Deposition of Paleocene(?)-Eocene West Foreland Formation, Northwest Margin Cook Inlet Basin: Record of Coeval Faulting and Explosive Volcanism

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The West Foreland Formation along the northwest margin of Cook Inlet forearc basin, south-central Alaska, preserves the record of coeval faulting and explosive volcanism. West Foreland strata are exposed in the hangingwall of the Capps Glacier fault, a northeast-trending dextral oblique-slip fault (north side up) that bounded the west side of the basin during Paleogene time. Three units are recognized. The lower unit is exposed along a narrow strip in the hanging wall immediately east of Capps Glacier fault, rests unconformably on Mesozoic volcanogenic rocks, and consists of clast-supported cobble-boulder conglomerates and minor interbedded medium- to coarse-grained lenticular sandstones. Conglomerates have crudely developed horizontal bedding and disorganized clast fabrics. Altered Mesozoic volcanic clasts dominate and arc granitoids are common. This unit is gradationally overlain by thick interbedded clast-supported boulder-pebble-cobble conglomerates, poorly sorted coarse- to very-coarse-grained sandstones with discontinuous pumice granule stringers, and thick pumiceous pebble conglomerates (lapillistones?) comprising the middle unit. Clast fabrics in conglomerates are disorganized, and conglomerates and sandstones are internally massive or display crude horizontal stratification. Pumiceous conglomerates are massive to horizontally stratified, include black lithic grains, and pumice clasts have euhedral biotite crystals. The upper unit gradationally overlies the middle unit, includes the same facies associations with the addition of poorly to moderately sorted, well-stratified medium- to very coarse-grained sandstones with locally developed cross-bedding, and locally prominent tuffaceous mudstones with trees in growth position. Stratified sandstones include features indicative of traction transport in sheet and channelized flows. Pumice-clast conglomerates in the middle and upper units are interpreted as reworked pyroclastic deposits proximal to an eruptive center; it is unclear if reworking was syn-eruptive or post-eruptive. Zircons from pumice clasts have yielded U-Pb dates between 44-41 Ma and are in general agreement with available pollen-based age control.

Together, the three units form an upward- and basinward-fining succession at least 1,000 m thick comprised of proximal wet alluvial fan deposits (lower unit) characterized by hyperconcentrated flood flows, medial wet alluvial fan deposits (middle unit) characterized by gravelly and sandy hyperconcentrated flood flow deposits, and distal wet alluvial fan-proximal alluvial plain deposits (upper unit) that originated from hyperconcentrated flood flows, sheetflows, channelized flows, and overbank flows that inundated floodplains. Eastward diverging stratal surfaces in the lower and middle units suggest growth strata. These features are consistent with syndepositional faulting and coeval volcanism. The absence of abundant volcanic detritus in lower Miocene fine-grained strata near the trace of Capps Glacier fault suggests motion on the structure and explosive volcanism had decreased by that time.