2.5.2. Alternative construction sites in other Antarctic areas

Other BAS placement options in other Antarctic regions were further analised, taking into consideration scientific, environmental, logistic and other aspects. However, no alternative site for BAS placement was reported to meet all the criteria to a greater extent than that at Mount Vechernyaya location selected.

2.5.3. Zero alternative (no construction)

As a zero alternative option, renovation and continuation of use of the Mount Vechernyaya field base infrastructure was subject to analysis. However, continued use of the residential premises and other RAE field base infrastructure turns out to become increasingly problematic due to their deterioration and incompliance to the Antarctic environmental protection requirements.

Therefore, the zero alternative option seems to be only a temporary postponement of own station construction.

Unavailability of existing facilities hampers substantially the development of scientific research, increasing the number of staff involved in BAE, making the field season longer and thus jeopardising the proper implementation of the National Program in its entirety.

The up-to-date station construction would benefit to friendlier environment for living and working of polar explorers and contribute to reduced impact on the environment.

3. Initial Environmental Evaluation

3.1. General geographic description and relief

The natural complex known as Mount Vechernyaya is located at the western part of Enderby Land, Tala Hills (eastern part), at the coastal area of the Alasheeva Gulf, Cosmonaut Sea. It incorporates a series of rocky ridges with a dominant mountain, the Mount Vecherniaya (272.0 m), and several lower ridges, breaking through the Antarctic ice sheet on the Cosmonauts Sea shore. The Alasheeva Gulf cuts inland with the Vechernyaya, Lazurnaya, Terpeniya and Zarya Bays, which are separated by the Rog, Gnezdovoy and Dostupny Capes (Figures 3.1-3.2). The Hayes outlet glacier, flowing into the sea on the ice-covered valley, can be treated the eastern boundary of the area.

The area stretched about 8 km along the seacoast; its utmost width is about 2 km. Geographically, the area can be treated as a western extension of adjacent Molodyozhnaya station oasis. Topography, the area belongs to the exarational low rocky hills near Mount Vechernyaya, consisting of several ridges extending substantially parallel to the seashore of Terpeniya Bay with focus to the north-west. The ridges are max. 1 km long and about 150 meters wide. The north-eastern slopes of the ridges are steep and short, sometimes precipitous, while being flat at the south-west (Figure 3.3). The ridges are separated by terraced valleys, with glaciers and river beds of temporary streams at the bottoms. In particular, to the east of Mount Vechernyaya, there is a flat mountain terrace of about 350 m long and 50-80 m wide, turning into an elongated southeast slide, which houses freshwater lakes (Verkhneye and Nizhneye) connected with a temporary watercourse. The elevation drop between the terrace and Nizhneye Lake is 50-60 m. The availability of lakes makes the Mount Vechernyaya area similar to the other Antarctic oases.

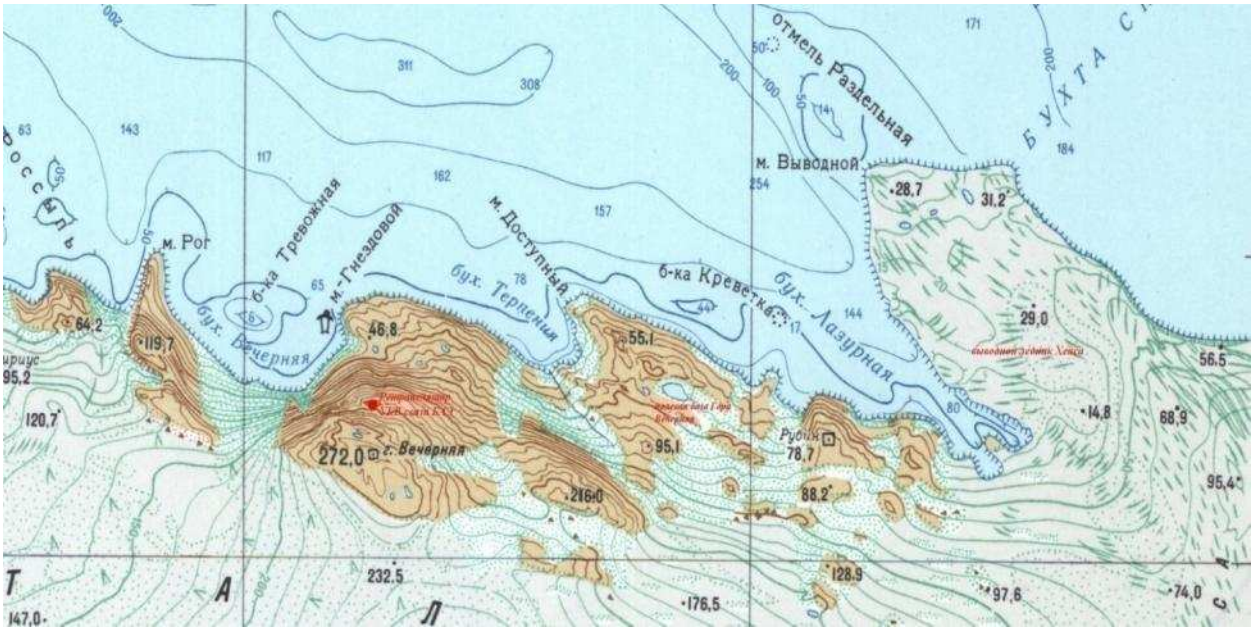

Figure 3.1 – Topographic map of Mount Vechernyaya area

To the south of Mount Vechernyaya, a gradually rising slope of the Antarctic ice sheet is located. It gains 350 m height at 3 km distance from Mount Vechernyaya and 1000 m height at 70 km distance.

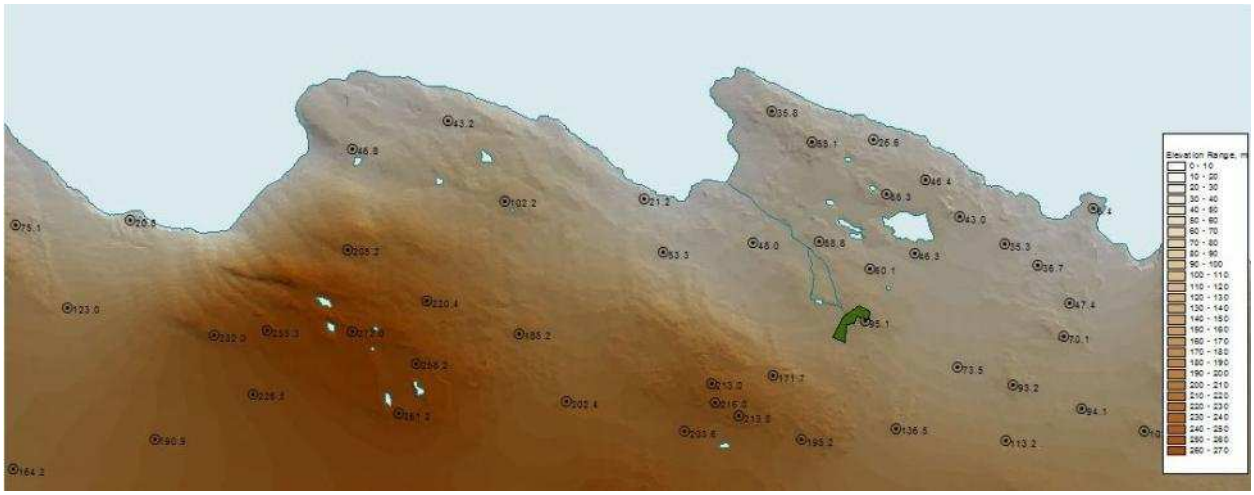

Figure 3.2 – Hypsometric map of Mount Vechernyaya

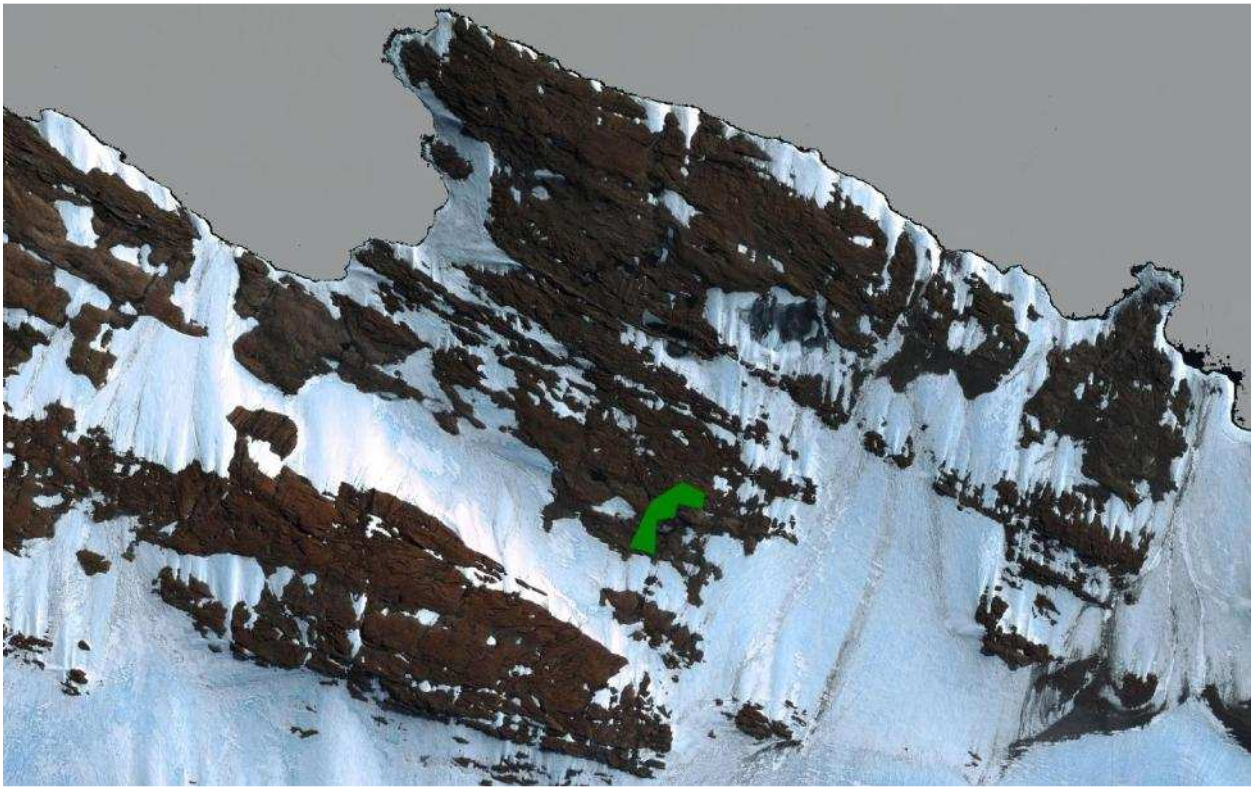

Figure 3.3 – Google map of Mount Vechernyaya area (site of planned BAS location is shown)

3.2. Sea and sea ice

The Cosmonauts Sea description is given under the Electronic directory on the Antarctic environment (http://www.aari.aq/gis/web/kosm/opisanie.html). The Cosmonauts Sea area is about 435,000 km^2. The Cosmonauts Sea coast stretches over 1,200 km and looks almost everywhere as a ridge of ice cliffs of 10 to 30 m high and more (Figure 3.4). Being rather

tortuous, the coast line forms large peninsulas with bays in-between, including the Alasheeva Gulf. In the bays there are small ice-free islands, detached or in clusters.

Figure 3.4 – Coast line at Mount Vechernyaya

The shelf width in the Cosmonauts Sea varies from 80 km average in the west to 40 km of Enderby Land north ridge in the east. The Gulf's coastal bottom topography turns out to be similar to the structure of the inland coast: characteristic ridges and valley-typical slides, trending northwest. Except for some basins with thick silt deposits, the shelf is almost completely covered with sand and siltstone sediments.

Drifting ice

The stable autumn ice formation begins at the Cosmonauts Sea coastal area only in the second half of March, while in other Antarctic basins - in late February - early March (http://www.aari.aq/gis/web/kosm/opisanie.html). However, a significant expansion of the ice belt is inhibited until April. The rocketed increase in ice cover occurs only in May-July, when the ice moves rapidly to the north from average latitude 67° S to 62° S. In August, it usually extends to latitude 60° S, where it stabilises until the spring thaw in late October, shifting slightly to the north to 59° S. Unlike most Antarctic areas, the Cosmonauts Sea ice belt grows to its maximum size by mid-October, i.e. a month later. The ice cover pool in this area reaches an average of about 0.9 mln. km^2, and its edge extends to latitude 59° S.

The ice cover is reported to step away basically in two summer months - from December to January. The drifting ice belt width is reduced in this period by 400-500 miles, with the pool edge retreating in January to latitude 67° S. The following reduction of the sea ice cover in February and March mainly depends on the intensity of the local fast ice breaking.

Fast ice

The Cosmonauts Sea refers to the relatively small number of marginal seas of the Southern Ocean with well-developed fast ice (http://www.aari.aq/gis/web/kosm/opisanie.html).

The stable formation of fast ice in the Cosmonauts Sea starts generally in the first half of May, and after about a month it covers the entire shelf zone of the basin, laying there until spring break in October. The fast ice usually keeps on growing until early November, reaching the thickness of about 1.5 m.

The fast ice in the Cosmonauts Sea starts to break in October and goes on through April. The destruction of the fast ice is finalised, as a rule, with beginning of the new autumn ice formation in the Alasheeva Gulf at the second half of March. Therefore, in most cases, it is not actually removed in its entirety. However, on-going removal of the fast ice hacks actually benefits to annual 'washing' of the old bay ice.

Currents

The main elements of the large-scale circulation in the area are the east-directed stream in the northern part of the sea and the Antarctic slope stream, which transports waters in general westerly direction along the Antarctic continental slope. The northern part of the sea is characterised by large-scale anti-cyclonic meander east of longitude 35° E, with its southern peripheral water turning to the west at longitude 50° E.

3.3. Geology and soils

Geologically the Enderby Land belong to East Antarctic Platform or Antarctic Precambrian Crystalline Shield. The area's structural formation can be traced back to the paleoproterozoic age. According to the research performed by RAE and BAE the territory of the Mount Vechernyaya area is composed of mainly enderbite and charnokite gneisses and plagiogneisses. Reference to the investigations made, the Mount Vechernyaya plot area developed under linear granite-gneiss dome-type pattern.

Soils

The soils in the area of planned BAS construction are forming only in places that are not covered by glaciers, where there are conditions for the accumulation of friable material of colluvial and fluvio-glacial origin – mainly in depressions and water flows hollows (Figure 3.5). The area occupied by soils within the BAS site takes no more than 5-10% of the ice-free surface (similar to the other Antarctic oases). The rest territory is represented by solid rocks.

A) B)

Figure 3.5 – Examples of soil formation at the BAS deployment area: a) at the lower part of slope; b) in a hollow

Parent rocks are products of bedrock weathering, exposed to gravitational movement – colluviums, as well as fluvioglacial deposits. The soils are poorly developed, the upper layers are formed by detritus & gravel and sand & gravel materials, coloured gray-brown and brown. Such differences in soils can be explained by terrain features and moisture effects due to snow melting at summers and further distribution of melt waters. These kinds of soils can be classified (*Abakumov, Krylenkov, 2011*) as nano-litozem (or petrozem), generally characteristic for the Antarctic coastal area. The soil depth basically does not exceed 20 cm.

The beds (bottom) of temporary (seasonal) streams accumulates a fine fraction of weathering products; due to movement of waters, in some cases, similar-to-alluvial deposits are formed, predominantly represented by coarse sand (Figure 3.6).

Figure 3.6 – Fluvioglacial deposits at temporary stream beds

According to the investigations made (*Lupachev et al, 2012; Abakumov, Lupachev, 2011-2012*), the intact Antarctic oases soils contain from 5-10 to 30% of silt (fractions under 1 mm diameter). The ratio of physical sand and physical clay turns to be almost equal for different types of soil, amounting to 85-95/5-15%. The soils in elevated areas, devoid of vegetation, demonstrate mainly low-alkalinity reaction; the soils are characterized with low C_{org} content (0.2-1%). At the areas of lichen vegetation, the soils are slightly acidic or acidic, C_{org} reaches 8-10%.

The soils are mostly uncovered by vegetation, although algae (in rare cases – crustose lichens) quickly develop in rock crevices and melkozem substrate in their short growing season, thus playing an important role in weathering and soil formation.

At penguin habitats to the north-east of the intended BAS deployment, specific organic soils (or mineral organic soil-similar substrates) are generated under guano layers. In general, the organic substances of animal origin (guano, feathers, tissue and bones of birds and other animals), enriching the soils and ground with nitrogen and phosphor, play an important role in soil formation in Antarctica.

Chemical analysis of soil samples performed showed that the loss on ignition ranges 0.4 to 1.54%, averaging 0.9%, indicating low content of organic material in the soil. The deposits of temporary stream beds are mainly represented by minerals, having the loss on ignition factor of less than 0.01%.

The mineral part of the soils sampled at different sites in the vicinity of Mount Vechernyaya is characterised by the dominance of silicon compounds (average content – 63.4%); content of iron and aluminum compounds – 14.1% and 8.0% respectively; content of calcium oxide, sodium, potassium and magnesium – 4.5%, 3.5%, 2.3% and 2% respectively.

The structure of temporary stream deposits is also dominated with silicates, although their content is somewhat lower than in the soils (Table 3.1). At the same time, as compared to soils, increased iron oxide (13.3%) and calcium oxide (6.0%) content is reported.

Table 3.1 – Macroelement content in soil samples taken at Mount Vechernyaya sites, %

Year	Sample No	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	SO_3	Loss on ignition
2012	1	60.17	0.93	14.49	10.1	0.10	3.11	4.47	1.96	3.25	0.29	0.13	1.15
2013	1	57.07	2.13	12.77	13.28	-	6.00	3.23	2.00	2.50	0.51	<0.10	<0.01
	13	64.86	0.99	13.77	8.12	-	4.87	1.89	1.8	3.56	0.18	<0.10	0.46
	25	63.4	0.71	14.18	8.02	-	4.87	1.89	2.04	3.63	0.18	<0.10	0.52
	27	64.82	0.72	14.14	7.29	-	4.50	1.35	2.30	3.63	0.24	<0.10	0.86
	29	63.72	0.68	13.95	7.26	-	4.87	2.43	1.80	3.63	0.26	<0.10	1.54
	31	63.09	1.01	13.89	8.92	-	4.50	2.16	1.90	3.30	0.21	<0.10	0.4
	34	63.92	0.77	14.14	6.94	-	4.50	1.89	2.20	3.50	0.21	<0.10	1.19

3.4. Glaciers and inland waters

Glaciers

Glaciers cover about 70% of the Mount Vechernyaya territory. They mainly belong to the icecap - part of the East Antarctica ice sheet. The ice sheet slope is 3.5º average. It has is reported 10-20 m thickness at the coastal area, while reaching 500 m thickness at 10 km distance from the seashore.

The coastal areas are characterised by strong differentiation of the ice cover profile. The areas with relatively even subglacial topography are covered with hilly glaciers, with ravines and terraces on the surface, specific micro-relief due to wind performance and accumulation of snow. Areas with steep slopes of subglacial relief generate ice-broken platforms with numerous cracks (*Kotlyakov, 2000*). The cracks in the ice sheet are observed within 20-30 km strip along the seacoast. Cracks are also characteristic for the Hayes outlet glacier.

The icecap flows down to the Cosmonauts Sea with 10-30 m high ledges. Apart from the main ice sheet, the leeward slopes of the Tala Hills ridges are covered with isolated wind-blown glaciers and perennial snowfields.

The speed of undifferentiated ice sheet edge in this area is assessed to be average for Antarctica at about 100 m / year, according to V. M. Kotlyakov (*2000*).

Trough depressions of subglacial relief accommodate outlet glaciers, moving inside the ice sheet at relatively high speeds. The Hayes outlet glacier borders on the area in the east. The absolute heights of the Hayes glacier at the Lazurnaya Bay area do not exceed 30 m, with glacier speed ranging 900 to 1400 m / year, according to different estimates.

The accumulation of ice cover at the Enderby Land coastal area is estimated at 20-40 g/cm^2. The firn snow thickness ranges from zero to 80 m, depending on snow accumulation (*Kotlyakov, 2000*), the firn snow age averages to 60-70 years.

Figure 3.7 – View of the excurrent Heys Glacier from field camp Mount Vechernyaya

Figure 3.8 – Crevasse at Heys Glacier

Lakes

In the Mount Vechernyaya region more than twenty permanent and temporary lakes were identified. Their surface area ranges from several tens to several thousands of square meters, with depths ranging from several tens of centimeters to 20 meters or deeper.

А) Б)

Figure 3.9 – Permanent and seasonal fresh water lakes at feld camp Mount Vechernyaya

The largest lakes are located near the Mount Vechernyaya – Nizhneye Lake (about 1.5 ha) and Verkhneye Lake (0.15 ha). These lakes are connected by a temporary watercourse. The water level of the lakes is unstable and depends on the melting snow intensity. Periodically, the inland water is discharged into the sea, thus resulting in significant shallowing of the lakes.

The Nizhneye Lake is covered with ice all-the-year-round, only a narrow discontinuous rim free of ice is opened by late summer. According to the bathymetric survey of 2008, the maximum depth of the lake is 3-3.5 m.

The Verkhneye Lake is completely free of ice by mid-summer. Freezing occurs no earlier than by mid-February. The lake is deep, with max. 20 m depth. The thickness of ice cover in winter reaches 2-2.5 m and more.

Reference to BAE studies performed, the lakes' bottom sediments are reported to be represented mainly by sand fractions with inclusions of gravel, uniform in colour (gray-brown, gray-black, green). The organic part of the sediments is formed by algae residues, with the loss on ignition factor ranging 11.4 to 23.8%. The macroelement content in the lake sediments is similar to that of inland soils (Table 3.2), which serve the source of mineral particles brought with melting water. It should be noted that, in some cases, the loss on ignition factor of the Verkhneye Lake sediments reached 66.4%, proving the heterogeneity of the emerging deposits.

Table 3.2 – Macroelement content in bottom lake sediments at Mount Vechernyaya area, %

Sampling site	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	SO_3	Loss on ignition
Nizhneye Lake	54.56	1.22	12.46	7.74	0.21	0.38	4.59	3.6	2.2	0.43	0.21	12.34
Verkhneye Lake	47.36	0.92	11.48	5.47	0.1	0.38	4.59	2.35	2.35	0.47	0.47	23.84
No Name Lake	56.00	0.77	13.95	5.46	0.15	3.11	3.35	2.30	3.00	0.25	0.26	11.43

3.5. Meteorology and climate

The peculiarities of the western Enderby Land atmospheric circulation are predominated by interaction of pressure systems prevailing in the middle and high latitudes of the Southern Hemisphere.

The radiation environment in the area is determined by its position beyond the Arctic Circle, nature of the underlying surface, sunshine duration and ambient air conditions.

The annual ambient air temperature is characteristic for Antarctica, with maximum values in summer (January) and minimum values in winter (July). The average monthly air temperature drops by 7.3°C from February to July and increases by 0.9°C from July to September.

The second half of winter (July-September) is the coldest season, and almost all the absolute minimum temperatures were recorded in these months, reaching -42°C (Figure 3.10).

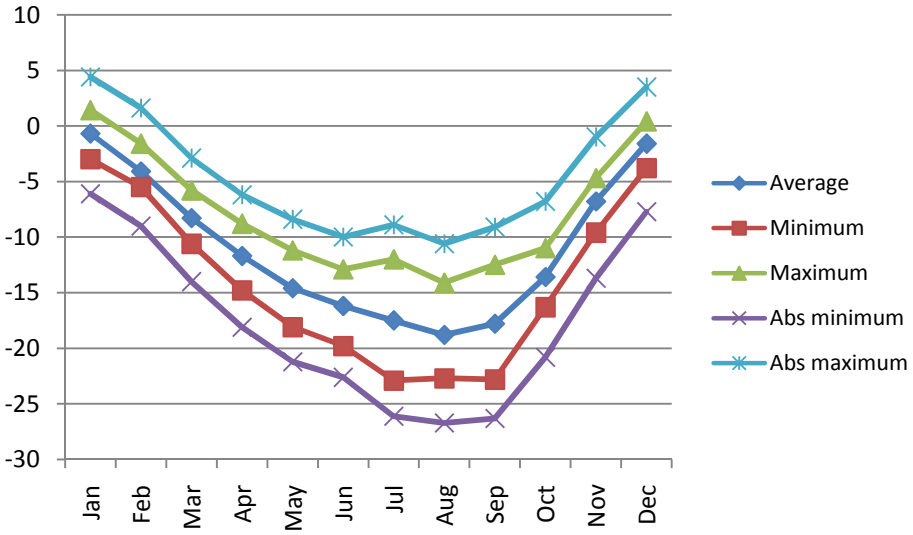

Figure 3.10 – Annual temperature ranges, ˚C, by data of Molodyozhnaya (1963-1999)

The given region is dominated by winds from the east-north-east to south-south-easterly direction with an annual frequency of occurrence of 85.7%. While east-north-eastern winds are associated with cyclones that prevail in the period from August to January, the south-south-eastern winds are of anticyclonic or katabatic origin, blowing in the period from February to July.

This area is dominated by winds from the east-north-east to south-south-easterly direction, their annual frequency - 85.7% (Figure 3.11). While east-north-eastern winds are associated with cyclones that prevail in the period from August to January, the south-south-eastern winds are of anticyclonic or katabatic origin, blowing in the period from February to July.

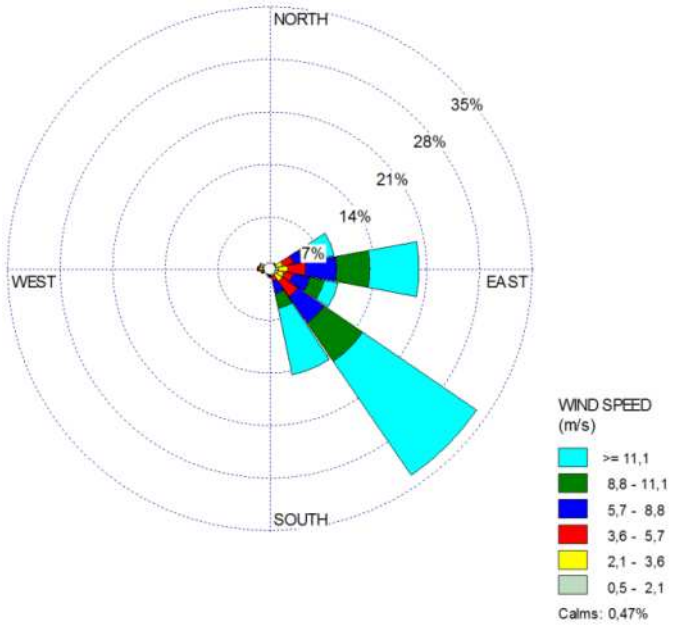

Figure 3.11 – Wind rose by data of Molodyozhnaya station

Calm weather is not typical, the maximum frequency of calms is reported in July-December, while in February-April they range only 0.2-1.0%. Calm weather is generally reported upon changing of the prevailing types of weather.

Both during long-term studies and at summer season monitoring, strong winds of 11 m/sec. and more are most frequently reported (Figure 3.12).

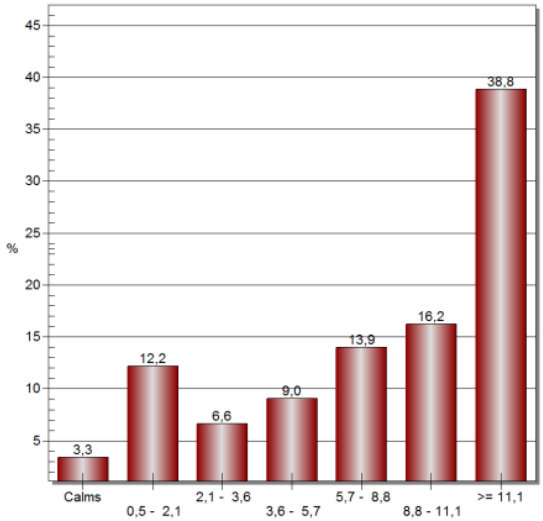

Figure 3.12 – Frequency of winds by data of Molodyozhnaya station (1994-1998 rr.)

The highest wind speed have been recorded in March and April; January and December are relatively less windy. The maximum average monthly wind speed has been recorded in April - 17.6 m/sec, and the minimum – in January (at 3.2 m/sec).

The air humidity values are subject to minor fluctuations, averaging 67%. June is most exposed to humidity variations, while August is the least variable in this respect.

Average annual precipitation is 270 mm. The main quantity of precipitation falls from March to September, with the average value in these months fluctuating between 48 and 71 mm. The most humid month is April; the absolute top record of precipitations was registered in this month in 1967 – 207.1 mm. The fewest amount of precipitation is recorded in January and December.

At all months the average cloudiness was reported above 6 points, more cloudy (in average) are March and April, least cloudy – June, July and December. The most of days with clear weather was registered in November 1990, the cloudiness was reported to be 1.4 points then.

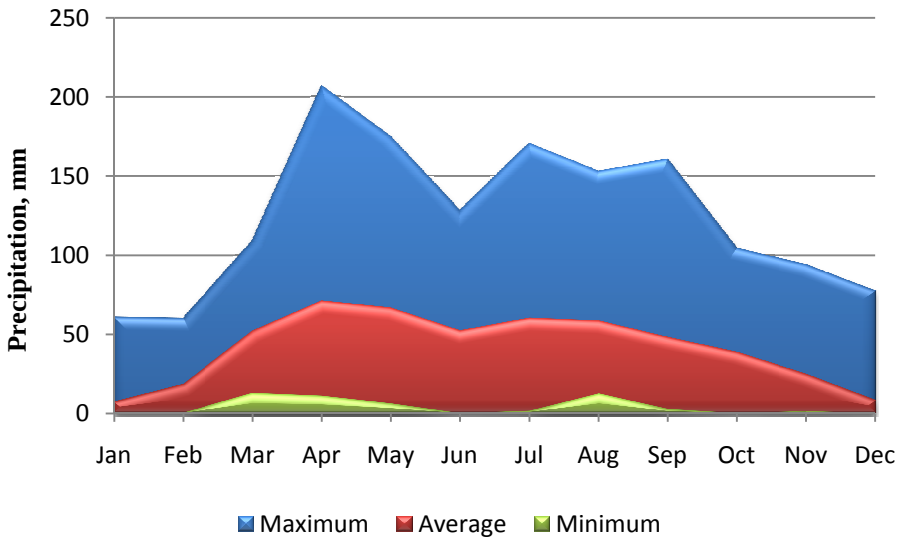

Figure 3.13 – Monthly precipitation values by data of Molodyozhnaya station (1963-1999)

The long-term average values of major meteorological parameters in the region (according to the monitoring values obtained at Molodyozhnaya station) are given in Table 3.3 below.

Table 3.3 – Long-term average values of major meteorological parameters in the planned BAS deployment site (by data of Molodyozhnaya station)

Meteorological parameters, units of measurement	Value
Direct radiation, kcal/cm^2	45.0
Total radiation, kcal/cm^2	100.6
Radiation balance, kcal/cm^2	30.5
Absorbed radiation, kcal/cm^2	70.5
Average ambient air temperature (annual), $^\circ$C	-11.0
Average annual atmospheric pressure, mbar	988.5
Average wind speed, m/sec.	12.6
Prevailing wind direction	E, SE
Average annual relative humidity, %	58
Annual cloudiness (total), point	6.6
Annual precipitations, mm	270
Number of snowstormy days per year, days	190

The readings of manual and automated meteorological monitoring performed by BAE explorers during their seasonal work at Mount Vechernyaya field camp are shown in Table 3.4 below.

Table 3.4 – Average monthly and extreme values of major meteorological parameters performed by BAE explorers at Mount Vechernyaya field camp by manual and automated meteorological measurements

Meteorological parameter	2006-2009				2012	
	December	January	February	March	January	February
Average ambient air temperature, ^{0}C	- 1.9	- 2.5	- 9.2	- 10.4	-1.7	-6.3
Min. air temperature, ^{0}C	- 3.8	- 6.9	- 16.4	- 19.4	-10.3	-16.0
Max. air temperature, ^{0}C					7.0	3.4
Relative humidity, mean (%)	66	64	56	75	70.3	69.5
Wind speed, mean (m/sec.)	5.5	14	18	12	18.4	15.4
Max. wind blast, m/sec.	17	30	52.2	53.1	36.8	30.9

According to the BAE measurements, the average wind speed at summer at the Mount Vechernyaya area was reported to range 12.0-18.4 m/sec., which is slightly higher than the average annual wind speed at Molodyozhnaya station. The maximum recorded wind blasts reached 52-53 m/sec. The distribution of wind speeds is shown at Figure 3.14.

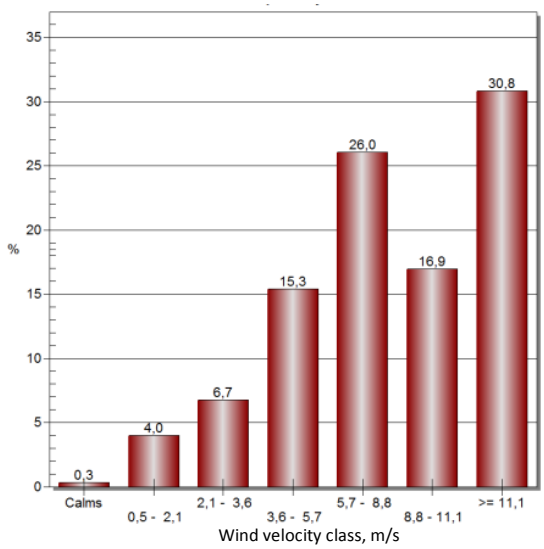

Figure 3.14 – Distribution of wind speeds by data of observations at Mount Vechernyaya meteorological station, summer season 2012-2013

The most frequently atmospheric phenomena (for the period of monitoring) were snow, drifting snow and snowstorms. In addition, during December - January an optical atmospheric phenomenon - halo - was also observed.

3.6. Flora and fauna

Living organisms at the eastern Tala Hills (in the vicinity of the Belarusian Antarctic station intended placement) are mainly found at the surface of rocky outcrops in clusters of melt water, freshwater lakes, in the bays of the Alasheeva Gulf, Cosmonaut Sea. Some species are

spread around all the possible places for living, some species are found at certain locations only. In addition, there are several areas with the greatest biological diversity, as pointed for monitoring (see the map).

To the date, in the Mount Vechernyaya area 3 kingdoms of living organisms revealed. Plants and Fungi kingdoms are represented by lower groups only, i.e.: lichens (Lychenophyta) - 28 species of 3 groups, including 7 species being endemic to Antarctica; bryophytes (Bryophyta) - 3 species; seaweed (Algae) - 79 species of 8 groups. Fungi - 1 lichenophylic specie (living on lichens), Arthonia molendoi.

Almost constant low humidity, low temperatures and strong winds, causing withering and corrosive effect on the soil and plants, create very unfavorable conditions for plant organisms. Yet, where the appropriate conditions of permanent sufficient soil moisture exist in local landscapes, vegetation is more noticeable, as compared to dry places. Plants of one or more species settle separately in the area or form clumps ranging from several centimeters to several decimeters.

Lichens are widely spread. They settle not only in shelters, but also in parts of windward rocky ledges, sometimes close to ice. Observations have shown that the plants covered with snow are further blanketed by a protective layer of ice, which protects them from the corrosive effects. The substrates for lichens there are rock, loose soil, as well as other plants.

Crustaceous lichens, coloured dark gray or almost black, turn to be most common in the area. They are found on the surface of rocks in the form of individual spots, sometimes reaching several square meters. Due to the fact that the area is dominated by the southern and south-easterly winds, lichens are usually found on the northern and north-western slopes, sheltered from the wind. Here, lichens grow on mosses, but most of them accommodate on the rocky substrate.

The second substrate to settle widely Antarctic lichens are mosses, which usually live there on sandy, highly humid ground, often near the melting snow on the northern slopes. On the southern slopes of Mount Vechernyaya, no overgrown mosses are found.

The third substrate for lichen colonisation are sand pockets in the depressions between the stones, located on the northern slopes of Mount Vechernyaya.

Following the lichens, the most common component of the vegetation in the area are mosses. They settle in areas with constant and adequate moisture and are found at the bottom of the Nizhneye Lake (which does not freeze in winter).

At a distance of 20-30 m from the BAS deployment boundary, there is an integrated ecosystem (biocenose), represented by the colonies of lichens, mosses and terrestrial algae. The total biocenose area is approximately 150 m^2. Mosses, representing presumably only one group, occupy the area of about 10-12 m^2. Ground algae (one group) occupy the area of about 12-14 m^2. Mosses and algae are confined to the moraine with high content of fine soil (microprofile-developed soil). Lichens of crustose and foliose groups count at least eight species. The approximate area occupied is about 50 m^2. Lichens are widely spread both on melkozem substrates and on rocky outcrops, as well as on moss cushions. To avoid damage to

the biocenose in the process of the nearby BAS performance, the area of vegetation is expected to enclose with special marking. At the same time, no complex community is located directly within the boundaries of the BAS deployment, which may be damaged as a result of human-caused performance. Scattered islands of lichens located within the BAS boundaries are represented by 4 species that are common and widespread in this oasis. Their total area of projective cover forms less than 1% of the BAS site area.

Large clusters of mosses, lichens and ground algae are reported at the foot of the Rubin Hill (height 78.7 m, approx. 600 m NE from BAS, point 1), at the foot of Mount Vechernyaya, east of the Gnezdovoy Cape (approx. 1 km NW from BAS, point 7), in the vicinity of Hill 46.8 (Adelie penguin colony at the Gnezdovoy Cape and nearby areas, approx. 1.5 km NW from BAS, point 4), in the vicinity of Hill 64.2 (approx. 3.5 km NW from BAS, point 8).

Examples of moss and lichens communities at Mount Vechernyaya are shown at Figure 3.15.

Figure 3.15 – Characteristic ecosystems (cenoses) at the planned BAS construction area: a) moss and lichen community in rock crevice, b) moss and lichen community at the bank of a temporary lake, c) lichen community at leeward slope of ravine, d) moss community

The animal kingdom (Animalia) is represented by 12 groups. Sponges (Spongia) - 3 species. Flatworms (Plathelminthes) - approx. 10 species, being fish parasites. Nematodes (Nematoda) - approx. 10 species. 1 of them is a free-living specie, the rest are fish parasites. Rotifers

(Rotatoria) - 3 species. Acanthocephala (Acanthocephala) - 2 species of fish parasites. Cnidarians (Cnidaria) - 9 species of two groups: hydroids (Hydrozoa) - 7 species and coral polyps (Anthozoa) - 2 species.

Annelida (Annelida) - 12-13 species of two groups: polychaetes (Polychaeta) - approx. 10 species; leeches (Hirudinea) - 2-3 species. Mollusks (Mollusca) - 5 species of class gastropods (Gastropoda).

Arthropods (Arthropoda) - approx. 30 species of 5 classes: crustaceans (Crustacea) - approx 15 species (included in both marine and freshwater plankton and benthos); sea spiders (Pantopoda) - 1 specie; arachnids (Arachnida) - approx. 10 species (mites that live in clusters of lichens and mosses); Entognatha insects (Enthognatha) - 2 species (collembola class (Collembola), inhabit clusters of mosses and lichens); Ectognatha insects (Ectognatha) - 1 specie (class Mallophaga (Malaphaga), skua parasites). Tardigrade (Tardigrada) - 1-2 species.

Echinoderms (Echinodermata) - approx. 10 species of classes: sea urchins (Echiuroidea) - approx. 4 species (some species form large clusters of up to 60 specimens per m^2); starfishes - approx. 4 species; brittles - 1 specie; holothurians - 1 specie.

Chordates (Chordata) - 13 species of three classes: bony fishes (Osteichtyes) - 5 species (all species, except for ploughmen, are found in large quantities), birds (Aves) - 6 species (Adelie penguins (Figure 3.16), 2 colonies (Gnezdovoy Cape and McMahon Islands), south polar skuas (Figure 3.17) and Wilson's storm petrels nest in the vicinity of the colonies; emperor penguins, snow and blue marked petrels are located sporadically). Mammals (Mammalia) - two species of seals (Weddell seal - common to the area - and crab-eater seal – single occasions) (Figure 3.18).

Figure 3.16 – Adelie penguins at Gnezdovoy Cape

Figure 3.17 – Polar skuas nestling