Subduction processes on the Mariana trench and northern Manila trench: implications for the intra-oceanic and ocean-continent convergent margins

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Different tectonic backgrounds often produce different subduction mechanisms. The Mariana subduction zone is a typical erosive margin, and the mode of material transportation is mainly controlled by subduction erosion, while the subduction process in the northern Manila subduction zone is dominated by subduction accretion. However, there are little comparative investigation about the subduction mechanisms between the Mariana subduction zone and northern Manila subduction zone. In this study, the high-resolution bathymetric data obtained by using the multi-source data fusion method and collected multichannel seismic profiles are used to research the subduction mechanisms and to develop the subduction modes for the Mariana subduction zone and northern Manila subduction zone. We propose that the Mariana subduction zone formed at the intra-oceanic convergent margins with rare continental sediments tends to occur subduction erosion. A rough seafloor morphology (e.g. seamounts, horst and graben topography) of the subducting Pacific Plate, with a convergence rate of 8.4 cm/yr, and the steep slope of the inner trench, promote subduction erosion at the Mariana margin. The northern Manila subduction zone is the result of the convergence of ocean-continent plates. The continental sediments of the overlying plate usually undergo subduction accretion during the subducting process, forming an accretionary wedge along the northern Manila margin. With the continuously subducting of the continental crust, a series of folds and thrust faults are formed inside the accretionary wedge. Both the Mariana subduction zone and northern Manila subduction zone are distinctive types of the convergent margins in the world. The comparison of subduction mechanisms has important reference significance for the study of the subduction process, evolution and inter-plate interaction of global intra-oceanic and ocean-continent convergent margins.