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Effects of multi-seamount subduction on accretionary wedge deformation: insights from analogue modelling

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Seamounts are very common features on subducted oceanic crust. Although the geophysical data such as seismic profiles succeed in imaging the subducted seamounts, the evolution processes of seamount subduction are difficult to be understood. Modelling methods (e.g. analogue or numerical modelling) have been used in exploring the effects of seafloor highs subduction on accretionary wedge deformation because of their advantages in the analysis of the spatio-temporal evolution processes as well as the variation of the potential parameters. The deformation patterns caused by single seamount or aseismic ridge have been observed in many analogue modellings or numerical modellings, however, the effects of multi-seamount sequential subduction on accretionary wedge deformation have rarely been investigated in detail, especially in the cross-sectional views. In this study, a series of analogue modelling experiments of sequential subduction of two seamounts (variation in shapes, intervals, rheological properties of strata between seamounts) were carried out to improve the understanding of the deformation mechanisms of accretionary wedge with multiple seamounts subduction. Our analogue modelling results demonstrate that the seamount subduction will significantly block the seaward propagation of accretionary wedge and facilitate a lateral thrust. Two structural quiet zones will form in the leading and trailing edges of subducted seamount. As the seamount go deep into the wedge, the structural quiet zone in the leading edge will be remolded by the newly basement originated thrust faults and form a duplex structure which help the deep subducted sediments transport back onto the shallow. Comparatively, the structural quiet zone in the trailing edge of subducted seamount is hardly to be deformed because of the stress block effects of seamount, and the lateral thrust may play a major role in deforming the strata between the subducting seamounts.