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Evolution of the Aure-Moresby Foreland FTB (Papua New Guinea): Constraints from balanced crustal scale cross-section and forward modeling.

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The New Guinea Orogen evolved by the accretion of volcanic arcs onto the northern Australian margin during the Cenozoic arc-continent collision. Since that time, the northern Australian margin has undergone oblique convergence with Pacific plate involving volcanic arcs and intra-oceanic basin in between. The resulting FTBs are the Papuan FTB, the Mobile Belt and the Aure-Moresby FTB belonging to the curved shape New Guinea Highlands.

Previous regional structural studies were focus to the Central Papuan FTB. Concerning the Aure-Moresby FTB, few studies based mainly on field work describe a highly deformed Neogene underfilled foreland basin with mixed carbonate-siliciclastic deposits. One regional cross-section through the onshore Aure-Moresby FTB is proposed by Kugler during his PhD in 1967. In this regard, some lack of consistency about the regional structural style can be highlighted such as the different timing and amount of shortening between the Papuan and Aure-Moresby FTBs and the large N-S positive flower structure to explain the uplift of the Aure FTB.

The main goals of this study on the Aure-Moresby Foreland FTB are: (i) to discuss the impact of the mechanical stratigraphy on structural style, (ii) to estimate the significance of basement involvement and its morphology, (iii) to determine the shortening by comparing the regional balanced and restored cross sections, (iv) to estimate the relative ages of tectonic deformation and to propose a 2D kinematic model illustrating the evolution of the orogenic system since the Late Cretaceous.

For this purpose, 2D seismic profiles, chronostratigraphic synthesis, remote sensing mapping, wells and gravimetric data have been integrated in order to construct a consistent structural evolutionary model of the Aure FTB. This study is mainly focused on the interpretation of NE-SW trending 2D seismic lines in Move software to build a balanced cross-section from the hinterland to the foreland Aure foredeep.

This study shows that the Aure-Moresby FTB structure is the result of thin-skinned deformation along Late Cretaceous, Miocene and Pliocene detachment levels affected by recent thick-skinned deformation. The section is characterized by multiple fault-propagation folds detached at various level within the Mesozoic and Cenozoic. In the central Aure FTB, two main structural steps show

major uplifts that correspond to the wide Dude Anticlinorium and the Kapau Margin interpreted as crustal scale thrusting rooted at the brittle/ductile transition and connected with the Cretaceous décollement level. Crustal scale deformation seems to be transmitted into Mesozoic and Cenozoic decollements and disharmonic levels forming the frontal folded zone. In the frontal Aure FTB, Miocene carbonate may be involved in the deformation forming potentially Pleistocene structural traps. Based on flexural slip restoration technique, 28 km of shortening have been calculated within the sedimentary cover along 250 km that correspond to a ratio of 11,2 %.