

## STUDY AREA

Why is Sørkapp Land, and specifically western Sørkapp Land, such an attractive area for scientific research?

The answer is: Due to its geographic location and natural environmental features that make it unique in this part of the Arctic.

Sørkapp Land is the southern peninsula of Spitsbergen, the largest island of the Svalbard Archipelago. The island's east-west width is 150–200 km in its northern part. The island narrows to the south in the shape of a wedge between the Barents Sea in the east and the Greenland Sea in the west (Fig. 1). Their waters differ in temperature, which affects local climate conditions. The eastern coast is affected by the cold East Spitsbergen Current, which flows from the Arctic interior towards the south. This results in extensive glaciation and the lack of continuous vegetation. On the other hand, the western coast is warmed from the south by the West Spitsbergen Current, the last branch of the Gulf Stream. This produces relatively little glaciation and allows for a continuous tundra. However, southern winds cause a narrow belt of the cold current's waters to separate the warm current from the coast. Moreover, the two coasts differ in terms of geological structure and relief. In the east, the mountains are built of non-resistant Cretaceous and Tertiary rocks that fall down directly into the sea or onto narrow coastal lowlands (less than 1 km wide) at some locations. In the west, the mountains are separated from the sea by much wider (up to 4 km) coastal lowlands, with both cutting into hard Proterozoic and Paleozoic rocks (see cover photo). For this reason, the two Spitsbergen coasts are extremely different in terms of their natural environment and landscape (Hisdal 1985; Stange 2003). The further to the south, the smaller the distance between the two coasts.

This is true primarily of Sørkapp Land because the peninsula constitutes the end of the land wedge. Its maximum east-west width is 40 km in the north, and only 17 km in the south. Moreover, this wedge is “torn” in two places. In the north, two fjords, Hambergbukta from the east and Hornsund from the west, leave only a narrow isthmus between them. The width of the isthmus decreased to a mere 7 km in 2011 as a result of the present-day retreat of tidewater glacier fronts at the fjord heads due to the warming of the climate. The peninsula gradually narrows also in the south due to the retreat of the ice cliffs of the Vasilievbreen (east) and Olsokbreen (southwest) glaciers. The distance between the glaciers' cliffs has decreased to 12 km. The north-south length of the peninsula is 55 km (Fig. 2).



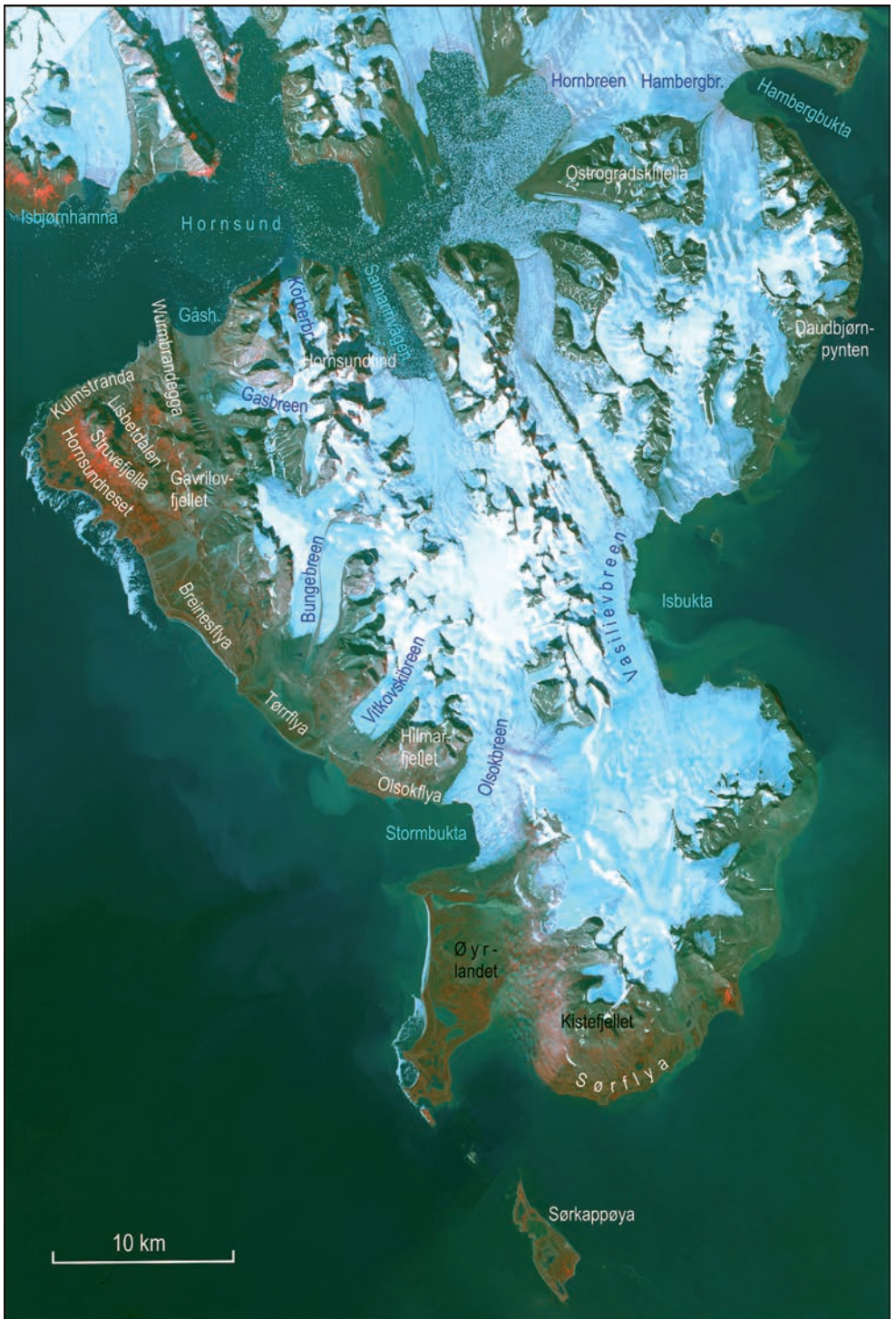
Fig. 1. Satellite image of southern Spitsbergen (south of Van Mijenfjorden) from August 20<sup>th</sup>, 1985: Landsat 5, MSS-421. Color scheme: white – glaciers, red or reddish – vegetation cover, beige and blue-grey – unglaciated areas without vegetation cover, black – seawater, blue-and-black – glacial water mixed with seawater



Fig. 2. Satellite image of Sørkapp Land consisting of four *TerraASTER* scenes from 2003–2005. Color scheme: blue with white – glaciers, red or reddish – vegetation cover, grey-greenish – land areas without vegetation cover, blue stripes or dots against a dark background – ice-pack on the sea, dark with greenish stripes – seawater with admixtures of glacial water. Majority of the image is current for 2004

All of these factors help generate a great deal of variety in the peninsula's natural environment: from the western and southern lowlands overgrown by tundra with herds of reindeer to the glacial-mountainous Arctic desert in the interior and east. Therefore, the peninsula is an excellent study area featuring all the relationships between the different components of the natural environment. They result in an unusually diverse, completely natural and almost primeval landscape: glacial and periglacial, mountainous and low-lying, inland and coastal. These basic landscape types are internally differentiated: e.g. fjord-type coastal landscape and open-ocean-type coastal landscape. Traces of the Pleistocene ice sheet may be discovered in the contemporary landscape. In addition, the reaction of this environment to climate warming can be readily noted due to relatively rapid climate fluctuations since the 1980s. New climate phenomena and associated trends can be easily observed in this area.

Apart from that, Sørkapp Land belongs to the least accessible by sea Arctic areas, mainly because of wide shallows off-shore, numerous submerged rocks and rela-



tively new bays and fjords at the tidewater glaciers' retreating fronts, which have not been surveyed yet.

Western Sørkapp Land (Fig. 3) is the most interesting part of the peninsula.

The area is accessible primarily by sea, as it protrudes between the open Greenland Sea and Hornsund Fjord, which results in the shortest season with sea-ice, i.e. the longest period without a barrier to newcomers. Moreover, there is only one Sørkapp Land anchorage in Gåshamna bay near the fjord's southern coast, close to its mouth.

Sørkapp Land was under the Barents Ice Sheet at least once during the Pleistocene, most likely during the Late Weichselian (Salvigsen, Elgersma 1993). The western part of the peninsula was completely covered by the ice sheet, which is evidenced by erratics on Kovalevskifjellet peak at the elevation of 640 m (Ziaja 1989).

Most of western Sørkapp Land has been devoid of glaciers (Ziaja 1999) throughout the Holocene. The unglaciated area includes not only the coastal lowlands of Kulmstranda and Hornsundneset but also two mountain ranges: Struvefjella and a second unnamed range, which consists of Wurmbrandegga, Savitsjtoppen, Kovalevskifjellet and Gavrilovfjellet. The unglaciated area also includes Lisbetdalen valley between the two mountain ranges, which is an exception in Sørkapp Land and a rarity in Spitsbergen. Animals, plants and soils are very common and fully visible in the area's landscape. This is not true in most parts of the peninsula. Little research had been conducted in the area until the 1980s. However, some hunting activity had been conducted since the 17<sup>th</sup> century.

Animal life, plant life and soils are also well developed on the low (elevation: below 50 m above sea level) coastal plains in the southern part of western Sørkapp Land, which is covered in part by tongues of glaciers extending from the peninsula's interior. Adjoining mountains are also partly glaciated on the land side. Two coastal plains, the wide Breinesflya plain at the foot of Wiederfjellet massif and the narrow Tørrflya plain at the fore-field of Bungebreen glacier, extend from the northwest to the southeast. Furthermore, narrow karst plains stretch at the base of the mountains from the Bungeeleva pro-glacial river to the lateral marginal zone of the large Olsokbreen glacier.

The northernmost part of western Sørkapp Land consists of a low plain along Gåshamna bay and Tsjebysjovfjellet mountain, with a narrow lowland at its base on the fjord to Körberbreen glacier in the east. This area, together with Gåsbreen glacier, was already investigated in detail in 1899 (De Geer 1923). Hence, the monitoring of changes in Gåsbreen glacier is the longest of all more than 80 of the Sørkapp Land glaciers. Gåsbreen glacier is a part of the boundary between the high-mountain-glacial interior and western part of the peninsula.

The lack of glaciers and a compact area of about 100 km<sup>2</sup> make this area relatively safe for exploration, which was particularly important for the early expeditions in the 1980s.

Animals in Sørkapp Land and the adjoining seas have been hunted since the 17<sup>th</sup> century. Historical remains including graves of Western European whalers and

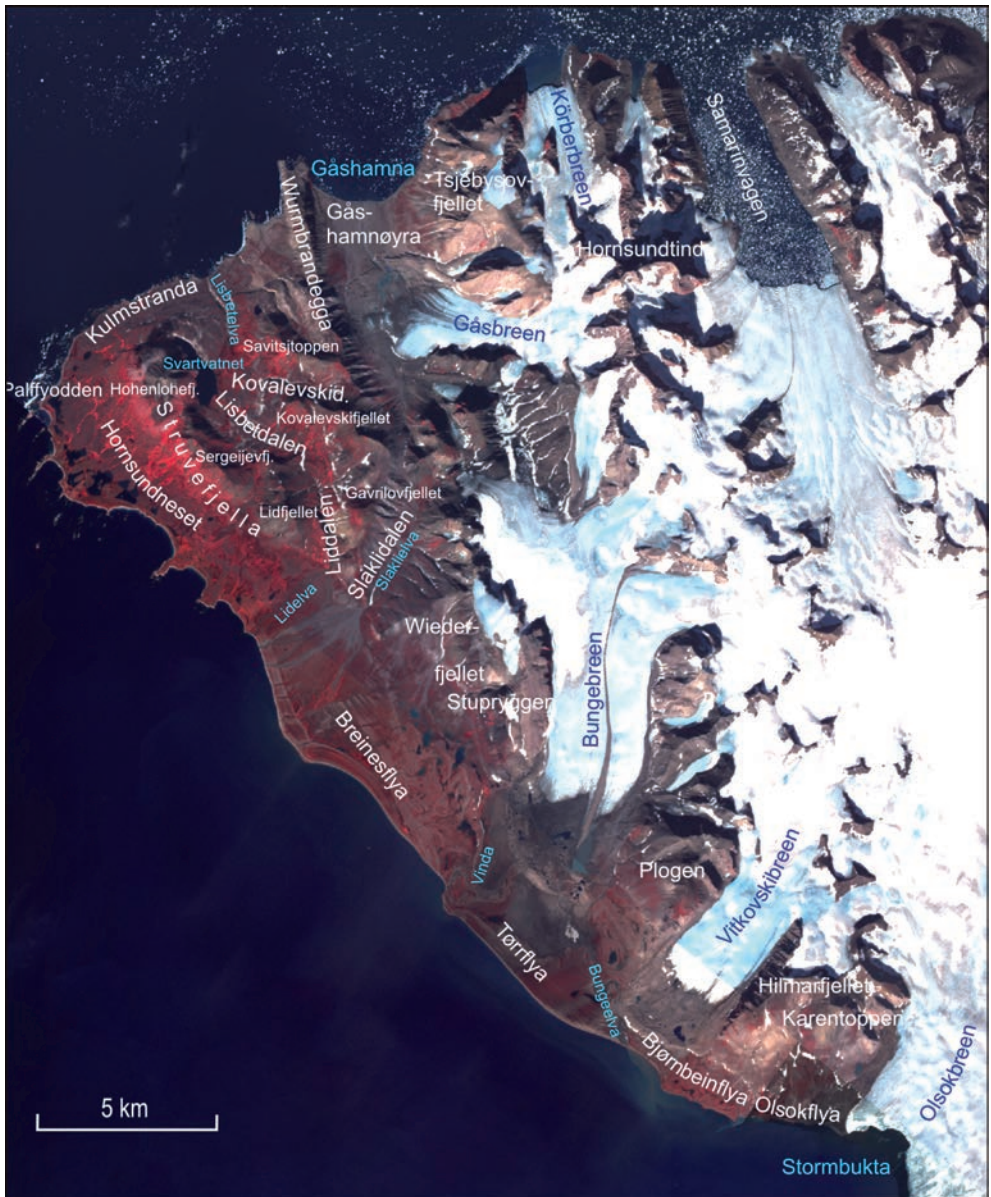


Fig. 3. Satellite image of western Sørkapp Land consisting of TerraASTER scenes. Color scheme: light-blue with white – glaciers, red or reddish – vegetation cover, brown – land areas without vegetation cover, dark-blue with lighter dots – seawater with ice-pack. The image is current for 2004

Pomor (North-Russian) hunters have been preserved in the western part of the peninsula.

The last Norwegian trapper station was operational until the establishment of South Spitsbergen National Park (south of Van Keulenfjord) in 1973 and has been

preserved on the coast, one kilometer north of Palffyodden cape in an area most abundant in game. The station is a good base for summer scientific expeditions because its main hut is built of timber beams (two cozy rooms with stoves and a porch), making it resistant to polar bear attacks (see upper back cover photo). A very small auxiliary hut (ca. 7 m<sup>2</sup>, 1.5–1.7 m high), situated on the Breinesflya coast at a distance of about a half a day by foot from Palffyodden, also belongs to the former trapper station. The smaller hut, also built using timber beams, is a safe shelter for two individuals (see lower back cover photo).

The three advantages of western Sørkapp Land – relatively easy access, lack of glaciers and a former trapper station – are the more valuable due to the presence of many interesting environmental phenomena and historical sites.

In the 1980s, researchers went on foot from the huts to other parts of western Sørkapp Land. In most cases, they did not cross Körberbreen glacier in the north and Olsøkbreen glacier in the south, as the glaciers flow towards the sea.

The glaciated peninsula's interior is extremely different from western Sørkapp Land because biotic features are rare and hardly visible in the landscape of the peninsula interior. The boundary between the two regions is shifting slowly to the east due to the retreat of the glaciers.