

## Cenozoic Placer Deposits and Fluvial Channel Systems on the Arctic Shelf of Siberia

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### Abstract

The eastern Arctic shelf is a typical passive continental margin and is characterized by complex, branched, fluvial channel networks of various ages. At least four main generations of buried valleys can be distinguished: Eocene, Oligocene, early Miocene, and Pliocene. Younger Quaternary buried valleys typically occur in both inshore and offshore zones covered by thick middle to late Pleistocene ice-loess sediments. These drainage networks reflect gradual restructuring and subsidence of the Mesozoic platform, as well as repeated sea-level changes. The accumulation of ice-loess sediments on the shelf and coastal plains during the late Pleistocene epoch was also a significant factor in the restructuring and burial of the fluvial channels.

Paleochannels contain gold- and tin-bearing placer deposits. Four types of placer regions are distinguished on a mineralogical basis: (1) regions with gold- and rare earth element-bearing placers (area of subsidence of the Kharaulakh and Kular fold structures); (2) regions with tin-bearing placers derived mainly from cassiterite-silicate primary sources (Chokurdakh-Lyakhovskaya and similar transform zones); (3) regions with gold- and tin-bearing placers (main part of the coastal area east of the Kolyma River mouth); (4) regions with rare metal-(e.g., Ta, Nb, Sc, Be), gold-, and tin-bearing placers (in the area of median massifs). Placer potential generally increases with decreasing age of the channels; the Pliocene and early Pleistocene channels are the most productive. Fluvial placer formation, however, decreased drastically in the early Pleistocene when connections between sources and valleys were broken. Some of the eastern Arctic shelf placers are large or superlarge deposits and these contain more than half the placer gold and tin resources of the area. Small geochemical anomalies associated with sea-floor sediments are potentially important indicators of buried fluvial placers.

Tin placers of the east Arctic shelf area are Arctic analogs of the Tin Islands shelf placers of southeast Asia. There are also distinctive parallels between the Chukotka coastal plain gold placer and equivalent beach placers at Nome, Alaska. In contrast, gold placers of the western sector of the eastern Arctic shelf (Kular gold region) formed without marine influence. Technology and economics determine the spatial limits within which the search for placers is possible. In general, placer prospecting is limited to areas of moderate subsidence with less than 30 m of sedimentary cover. The width of this zone varies from 10 km near the Chukotka coast up to 100 km at the coastal and inshore plains of Yakutia. The zone can also extend up to some hundreds of kilometers seaward within the boundaries of the large transform structural and metallogenic zones such as at Chokurdakh-Lyakhovskaya.