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Structure and evolution of the Aure foreland basin under the control of multi-segmented basement, Papua New Guinea

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The island of New Guinea, one of the most tectonically complex regions in the world, is evolving within the obliquely and rapidly converging Australian and Pacific plate boundary zone. The arcuate Aure fold-thrust belt and Aure foreland basin (AFB), formed during the Miocene-Recent, extend 480 km along the southwestern coast and offshore areas of the Papuan peninsula. Based on surface geologic information, seismic and industrial well data, we carried out a structural study of the AFB. The AFB is divided into three sections from west to east, the west sub-basin (WSB), the middle sub-basin (MSB) and the east sub-basin (ESB), according to the basin structure and the geometric feature of the fold-thrust belt. The age of the strata involved in the fold-thrust belt and onlapping on the southern slope belt, shows that the WSB formed in the early Miocene, while the ESB probably formed later in the late Miocene or early Pliocene. At the beginning, the sedimentary strata developed only in the WSB, and then gradually expanded to the east. The Aure fold thrust belt is NW trending in the west, and gradually changes to nearly EW treading in the east. Furthermore, the width of the Aure fold thrust belt is large on the west side (ca. 118km) and decreases to the east side (ca. 45km). We consider that the structural difference of the AFB from the west to the east was significantly controlled by an oblique-subducted multi-segmented basement. The subducted plate, as the basement of the AFB, is not a uniform craton, and is composed of three different blocks, which have different degrees of flexure during the subduction. The flexure of the basement is largest in the WSB and gradually decreases to the east, which lead to the decrease of sedimentary thickness from the west to the east. The segmented basement of the WSB and the MSB are separated by one major strike-slip fault that is imaged by seismic data, which may have been reactivated to accommodate the varying degrees of basement flexure during the subduction. The structural boundary between the basement of the MSB and ESB is not clear yet.