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Title: COLLISION AND ACCRETION OF FAR-TRAVELED ISLAND ARCS AT THE KAMCHATKA SUBDUCTION ZONE, RUSSIAN FAR EAST

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Abstract: The Kamchatka-Koryak region provides a detailed record of the plate tectonic evolution of the north Pacific basin. It holds the key for understanding the origin of the Kormandorsky-Aleutian arc, and the major geologic features beneath the Bering Sea, such as the Bowers and Shirshov ridges and the Beringian continental margin. Work over the last two decades has established that this region is underlain by at least two exotic island arcs, which were formed at low latitudes in the Pacific during the Late Cretaceous and early Tertiary, and then transported northward until they collided with the Kamchatka margin. At that time, the Russia Far East was bordered on its Pacific side by an active Andean-style subduction zone that extended eastward into Alaska along the Beringian continental margin. Widespread arc magmatism occurred at 105 to 80 Ma in the Okhotsk-Chukotka volcanic belt and started again at 45 Ma in the Western Kamchatka volcanic belt. The 1000 km-long Ukelayat basin formed outboard and parallel to this continental arc. Extensive detrital zircon fission-track grain ages from Ukelayat sandstones indicate continuous arc magmatism and forearc-basin deposition from 90 to

45 Ma. This evidence indicates that there was steady subduction along the Kamchatka margin prior to collision of the exotic island arcs.

The Olyutorsky island arc was the first to collide, starting at about 55 to 45 Ma. The crustal part of this exotic arc was obducted over the Ukelayat forearc for a distance of at least 50 km. The suture is the Vatyna-Vyvenka-Lesnovsk thrust, which extends along the full length of the Kamchatka Peninsula and continues eastward beneath the Bering Sea, just north of the Shirshov Ridge. The Shirshov and Bowers ridges appear to be an eastward continuation of the Olyutorsky arc, which would mean a total length of 3000 km for the arc. The collision zone is only modestly exhumed in northern Kamchatka (<5 to 10 km). Deeper exhumation (~25 km) in southern Kamchatka shows that Ukelayat basin was metamorphosed to medium- and high-grade gneisses during the collision. Continued underplating beneath the collision zone drove uplift and exhumation.

At the same time, a new south-facing subduction zone was formed outboard of the colliding Olyutorsky arc. This subduction zone is marked by the Vetlov complex, which contains imbricated trench-fill sediments, with depositional ages ranging from 45 to 20 Ma. The Cape Kamchatka island arc collided next, starting at ~15 Ma. The point of collision migrated northward with time, leaving behind pieces of the arc, which are now exposed on the prominent capes along the east coast of Kamchatka. The collision continues today at Cape Kamchatka, where the extinct western part of the Kormandorsky-Aleutian island arc is being thrust lengthwise over the Kamchatka forearc. The modern Kamchatka subduction zone was established progressively in the wake of this migrating arc-arc collision.