the study area.

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