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Numerical simulation of rifting mechanism in the eastern and Western basins of the South China Sea

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The South China Sea is an important marginal sea in the western Pacific between the Eurasian Plate, the India-Australia plate and the Pacific Plate, and is a typical basin formed in a passive continent. The tectonic of the northern continental margin of the South China Sea has always been controversial between volcanic and non-volcanic continental margins. The new OBS data analysis of the western part of the continental margin in the northern South China Sea showed that there was no significant high velocity layer of lower crust in the crustal structural model, Further confirmation of the structural attributes of the non volcanic continental margin in the western section. And the northeast and the west of the South China Sea are quite different. The data showed that there existed a high velocity layer of the lower crust with a certain thickness. Underplating of magma on the lithosphere from tension to rupture played a controlling role. In this study, two sections of the central basin and the southwestern sub-basin were selected to establish two types of plate expansion models. In the eastern South China Sea, there was thermal material surging during the extension, causing the magmatism to extension and subsequently rupture, forming the sea basin. There is little or no magmatic activity during the lithospheric extension in the western South China Sea. These two different modes of cracking are the main controlling factors for the structural differences between eastern and Western of the South China Sea. Based on the numerical simulation of the basin extensional fracture in the eastern South China Sea, we can get the stratigraphic structure, lithospheric temperature field, viscosity coefficient, magmatic melting and lithospheric body strain after fracturing. The initial condition of the model is the high temperature magma invaded between the crust and mantle. In the strata, the lithosphere strength was reduced due to the high temperature and the lithosphere is thinned under the tensile stress. When the tension factor reaches 2.2, the vacuum melting occurs. The lithospheric deformation is mainly ductile deformation which due to magmatic intrusion, and led to the decrease of the viscosity of the lithosphere. There is no magma intrusion in the basin stretching model in the western South China Sea, and it is a normal lithosphere thermal structure.The simulation results show that the main brittle deformation in the initial stage of tensile deformation, the development of a large number of brittle fault, and the crustal brittle fracture was reduced. However, in the mantle part, the deformation was ductility [U+FF0C] as well as the deformation mode in lithosphere was stratified deformation. As the deformation increases, when the tension factor reached 2.5, the rocks began to melt and the mechanical properties were destroyed, resulting in the rupture of the lithosphere and ocean floor spreading. Therefore, it can be concluded that in the west South China Sea the fractures were Magmatic poor rift, while the magmatic activities in the east affect the cracking process and should be a quasi volcanic continental margin.