Short communication

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Reconstruction of the coastline of the Barents sea (the Kola Peninsula) during the Late Glacial and Holocene

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ABSTRACT. Comprehensive studies (lithological and micropaleontological) of bottom sedi ments from nine lakes at the Teriberka Village (the Kola Peninsula, Northwestern Russia) were carried out. The sediments formed after an isolation from the sea was dated. Based on these new data, a preliminary sea-level curve for the study area was constructed. The sea-level curve indicates several phases evolution of the Kola coast during the Late Glacial and Holocene. Rapid drop (~40 mm per year) of a sea-level was occurred *ca.* 11,500 cal. years BP. The sea level gradually elevated between *ca.* 11,000 and 7,600 cal. years BP (the Tapes transgression). Science *ca.* 7,300 cal years BP, the sea level slowly decreases by 2–3 mm per year.

Keywords: lake sediments, diatoms, radiocarbon age, sea-level changes

1. Introduction

The northeast of the Fennoscandian Shield is a classic study area for relative sea level changes caused by glaciostatic adjustment of the earth's crust. In the last 20 years, a method proposed by Scandinavian scientists (Donner et al., 1977) has been used to determine the rate of change in the position of the sea coastline. This method is based on determining the spatial and temporal position of the transition zone from the sea to a freshwater lake in bottom sediments from lake basins. Earlier work was carried out on the Barents Sea coast of the Kola region in the areas of Dalnie Zelentsy (Snyder et al., 1997), Nikel (Corner et al., 1999) and Polyarny (Corner et al., 2001), in the Tuloma River (Tolstobrov et al., 2016). However, there are many areas for which data about sea level changes are not available. This work presents new data about changes of the sea coastline at the Teriberka village (Kola Peninsula, Russia). On the basis of new lithological, micropaleontological and chronological data, a preliminary curve of relative sea level change was constructed.

2. Materials and methods

The material for the work was the bottom sediments from 9 lake located at altitudes from 4 to 58 m on the Murmansk coast of the Kola Peninsula near the Teriberka Village. For each lake, lithological studies, diatom analysis and radiocarbon dating of bottom sediments were made. Sediments cores were taken from ice-covered lakes in April, 2013, 2016 and 2018, using a piston corer with 54-mm diameter. The sediments were described in the field inferred from their visually recognizable features (grain-size, lithology, colour and structure). Diatom analysis was based on standard methods. Taxa names are provided by the AlgaeBase data (Guiry and Guiry, 2020). Radiocarbon dating has been done at the laboratory of the St. Petersburg State University and at the laboratory of the Geological Institute of the Russian Academy of Sciences using the traditional scintillation method (Arslanov, 1987). Radiocarbon dates were calibrated to calendar years using the OxCal 4.4 calibration program (Bronk Ramsey, 2020).

3. Results and discussion

A transition from marine to freshwater sediments was found in the bottom sediments of studied lakes. The marine sediments are presented by gray massive silt with sand. Shells or shell fragments of marine mollusks have been found in marine sediments. According to diatom analysis, these sediments are characterised by marine species such as *Diploneis pseudoovalis*, *Ehrenbergiulva granulosa*, *Paralia sulcata*, *Plagiogramma staurophorum*, *Mastogloia smithii*. Marine sediments are overlain by freshwater sediments – gyttia in the upper part of the cores. According to diatom analysis, by *Pseudostaurosira subsalina*, *Stauroforma exiguiformis*, *Staurosira venter*, *Aulacoseira granulata*, *A. distans*, *Fragilaria construens*, *Cyclotella schumannii*, *C. rossii* were dominant in gyttia.

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In the lake №4 locating at 17 m above sea level (a.s.l.), silty gyttia of the Tapes transgression were found. Thus, the lake №4 was isolated from the sea at the beginning of the Holocene. However, it again connected with the sea during the Tapes transgression. In addition, the lower part of the Tapes sediments is presented by a chaotic mixture from sand, gyttia and plant remains. The formation of this sediments can be associated with tsunamis. It is detail considered in previously works (Tolstobrov et al., 2018; Nikolaeva et al., 2019).

Curve of relative sea level

On the basis of new lithological, micropaleontological and chronological data, a preliminary curve of relative sea level change was constructed (Fig.). However, the curve may be slightly corrected in the future.

Analysis of the sea-level (Fig.) shows that after the deglaciation of this area, the sea level was above 59 m relative to the current. During the Late Glacial and the beginning of the Holocene, there was a rapid regression of the coastline of the sea due to the uplift of the earth's surface. Rate of the regression was approximately 40 mm per year. About 11,500 cal years BP, the sea level fell below 17 m a.s.l. As a result of the Tapes transgression, which took place within the North Atlantic, the lake №4 connected with the sea. During the Tapes transgression, the rise of the sea coastline was more than 5 meters in the study area. At the maximum of the Tapes transgression, the sea coastline located slightly below the 21 m a.s.l. After 7300 cal years BP, a gradual regression of the coastline of the sea began at an average rate of about 2-3 mm/year.

4. Conclusions

Environments of the formation of bottom sediments were established as a result of the study of lake basins. Based on new data, a preliminary sea-level curve for the Teriberka area on the Barents Sea coast was constructed. It shows that sea level fell rapidly at a rate of about 40 mm per year during the Late Glacial and early Holocene. About 11,500 cal years BP, the sea level fell below 17 m and then rose by more than 5 meters during the Tapes transgression (10,000–7,600 cal years BP). After 7300 cal years BP, a gradual regression of the sea coastline occurred at an average rate of about 2–3 mm per year.

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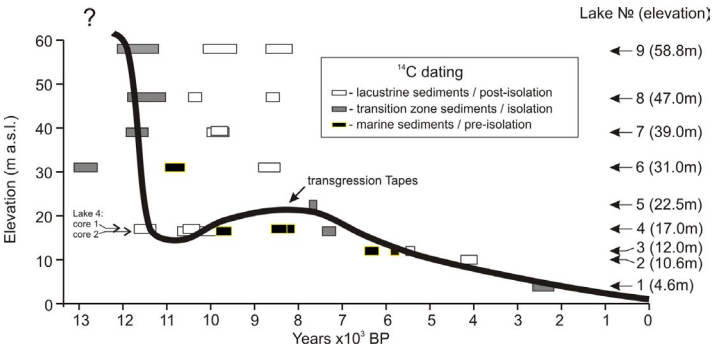

Fig. Preliminary sea-level curve for the Teriberka area based on dated isolation contacts in investigated lake basins. The curve refers to calibrated years.

Conflict of interest

The authors declare no conflict of interest.

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