Holocene environmental changes inferred from pollen record of Nordenskiöld Land alluvium sequences (West Spitsbergen Island):new data and review

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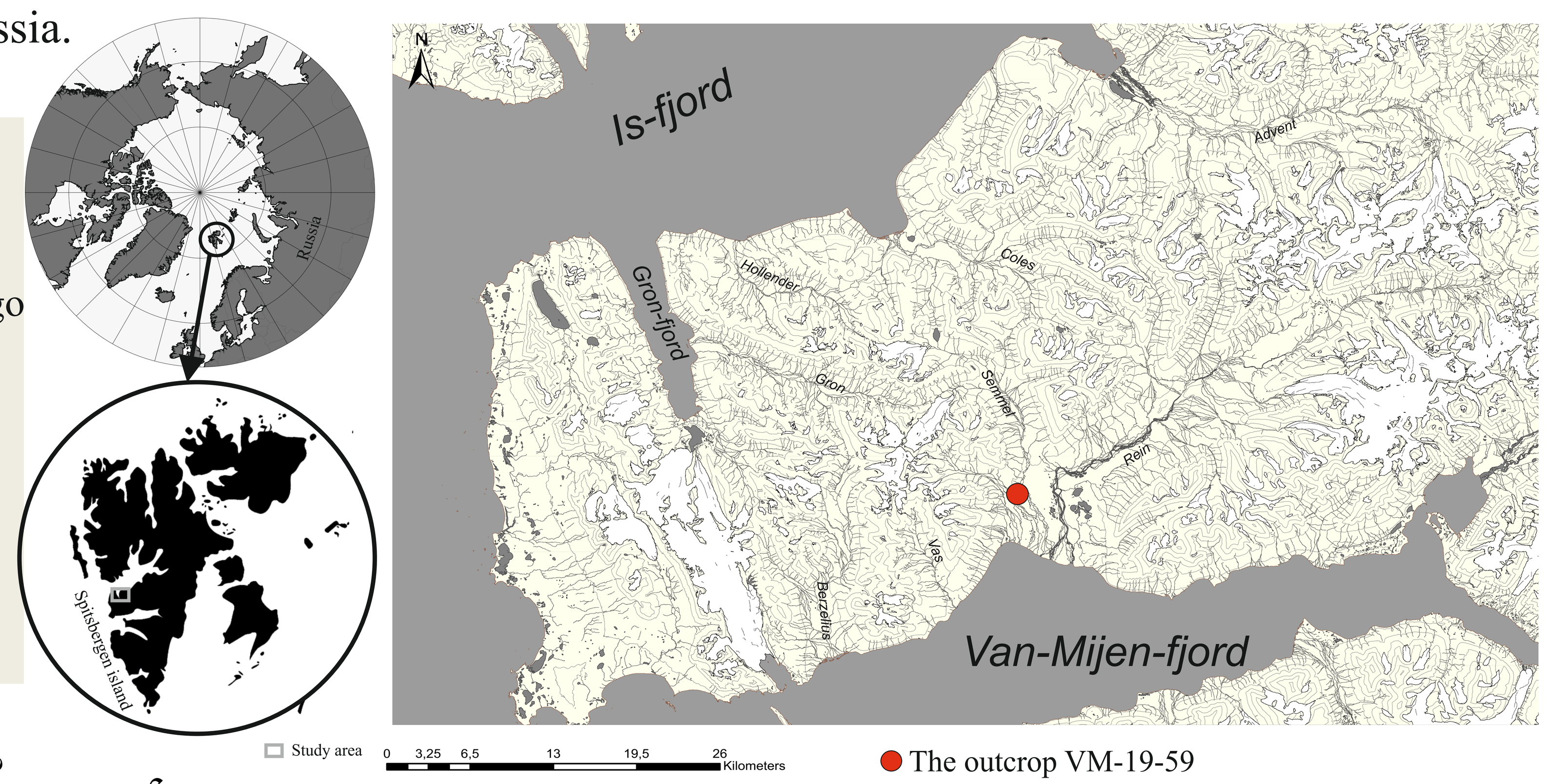
Introduction

The central part of West Spitsbergen, Nordenskiöld Land, is characterized by comparably small extension of glaciers, high landscape diversity and the long-term development of river valleys. In doing so the number of objects suitable for paleobotanical, in particular, palynological research is limited. Holocene climate and vegetation in numerous studies were reconstructed by using palaeobotanical data from lake sediments and peat sequences. Fluvial sediments are widespread and include both terrigenous and organic deposits, but studies focussing on alluvium archives are rare. Such records relate to Coles and Gröndalen valleys.

Study area

During the researches of the Russian Arctic expedition in the Svalbard archipelago in 2019, the outcrop of marine sediments overlain by an alluvial stratum (with a general thickness of 4.2 m) was found and studied on the right slope of Semmeldalen valley (16 m a.s.l.). The sediments are represented by sand and silt with Mytilus edulis shells in situ (0.2 m), which are covered by gravel -pebble material (2.0 m), followed by stratum of interlayered silt, sand, loam with plant remains lenses and layers (2.0 m). The laboratory studies included radiocarbon dating and pollen analysis.

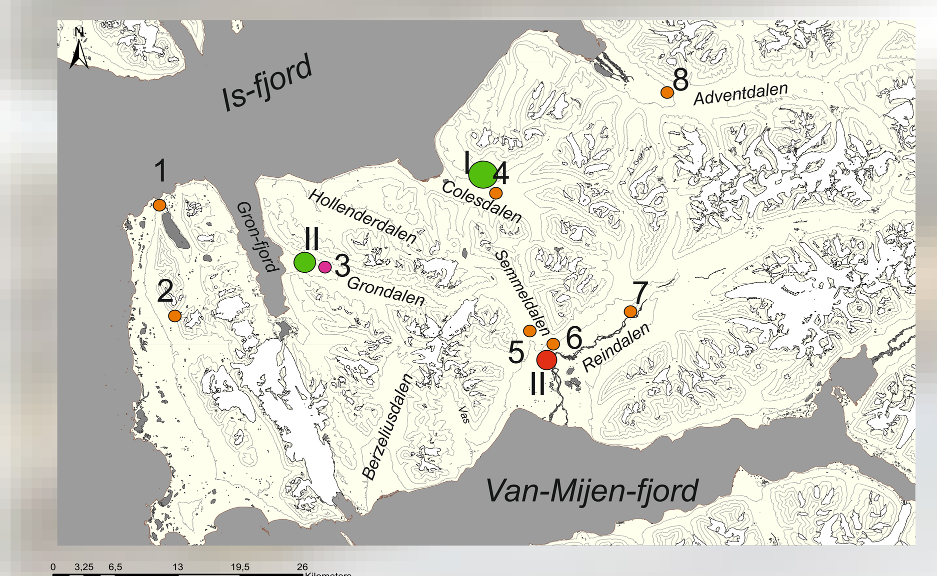
Study area



Results

Legend
Pebble gravel
Gravel
Clay
Soil, plant roots
Sands
Loam
Peat/plant remains
Shells *in situ*
Organic-mineral matter lenses

Discussion



Studied sites
I - K18-15 and K18-16 (Coles) (Soloveva et.al. 2020)
II - GD-1 (Grondalen),(Verkulich,2018)
III - VM19-59 (Semmeldalen)

Published data from Nordenskiöld Land
1 - Vardeborg (Jankovska,1994); 2 - Skardtjorna (Birks,1991); 4 - Colesdalen (Surova,1988);
5 - Semmeldalen-1 (Zelikson,1971); 6 - Semmeldalen-2 (Serebryanny, 1984);
7 - Reindalen (Surova, 1982); 8 - Adventdalen(Surova, 1982);

Alluvial sequences
3 - Grondalen (Serebryanny, 1993)

Studied alluvial sequences

age, yr. BP	3 - Grondalen (Serebryanny, 1993)	I - K18-15 and K18-16 (Colesdalen) (Soloveva et.al. 2020)	II - GD-1 (Grondalen), (Verkulich,2018)	**III - VM19-59 (Semmeldalen)**
0 - 2000	willow-grass tundra		grassy-willow tundra (Salix and herbs) **LIA - hiatus**	willow-grass tundra
2000 - 4000		sedge-grass tundra	sedge-grass tundra + Salix - 20% Betula sect. Nanae	willow-motley-grass tundra
4000 - 6000	subshrub-motley -grass tundra	subshrub-motley-grass tundra	sedge-grass tundra + Salix - 8-25% Betula sect. Nanae - 3%.	willow-sedge tundra
6000 - 8000	subshrub-sedge-moss tundra			subshrub-sedge tundra
8000 - 10000	sedge- moss and grassy-moss tundra			

Conclusions

According to pollen data, six stages of vegetation and climate changes in Semmeldalen valley were distinguished.
The obtained dates and lithology description allow us to make a preliminary conclusion that a sharp decrease in sea leve occurred about 9000 cal BP, thereby determining a radical restructuring of the natural environment of the study area.
The results of the research showed asynchrony in the change in the vegetation cover was revealed.
Preliminary results compared with published data show that there are local differences in valley development and environmental conditions changes in Central Svalbard during the Holocene.

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