

Figure 1: Regional map of Alaska. Tertiary Basins of western Alaska and the Bering Shelf are shown in tan. Modified from Plafker and Berg (1994) and Worrall (1991).

Introduction: The Hope Basin is a 700-km long predominantly early Tertiary extensional basin located on the Chukchi shelf off the northwestern coast Alaska and northeastern Russia. It is bound to the northeast by the Herald Arch, a basement uplift cored by northeast-vergent thrust faults of Cretaceous age. The origin of the basin has been attributed to transtensional deformation associated with the left-lateral Kobuk fault (Tolson, 1987). We carried out a new seismic interpretation of the structures of the Hope Basin on the basis of 2473 km of multi-channel seismic lines shot in 1977-80 by the USGS and reprocessed recently Agena et al. (2001), plus 1994 km of proprietary WesternGeco data acquired between 1980 and 1984. Our aim is to better understand the structural evolution of the basin and to test the hypothesis of transtensional origin by 1) identifying structures show evidence for transcurrent motions, and 2) by tracking the migration of depocenter through time.

Problems with the Transtensional model: The Kobuk Fault has only been mapped in detail south of the eastern Brook Range where it may have 80 km of right lateral displacement (Ave-Lallemant et al., 1998). Gravity data shows that the Hope Basin is about 700 km long; it is longer than the Kobuk fault itself. The Hope Basin would be the largest transtensional basin in the world. Worldwide there the depth of transtensional basins is proportional to their length (Hempton and Dunne, 1984). The Hope Basin does not fit this pattern.

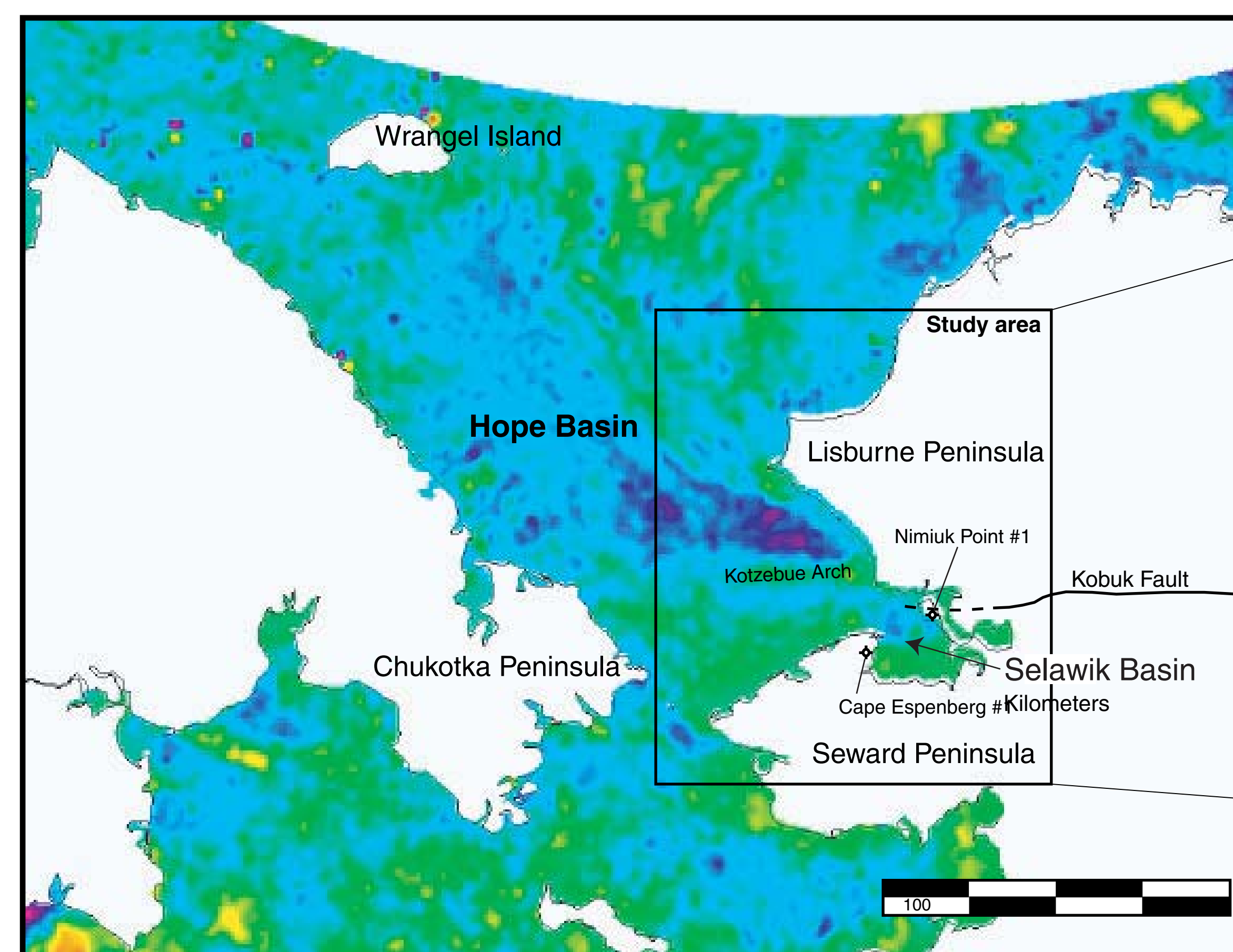


Figure 2. Seasat gravity map of the Hope Basin. The Hope Basin corresponds to the gravity low that extends from south of Wrangel Island to Alaska. Seismic data is available only in (or near) United States waters. Gravity data from Klemperer et al. (2002).

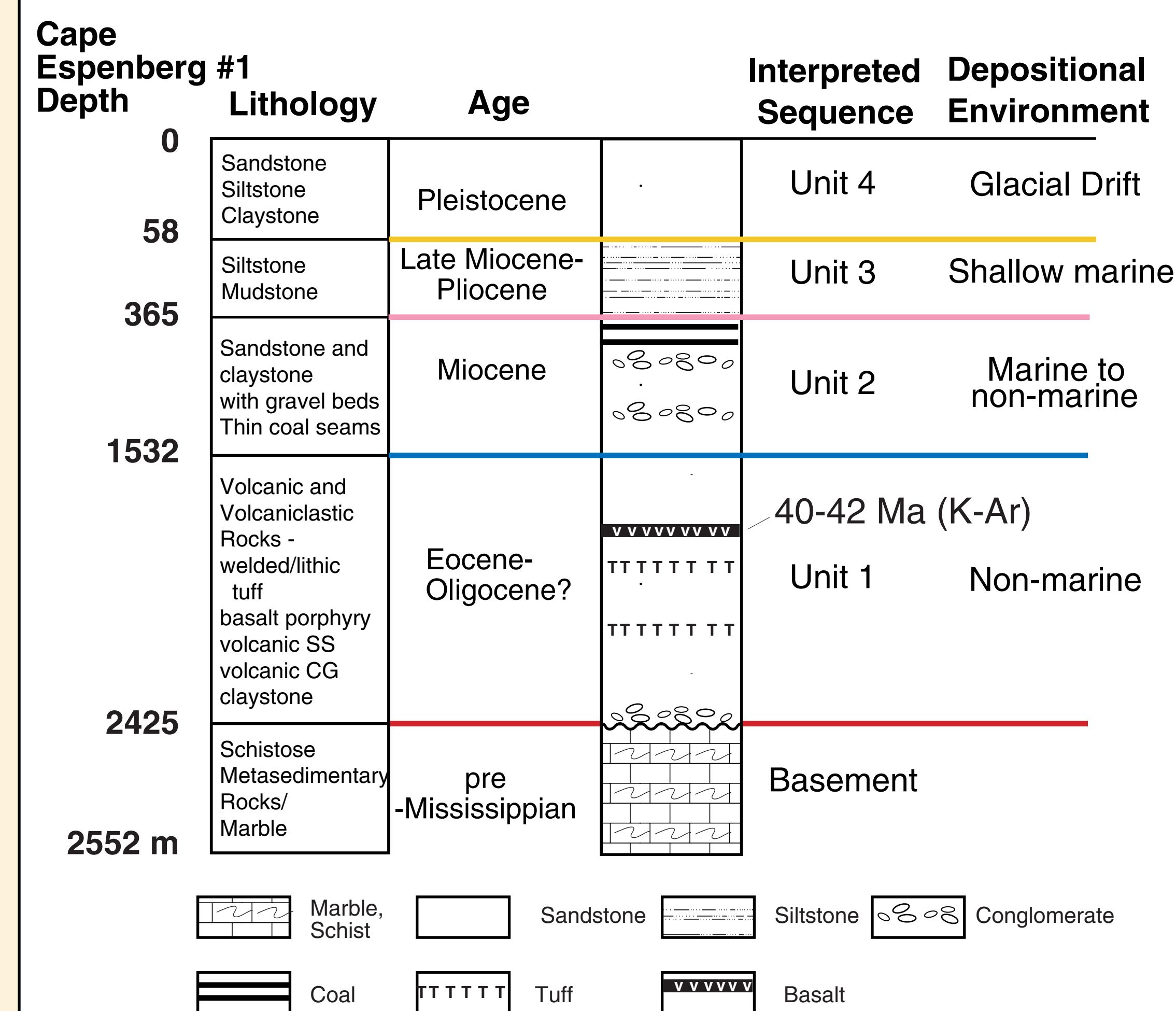


Figure 3: Generalized stratigraphic column of units within the Hope Basin as evaluated from the Nimiuk Point #1 and Cape Espenberg #1 wells (Tolson, 1987 and Decker et al., 1988).

Basin Stratigraphy: The stratigraphy of the Hope Basin is inferred to be similar to that found in two SOCAL wells located on-shore in the Selawik basin to the east. The seismic data does not tie directly to the wells, but the major sequence boundaries are recognizable and can be correlated across the basin. The upper Unit 1 includes 40-42 Ma basalts. The age of the base of Unit 1, which is at a depth of 2472 m in the Cape Espenberg well, is not well constrained. In the deepest part of the basin of the basin Unit 1 is as deep as 5 km and may range into the Paleocene, or even latest Cretaceous. Late Cretaceous continental deposits have been described in northern Chukotka.

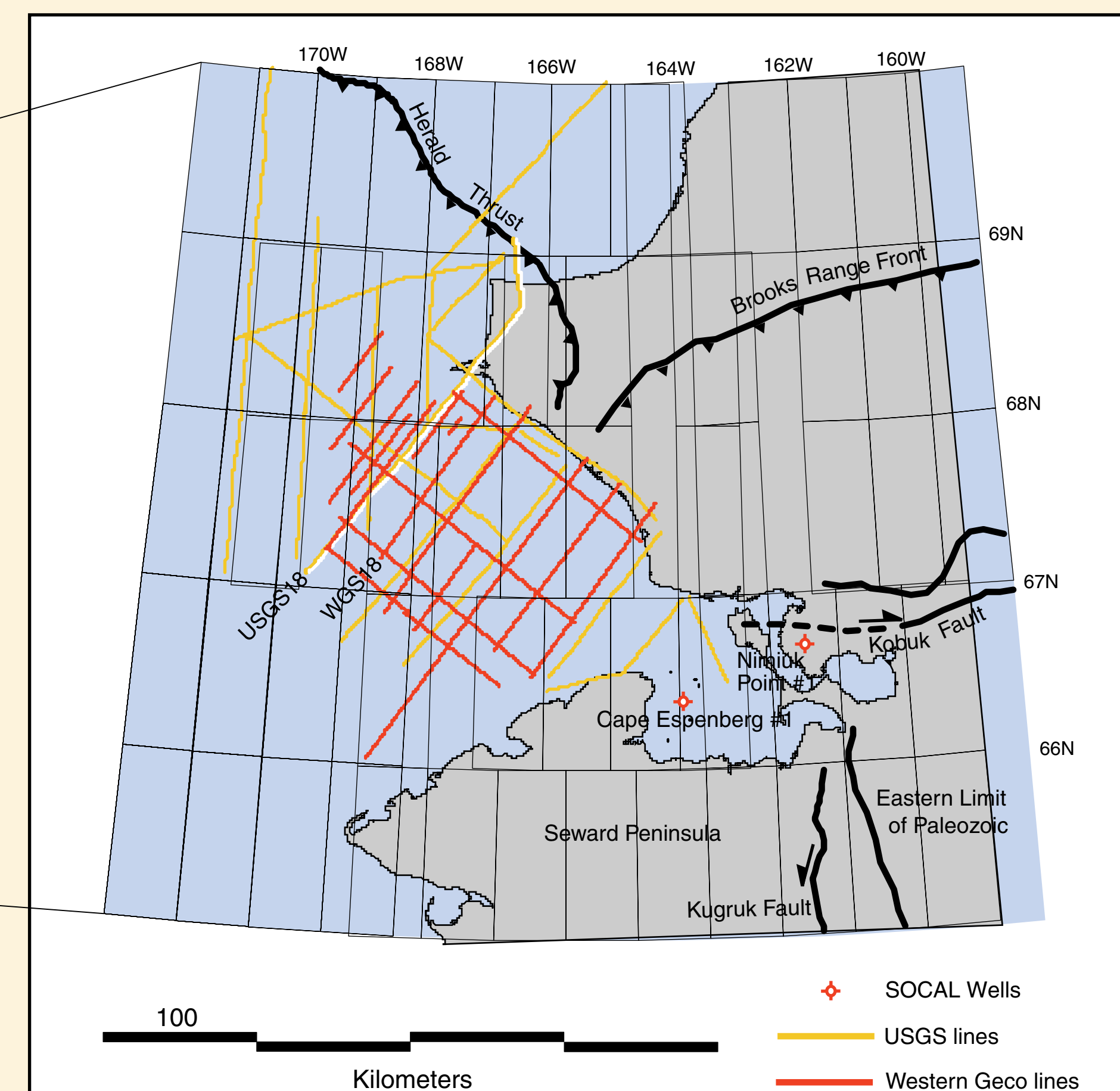


Figure 4: Seismic basemap with major structural features. Line USGS -18, highlighted in white is shown on Figure 5.