ISSN 1819-7140, Russian Journal of Pacific Geology, 2021, Vol. 15, No. 6, pp. 555–569. © Pleiades Publishing, Ltd., 2021.
Russian Text © The Author(s), 2021, published in Tikhookeanskaya Geologiya, 2021, Vol. 40, No. 6, pp. 68–84.

A Study on the Possibility of the Reactivation of the Fault System in the Western Part of the South China Sea as a Source of Geological Hazards

Tran Tuan Dung[a, b, *], R. G. Kulinich[c, **], Nguyen Quang Minh[a, d, *], Nguyen Van Sang[e, ****], Tran Tuan Duong [a], Nguyen Trung Thanh[a], Nguyen Ba Dai[a], Tran Trong Lap[a], Nguyen Kim Dung[a], Dang Xuan Tung[f, *****], Dao Dinh Cham[g, ******], and Nguyen Thai Son[g]**

[a] *Institute of Marine Geology and Geophysics, Vietnam Academy of Science and Technology, Hanoi, Vietnam*
[b] *Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam*
[c] *V.I. Il'ichev Pacific Oceanological Institute, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, 690041 Russia*
[d] *Department of Earth Sciences, National Central University, Taipei, Taiwan*
[e] *Hanoi University of Mining and Geology, Hanoi, Vietnam*
[f] *Institute of Geological Sciences, Vietnam Academy of Science and Technology, Hanoi, Vietnam*
[g] *Institute of Geography, Vietnam Academy of Science and Technology, Hanoi, Vietnam*
**e-mail: trantuandung@yahoo.com*
***e-mail: rkulinich@mail.ru*
****e-mail: quangminh.nguyen2114@gmail.com*
*****e-mail: nguyenvansangtd40@gmail.com*
******e-mail: dangxuantung0893@gmail.com*
*******e-mail: chamvdl@gmail.com*

Received April 24, 2021; revised June 10, 2021; accepted July 21, 2021

Abstract—This article summarizes the results of research on the possible reactivation of the fault system in the Earth's crust of the South China Sea with likely dangerous consequences for the coastal area of Vietnam. The research was carried out over several years with the publication of interim results. The solution to this problem required the determination of the regional stress field in the Earth's crust. Analysis of the focal mechanisms of local earthquakes, as well as the structural characteristics of faults obtained by gravity and seismic data was used. The possibility of renewal of fault activity was determined by the inversed-stress method in the calculated regional stress field. The parameters of the present-day stress field were used to estimate the required slip force along the pre-existing faults. The possibility of horizontal and vertical structural (block) displacements in the Earth's crust of the study area was calculated to assess the probability of reactivation of the entire system of faults. Based on a comprehensive analysis of the data, a forecast of the probability of reactivation of the fault system in the South China Sea has been made. This could be the cause of earthquakes, underwater landslides, and other dangerous natural processes in the coastal area of Vietnam.

Keywords: the South China Sea, fault system, earthquake's focal mechanisms, regional stress field, gravity and seismic data, forecast of reactivation possibility of faults

DOI: 10.1134/S1819714021060099

INTRODUCTION

One of the sources of dangerous natural processes on the seafloor (earthquakes, landslides, etc.) is the reactivation of tectonic faults in the Earth's crust. The resumption of tectonic activity is possible under the influence of the regional field of geodynamic stresses and favorable structural characteristics of the faults (location, strike azimuth, dip angle, penetration depth, etc.). In this regard, it becomes important to comprehensively study the faults system in regions with active geodynamics, which include the South China Sea (SCS) [7, 10, 14, 15, 18, 36, 37, 39–44].

The purpose of this work was to study the possibility of such tectonic reactivation. Research has been carried out for several years. Detailed descriptions of the data, methods of their processing and interpretation, as well as intermediate results, were presented in [53–57]. This article presents the results of a generalized analysis of previous work with the necessary references.