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Evolution of prodeltas : a print of glacier melting processes

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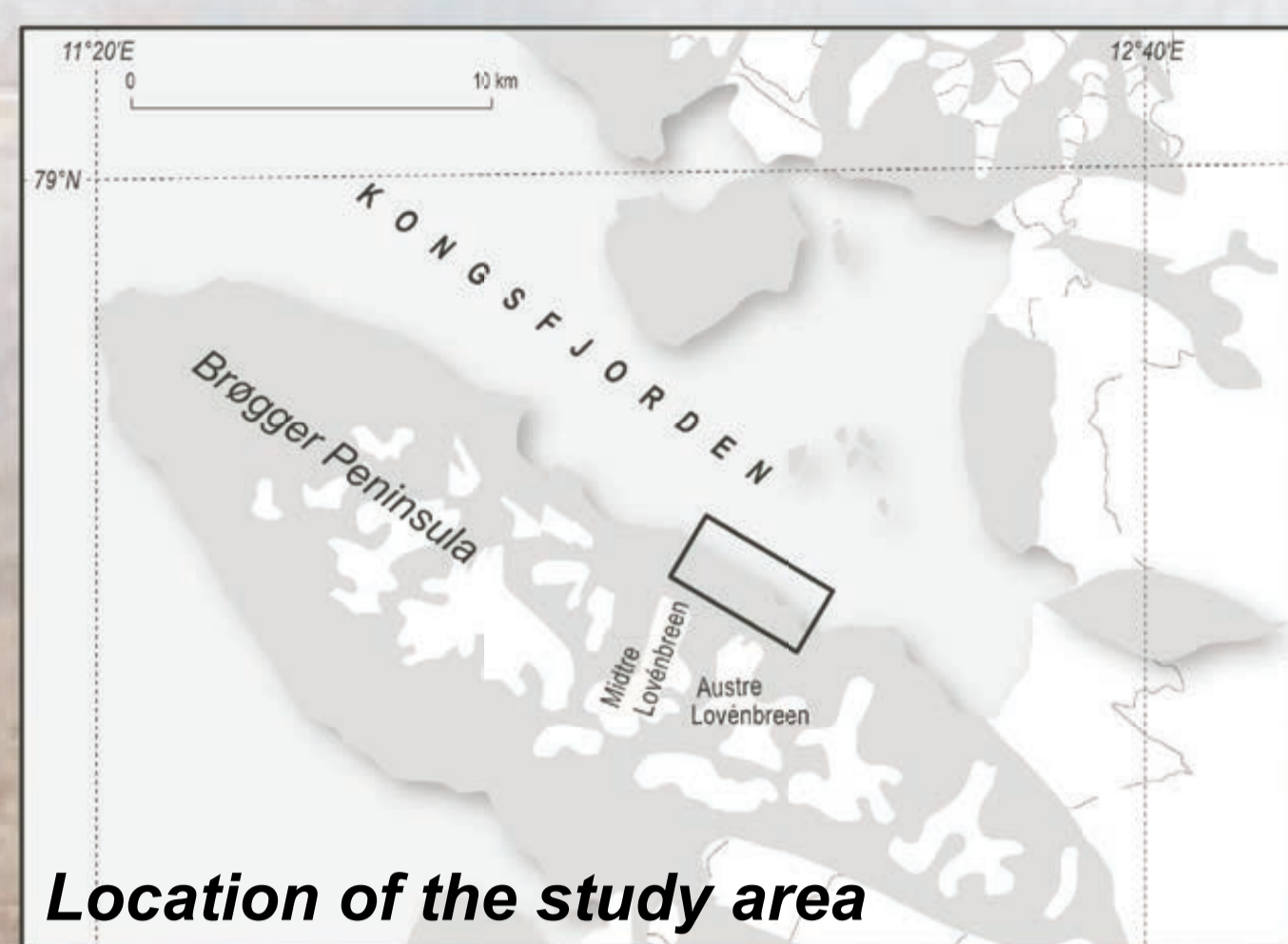
Introduction

- Arctic coastal areas:

- faster and greater modifications than other coastlines (Overduin et al. 2014).
- little known about the physical processes that control coastal high-latitudes and how they will evolve (Zagorski et al. 2013).

- Purpose: to understand the post-Little Ice Age sedimentary transfer in Kongsfjorden.

↳ Quantification of the coastal evolution from 1966 to 2017.



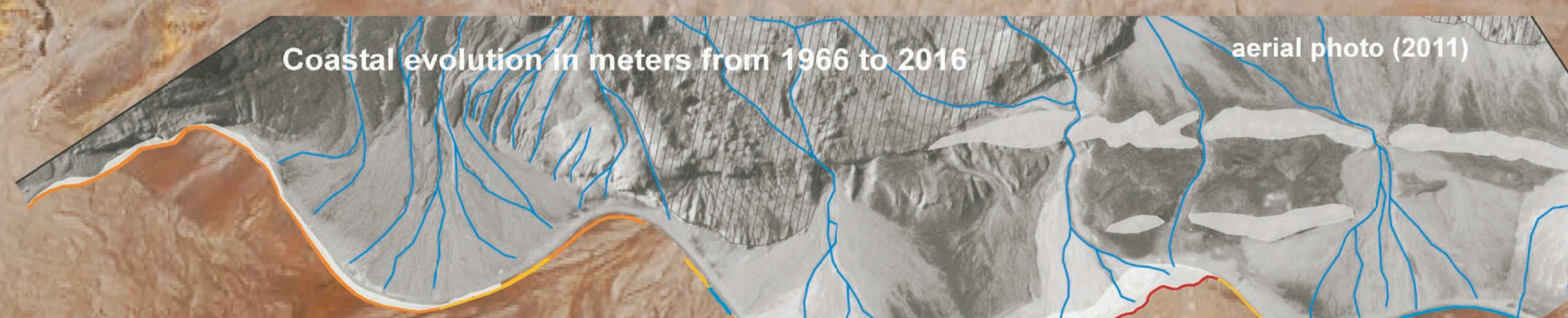
Location of the study area

Materials and methods

- Shoreline evolution:

- 1966-1990: interpretation of aerial photographs from 1966, 1971, 1977, 1990.
- 2011-2014: dGPS data
- 2009, 2011, 2012, 2016, 2017: sonar data

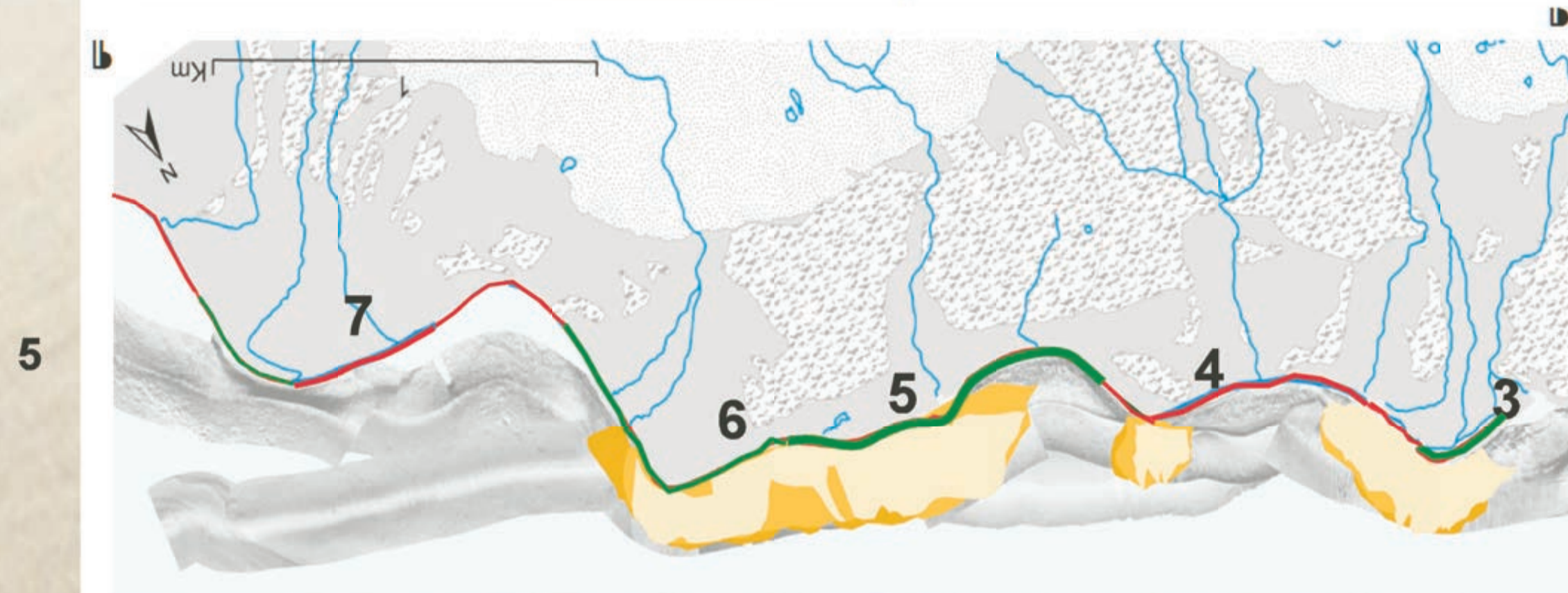
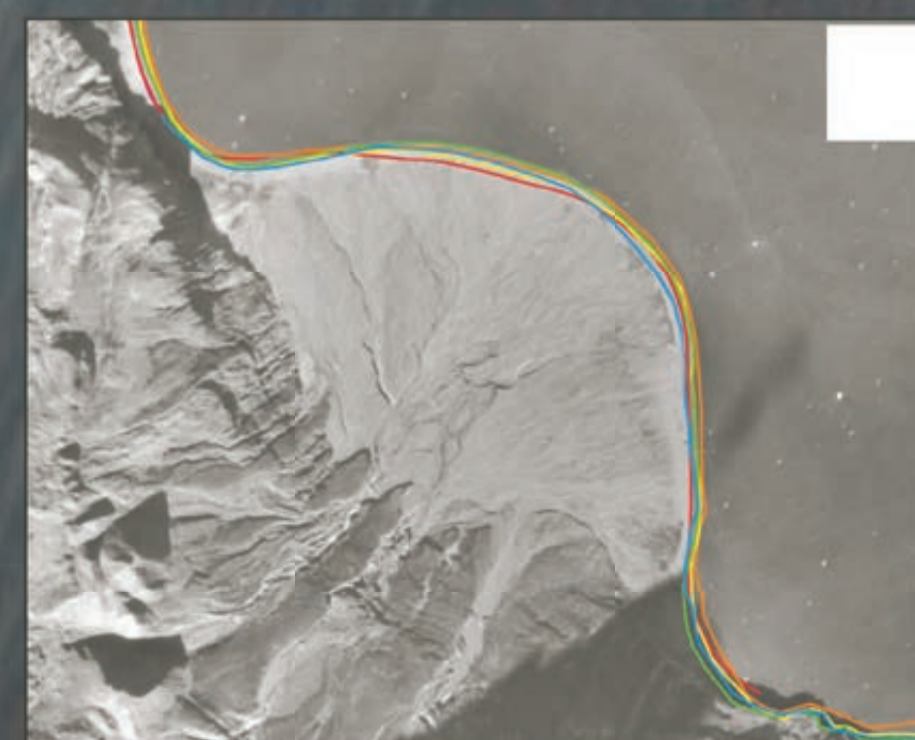
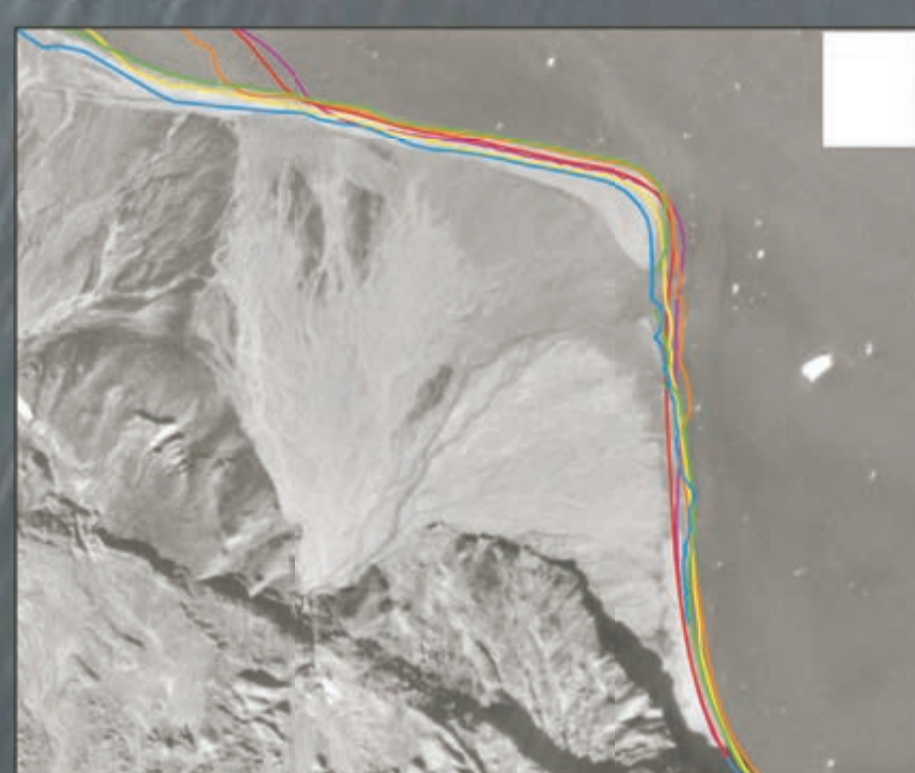
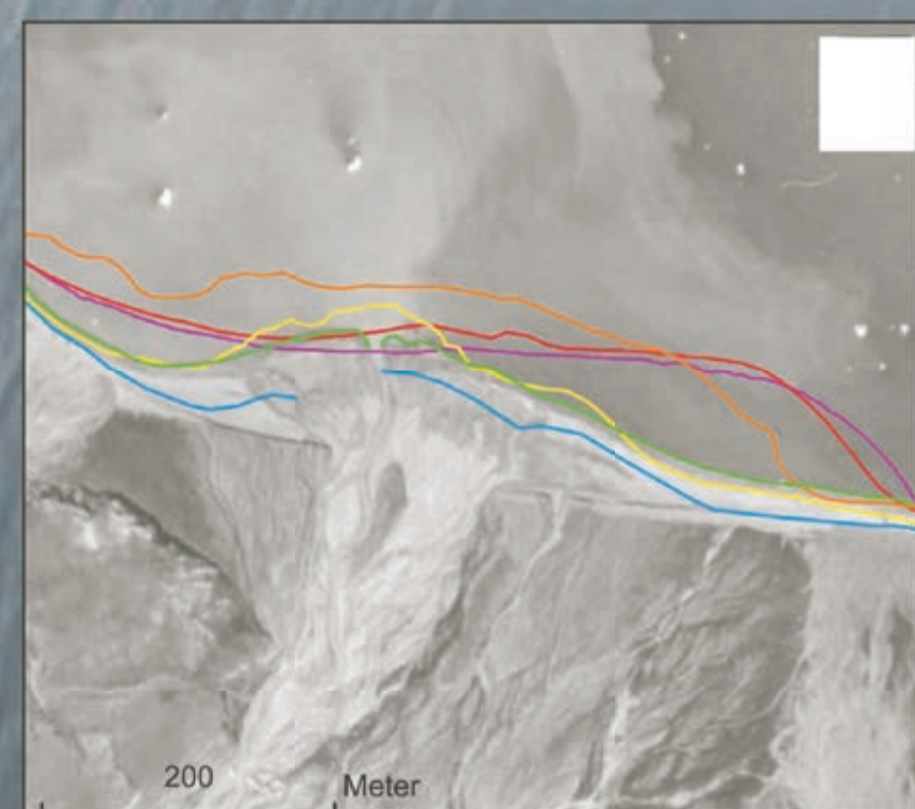
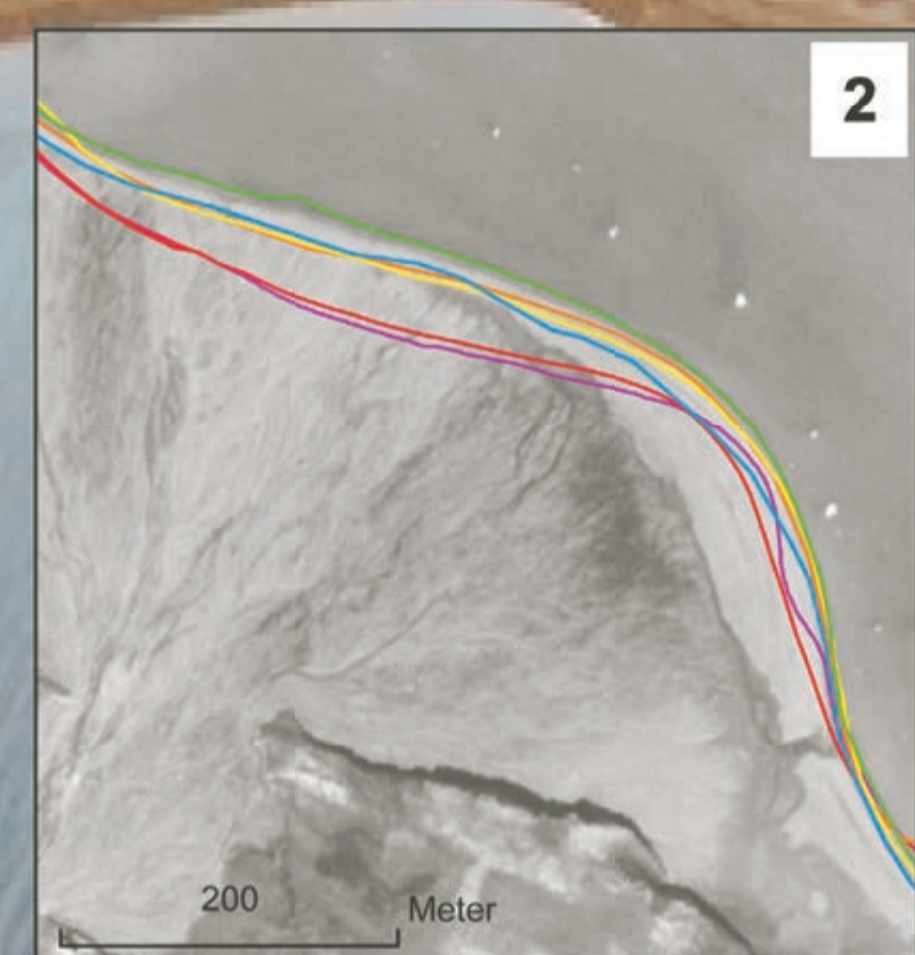
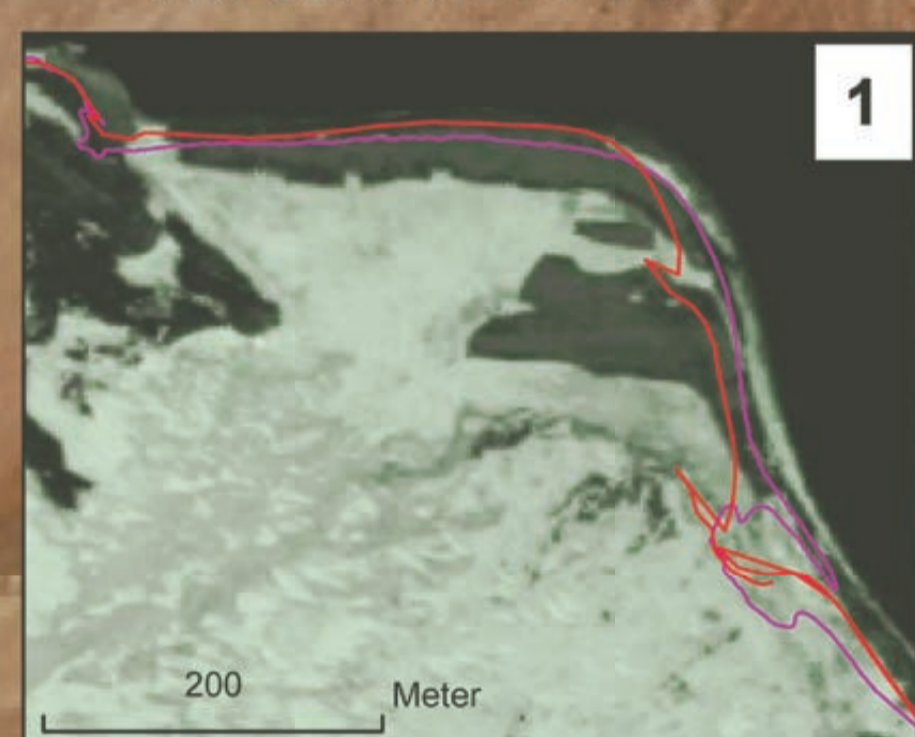
→ Reference line parallel to the coast with reference points every 50 m.
Shoreline evolution measured by calculation between reference points



- -0,3 to 0 m/yr
- 0,1 to 1 m/yr
- 1,1 to 1,9 /yr
- 1,8 to 4,8 m/yr

- Hydrographic network (1990)
- Coastal progradation
- Bedrock ridge (calcareous)
- Morainal area
- Glaciers

The five deltas and the shoreline data



Prodeltas evolution in meters from 1966 to 2012 from side scan mosaics

Prodelta 3 : 2009 : 68 000 m² - 2012 : 60 300 m²
Prodelta 4 : 2009 : 15 542 m² - 2012 : 24 300 m²
Prodelta 5 & 6 : 2009 : 106 500 m² - 2012 : 135 500 m²

Results & Questions

Question 1 : What are the effects of the glacier retreat on the hydrographic network ?
First results show a decrease of the drainage density and the width of the active band which conducts to a clear concentration of the hydrographic network.

Question 2 : What is the Kongsfjorden line evolution ?
Coastal areas supplied by the hydrographic network become smaller
Global progradation of the coast observed from 1966 to 2016 is focused on specific areas (linked to the prodeltas localisation)

Question 3 : What does happen to the sediments exported into the Kibgsfjorden ?
A part of these sedimentary supply is stored into the prodeltas with an extension of 40 000 m² from 2009 to 2012 (will be calculated for 2017). It should be important to estimate the volume displaced by the currents (drift)

Coastal evolution in m/yr from 1966 to 2014
Aerial photographs of 1966 and 1990, University of Franche Comté.

Photo from Alain Robert (2016)