Evidence of long ice-free conditions during MIS 3 in northern Finland

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Northern Finland has been repeatedly in the centre of the Fennoscandian Ice Sheet during Late Pleistocene. Till stratigraphy is composed of several till beds having stratified sand and fines inter-till layers and sometimes organic material; peat and gyttja. However, many of them were dated in 1970s and 1980s using radiocarbon method, which gave unreliable ages 45 ka or more i.e. indicating the limit of the dating method to be reached (e.g. Hirvas 1991).

From the beginning of this century, many of the earlier sratigraphical key sections were re-examined and dated by Optical Stimulated Luminescence (OSL). Many of the inter-till layers have been dated back to Eemian or Early Weichselian (e.g. Mäkinen, 2005, Auri et al. 2008; Lunkka et al. 2015), but there were also indications of the Middle Weichselian ages and ice-free conditions during MIS3 (Salonen et al. 2014, Sarala et al. 2010, Johansson et al. 2011). Particularly, several new observations of the inter-till stratified sections with OSL dates supported the idea (e.g. Sarala & Eskola 2011; Sarala et al. 2016). The best section and the key site locates in Kaarreoja, northern Finnish Lapland, where the most well-preserved and representative sedimentary deposit including organic peat and wood pieces were studied and dated (Sarala et al. 2016). It is confirmed that during MIS3, in the middle of the most recent ice age, some 30,000–50,000 years ago, birch and coniferous forests grew in Lapland, Finland.

Nowadays, there are more than 100 reported OSL ages from northern Finland. The determined ages of Weichselian age form three groups: old 115-70 ka (MIS 5), middle 53-67 ka and young 21-46 ka (MIS 3). New dating results prove that the extent of glaciers and the length of glaciations were mostly short through Weichselian in Finland. During Early Weichselian, there were three short stadials, which occurred only in the northernmost Finland. Middle (MIS 4) and Late Weichselian (MIS 2) stadials lasted longer, and according to Sarala (2005) and Salonen et al. (2008) they were probably the only stages when glaciers covered central and southern Finland. Instead, during the MIS 3 northern Finland seems to be ice-free for a long time and the OSL ages (21-25 ka) from Veskoniemi, close to Inarinjärvi Lake, indicate rapid build-up of continental ice to LGM limits (MIS 2). These observations support the recently strengthened idea of a variable climate within ice ages and the relatively short duration of glaciation cycles, as well as the rapid growth and melting of ice sheets during ice ages.

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