日本海下の深発地震と太平洋スラブ中のmetastable olivine wedge
Metastable olivine wedge in the Pacific slab and deep earthquakes beneath the NE Asia margin

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Seismic tomography and numerical simulations show that the western Pacific slab bends horizontally when it reaches the boundary between the upper mantle and lower mantle beneath northeast Asia. It is considered that a metastable olivine wedge (MOW) exists in the cold core of the slab because of a delayed phase transition from olivine to its high-pressure polymorphs. However, it is still debated whether the MOW actually exists or not, and even if it exists, its physical properties, such as seismic velocity and density, are still unclear. In this work we have used high-quality arrival-time data of 17 deep earthquakes occurring within the Pacific slab under the Japan Sea and NE Asia margin to study the detailed structure of the slab. The deep earthquakes are relocated precisely by applying a modified double-difference location method to arrival-time data recorded at both Chinese and Japanese stations. The hypocentral locations are accurate to 2 km. Travel-time double-residuals are used to estimate seismic velocity within the slab. Our results show that MOW does exist within the Pacific slab under NE Asia and the Japan Sea, and the MOW has a P-wave velocity 7~9% lower than the iasp91 Earth model. We relocated all the 17 deep events using the final slab model containing the MOW, and the results show that all the deep events are located within the MOW, rather than along the MOW boundary as suggested by the previous studies. The MOW in the slab can reduce the speed of slab subduction, and it plays an important role in the generation of deep earthquakes.

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