

FEATURES OF THE CENOZOIC DEFORMATION PHASES ON CO TO – THANH LAN ISLANDS (QUANG NINH PROVINCE, TONKIN GULF, VIETNAM)

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Received July 6, 2016

The analytical results of over sixty striations on the *fault surface*, the movement of quartz veins and marked stratigraphy which selected *at 18 different survey sites on Co To - Thanh Lan islands* (Tonkin Gulf, Northern Vietnam) have indicated that the tectonic activity of this area has 04 mainly compressive phases of E-W, NE-SW, NW-SE, N-S direction and 02 extensive phases of NE-SW and NW-SE direction. Based on the generation (before and after) among overlap striations of the same *fault surfaces at survey sites of CT-02, CT-03, CT-05 and TL-04*, the tectonic phases with mainly compressive directions are determined: (1) E-W, (2) NE-SW, (3) NW-SE and (4) N-S. These obtained results match with some previous regional studies, but revealed new detail structural features of structural-tectonics pattern on the islands in Tonkin Gulf (Bacbo Gulf). Moreover, in the study area and adjacent area, we have also identified the certain relationship between tectonic faults and the anomalies of methane, helium, high hydrocarbons and carbon dioxide at survey sites along fault zones, continuously further confirms the existence of the faulting. Obtained results allow discussing large scale structural features defined by the Red River Fault Zone and adjacent geo-blocks development. The rotation movements of the blocks, including islands in the Tonkin Gulf (Northern Vietnam) proposed to discuss in the future surveys and considering during the analyses of the field results. Gasgeochemical anomalies prove permeability and activity of some faults in the study area.

Key words: Cenozoic, deformation phases, compression, extension phases, tectonics, gas-geochemistry, Tonkin gulf, Vietnam.