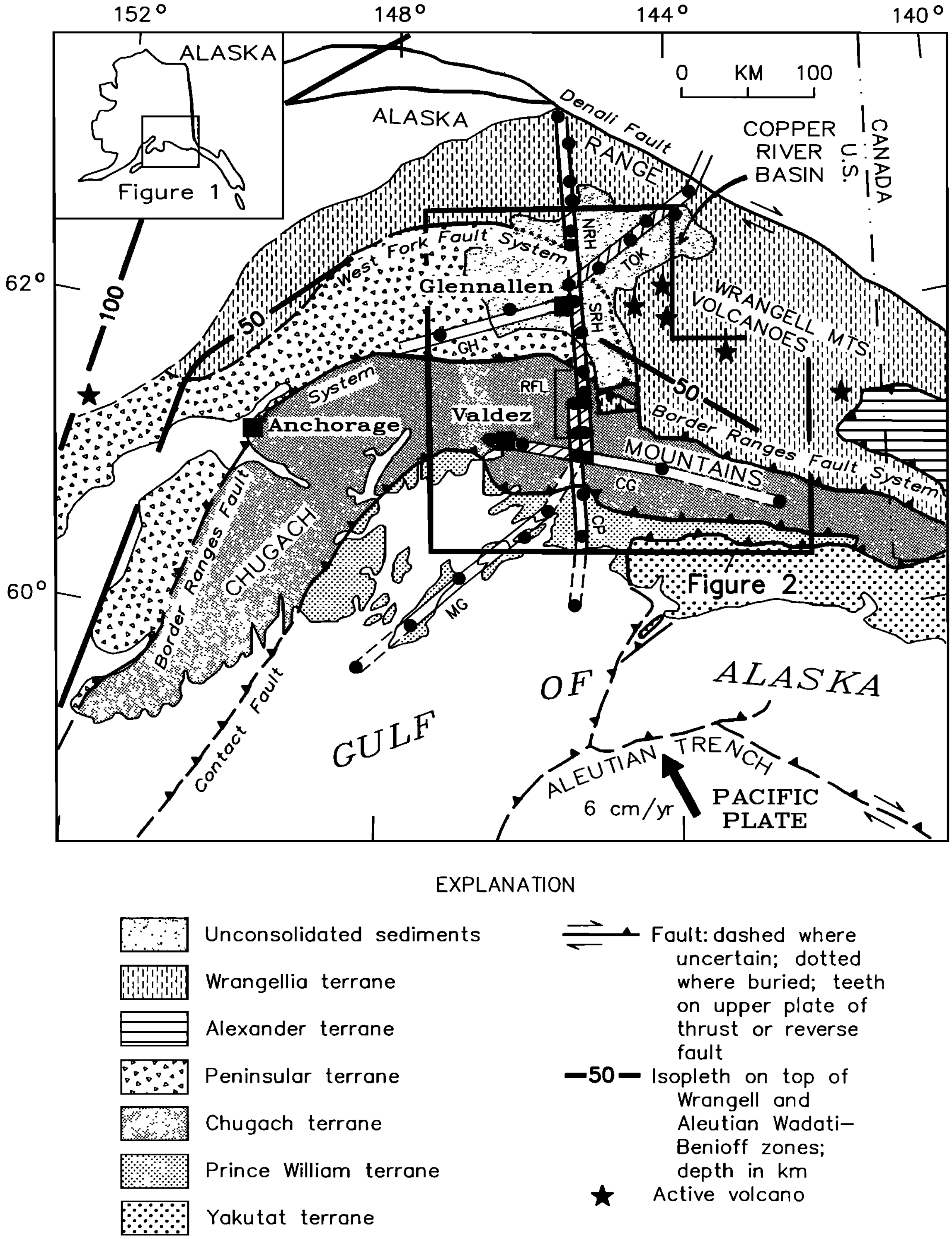

Fig. 1. Map of south-central Alaska showing tectonostratigraphic terranes [*Jones et al.*, 1984], suture zones, volcanoes, depth contours on tops of Aleutian and Wrangell Wadati-Benioff zones [*Stephens et al.*, 1984; *Page et al.*, 1989], and TACT seismic refraction lines (double lines). Refraction lines are labeled CG, Chugach; CP, Cordova Peak; GH, Glenn Highway; MG, Montague; NRH, North Richardson Highway; SRH, South Richardson Highway; and TOK, Tok Highway. Lines CP, SRH, and NRH are referred to collectively in this report as the Transect line. Large dots are shot points. Offset shots are linked by double-dashed lines. The diagonally lined segments of refraction lines are panels in the fence diagram of Figure 20. TACT reflection data shown in this report (RFL) are indicated by a bracket.

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Crustal Structure of Accreted Terranes in Southern Alaska, Chugach Mountains and Copper River Basin, From Seismic Refraction Results

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Seismic refraction data were collected along a 320-km-long "Transect" line in southern Alaska, crossing the Prince William, Chugach, Peninsular, and Wrangellia terranes, and along several shorter lines within individual terranes. Velocity structure in the upper crust (less than 9-km depth) differs among the four terranes. In contrast, layers in the middle crust (9- to 25-km depth) in some cases extend across projected terrane boundaries. The following observations can be made: (1) An intermediate-velocity layer (6.4 km/s) at 9-km depth extends across the deep projection of the suture between the Chugach and Peninsular terranes, suggesting that the northern Chugach and southern Peninsular terranes are detached and rest on a deeper terrane of unknown origin. (2) The top of a gently north dipping sequence of low- and high-velocity layers (5.7–7.8 km/s), more than 10 km thick, extends from near the surface in the southern Chugach terrane to more than 20-km depth beneath the southern Peninsular terrane. This sequence, truncated by the suture between the Prince William and Chugach terranes, is interpreted to be an underplated "terrane" made up of fragments of the Kula plate and its sedimentary overburden that were accreted during subduction in the late Mesozoic and/or early Tertiary, during or between times of accretion of the Prince William and Chugach terranes. (3) A thick crustal "root", with a laminated sequence at its top, extends from a depth of 19 km to as much as 57 km beneath the northern Peninsular and Wrangellia terranes. This root extends across the deep projection of the suture between the Peninsular and Wrangellia terranes, although resolution of this apparent crosscutting relationship is relatively poor. This root may represent tectonically or, possibly, magmatically emplaced rocks. The lower crust beneath the Prince William, Chugach, and southern Peninsular terranes includes a north dipping, 3- to 8-km-thick section of subducting oceanic crust.

INTRODUCTION

Southern Alaska, like much of western North America, is believed to be a composite of crustal fragments, or terranes, of various rock compositions, ages, and origins [*Jones et al.*, 1977, 1982, 1984; *Coney et al.*, 1980; *Csejtey et al.*, 1982; *Nokleberg et al.*, 1985; *Plafker*, 1987; *Plafker et al.*, 1989]. Although the terrane concept has proved useful in elucidating the tectonic history of western North America, there are many unanswered questions concerning the process of accretion that require knowledge of the subsurface. These include the following: (1) How deep do terranes extend? (2) Are terranes accreted by underplating as well as by overthrusting and strike-slip faulting? (3) Do different types of crust (oceanic, island arc, continental, accretionary prism) accrete in characteristic ways? (4) What percentage of accreted rock is constituted by the several different types of crust listed above? (5) What happens to terranes after accretion? (6) What is the role of the Moho in terrane accretion? Alaska is an important place in which to attempt to answer these questions because terrane accretion is occurring at present [*Bruns*, 1985; *Plafker*, 1987], and numerous, diverse terranes which were accreted in the late Mesozoic and Cenozoic have boundaries that have not been obscured by intrusion or metamorphism. We address a number of these questions in this paper and in the sequel to this paper [*Fuis and Plafker*, this issue].

Until recently, the deep structure of accreted terranes has been poorly known. A goal of the Trans-Alaska Crustal Transect (TACT) program is to elucidate the process of terrane accretion in Alaska by coordinated geological and geophysical studies. A major component of the TACT program is the collection and analysis of seismic refraction/wide-angle reflection profiles. In 1984 and 1985, we collected a number of such profiles to examine in three dimensions many of the terranes of southern Alaska (Figure 1 and Table 1). In this paper we report the analyses of four 130-km-long profiles that examine the crustal structure of the Prince William, Chugach, Peninsular, and Wrangellia terranes. Three of these profiles compose a north-south transect across these terranes from near the Pacific coast to the Alaska Range; these lines are referred to collectively as the

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