26: The Last Glaciation of Eurasia

A. A. Velitchko,
L. L. Isayeva, D. B. Oreshkin,
and M. A. Faustova

SCANDINAVIAN ICE SHEET

The southwestern margin of the Scandinavian Ice Sheet was on the Jutland Peninsula where the preglacial Jutland ridge appears to have been an obstacle to ice movement. The marginal zone crosses the peninsula in a submeridional direction and is incomplete. It consists of individual terminal moraines and associated outwash plain and glacial tunnel valleys. Most researchers refer to it as the maximum stage of the Last Glaciation. The marginal zone formed approximately 16 kya. This date was derived from varve analysis (Hansen, 1965). The glacier is believed to have had the maximum extent during deglacial times.

Eastward, on the northern European lowland, marginal ice forms have the shape of a ridge oriented southward between the Elba and the Oder rivers. They are expressed by small terminal moraines and glacial complexes of combined type occasionally including push moraines. To the east of the Oder River the limit of the maximum extension of glaciation is deferred by a straighter line and is defined weakly morphologically. The age of maximum ice advance was dated 20 ky by radiocarbon dating the Lausitz marginal valley sediments (Cepek, 1972). Sometimes marginal deposits of a younger stage of glaciation approach quite closely the limit of glacier maximum development and overlap it. On the Russian Plain marginal formations associated with maximum advance of ice occur along the margins of the Grodno Highlands whence they extend northeastward. They are represented by terminal moraines on the northern slopes of the Grodno and Lida Highlands. The age of ice advance maximum was dated here to be 18–25 ky by radiocarbon dating of plant debris of siltstones that are overlain by till in the Niemen River valley near the village of Gozha.

Eastward, near the slopes of Oshmyany and Minsk highlands on the right bank of the Viliya River, the boundary of maximum ice advance is marked by individual terminal moraines and by well-developed angular interlobate hummocks. On the
northern slopes of the Smolensk highland ice stagnation landforms are sporadically developed. The age of the maximum ice boundary is 18-24 ky, bracketed by radiocarbon dates of lacustrine–alluvial deposits that underly the moraine in the Zapadnaya Dvina River Basin known as the usvyatcha suite (Arslanov et al., 1971). Further east an active glacial tongue existed in the upper reaches of the Volga River. It left well-defined ice-marginal formations in the Mologo–Sheksna and Kubenskoye lowlands.

In the Vaga River Basin marginal landforms are of a more intermittent nature. The age of maximum ice advance was dated here on submoraine lacustrine sediments with peat interbeds in the depression of Lake Kubenskoye (Putchka River) as \( \approx 21 \) ky while to the east, in the Vaga River Valley, it is \( \approx 24 \) ky. Ice-marginal landforms are generally less pronounced eastward. The northern boundary of the Scandinavian Ice Sheet is not as well defined. Possible marginal glacial forms have been observed on the continental shelf. Diamictons have been reported from these localities. These are considered to be in the zone of ancient glaciation by most researchers. However, the chronology of marginal zones and moraines remains problematic; therefore, the ages of marginal moraines on the seafloor are estimated according to morphostratigraphy and correlation with dated marginal zones on the coast.

The Norwegian shelf contains a system of ridges that are most clearly defined along the northwestern shores of Scandinavia. Based on analysis of glacial features and a series of radiocarbon dates on marine and lacustrine sediments on islands and along the coast, Andersen and other researchers associated this system with the maximum advance of ice cover (Andersen, 1981). A series of ridges indicating ice extent on the shelf are traced along the northern and northeastern coast of the Kola Peninsula on the shelf of the Barents Sea. The aforementioned marginal forms are believed to belong to the former Scandinavian Ice Sheet combined with the local Lofoten and Ponoj ice domes.

**NOVAYA ZEMLYA ICE SHEET**

A system of marginal forms corresponding to the Novaya Zemlya Ice Sheet joins that of the Scandinavian Ice Sheet to the east. On land these marginal forms are distinctly different in morphology from those of the Scandinavian Ice Sheet. The marginal ridges of the ice maximum occur in the basins of the Mezen, Kuloj, Pechora, and Kolva rivers and in the Varsh depression, stretching from the upper reaches of the Mezen in the Timan area to the basin of the upper Pechora and Usa rivers and the foothills of the Polar Urals. These ridges are push moraines and glacial thrust masses. Drumlín-like hills and fluted moraines occur southward of the outer marginal formations though they were not observed in Europe at this time. They were deposited by active outlet glacier tongues penetrating further than the main line of the ice front. According to existing radiocarbon dates (Lavrov and Arslanov, 1977; Arslanov, Lavrov, and Nikiforova, 1981) outer marginal landforms and the associated tills are underlain by deposits of older age than those of the Scandinavian ice cover.

Evidence of glacial activity such as moraines and erratics present on the Jamal Peninsula are present only in its southwestern part. These moraines can be compared with those of the Polar–Ural Ice Sheet. Eastward in the lower reaches of the Ob River a moraine ridge of the Salekhard Urals defines probably the southern limit of the Polar-Ural ice cover that converged with the Novaya Zemlya ice cover. Radiocarbon dates obtained from submoraine deposits are contradictory. According to initial dates, the ages of submoraine alluvial–lacustrine deposits range from 25–