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Structural controls on the development of submarine channel/fan systems since the Pleistocene in the accretionary wedge off SW Taiwan

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The accretionary wedge off SW Taiwan is the result of incipient arc-continent collision between the Luzon volcanic arc and the northern rifted margin of the South China Sea (SCS). Dynamic interactions of thrusting, folding and a rigorous sediment supply from the Taiwan mountain belts have resulted in two arrays of canyons/channels and slope-fan systems in the accretionary wedge. The Penghu canyon/fan system lies in the lower wedge and near the northern rifted margin of the SCS. The Penghu canyon is a river-fed canyon and receives sediments from southern Taiwan and SE China during eustatic lowstands. It becomes detached from river inputs during eustatic highstands as it is in the present-day. The Gaoping canyon/fan system in the south traverses both the upper slope and lower slope domains of the accretionary wedge. This system is a river-fed system during a full eustatic cycle and it drains sediments from the onshore Gaoping River. We interpreted multiple grids of multichannel seismic reflection data of MCS994, MCS1000-6, MCS1014, MCS1046 collected onboard Ocean Research I during 2012 April to 2013 August to map out thrust/fold structures and channel/fan systems in the study area. Seismic facies analyses were performed on seismic sections and key stratal surfaces of base of Pliocene and base of Pleistocene are correlated from boreholes drilled in the shelf of the northern SCS margin. Our results show that the upper Gaoping Canyon has been confined by structural ridges with limited switching of canyon courses, whereas the lower Gaoping canyon/fan system has been developed on lower slope with channel/levee deposition in multiple slope fans since early Pleistocene. Pleistocene lateral aggrading channel-and-levee systems are especially evident near the modern canyon course in the lower slope. The Penghu can/fan system in the lower accretionary wedge is also evident by seismic facies showing channel cut-and-fill, channel abandonment and channel-and-levee systems. This system seems to migrate westward in response to in-sequence thrusting and westward migration of thrust front. The Penghu and Gaoping systems are separated features in the present-day. Seismic analyses show that these two canyon/channel system jointly to feed a slope fan, termed paleo-Gaoping fan in the lower accretionary wedge, in early to middle Pleistocene. Major part of this slope fan lies in an area of low relief, which we name as Penghu Embayment. This slope fan has been abandoned since Pleistocene because of tectonic uplift of the Penghu Embayment and switching of the Penghu canyon to the west and along the thrust front.