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The Identification of Magnetic Stripes: Corrected Age of Seafloor Spreading in the South China Sea Basin

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The complex tectonic setting of the South China Sea Basin underlies the importance of investigating the spreading history of its seafloor. Current studies rely mainly on the interpretation of seafloor magnetic stripes; however some divergences persist regarding the formation and tectonic evolution of the South China Sea. The aim of this study was to determine the age of seafloor spreading within the three sub-basins (central, northwestern and southwestern) forming the South China Sea. The research was based on magnetic anomaly data of seafloor basaltic rocks. We used an inverse modeling method taking into consideration the various factors.

We reviewed previous geophysical data which lead us to revise the age of seafloor spreading in the South China Sea Basin adding new considerations, such as: the short-wavelength noise, the long-wavelength background, the topography, the thickness of seafloor sediments and the mixed areas between two inversely magnetized blocks. Our magnetic anomaly model was adapted to include features such as the magnetization and thickness of the source layer, different spreading rates, asymmetric spreading and axial jumps using the Modmag program implementing the CK95 geomagnetic reversal time scale. Approximate spreading parameters were applied to different profiles within the same basin to make sure they were appropriate.

Based on the age of seafloor spreading in the central and southwestern sub-basins determined by our model and the spatial distribution of the magnetic stripes, we proposed a two-step spreading history of the South China Sea Basin. The spreading age for the entire basin ranges from 31.4 Ma to 16 Ma with spreading rates of 30–80 km/Ma. The central sub-basin has a similar range of extension ages to that of the entire basin. The early spreading episode of the central sub-basin lasted from 31.4 Ma to 25.2 Ma, whereas the later stage began at 25.2 Ma during or after the spreading ridge centered at Lat.17°N jumped to 15°N with an abrupt drop in spreading rates. Spreading of the northwestern sub-basin seafloor which is considered the western extension of the northern central sub-basin seafloor, occurred early in the first stage (31.4 to 28 Ma), whereas the southwestern sub-basin which experienced a similar tectonic process to that of the middle part of central sub-basin, underwent late-stage seafloor extension from 24.2 to 16 Ma. Spreading of the South China Sea basin abruptly ceased around 16 Ma probably related to the tectonic collision of the eastern part of the basin with a continental fragment. After seafloor spreading stopped, a large amount of magma intruded the failed ridge and built the Huangyan seamount chain.

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References:

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