third expedition, 1958–59. The gravimeter used for this measurement had a small and stable drift, which was confirmed by examining the observed closure at Cape Town and also from observed drift at Syowa Base and Cape Town. The result is:

$g_{\text{Syowa base}}=982.540$
Latitude 69°00.4′S
Longitude 39°35.4′E
Height 29.2 m

relative to $g_{\text{Cape Town}}=979.6470$. The accuracy of this value was estimated to be a few milligals. A similar observation was made on the fourth expedition, 1959–60, and it was ensured that this value has an expected accuracy.

Gravity measurements in the Ongul Islands were also carried out with the same gravimeter at several points of which positions were determined by the triangulation survey. Experimental observations on pack-ice in Lützow-Holm Bay were also made with the gravimeter and a rather high positive gravity anomaly was found in this region.

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ON THE FORMATION OF THE PUDDLES OF LÜTZOW-HOLM BAY*

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リュッツォウ・ホルム湾のパドルの生成機構について*

高 橋 喜 彦**

In January of 1957, when the First Japanese Antarctic Research Expedition was engaged in transportation for the establishment of Syowa Base on Ongul Island, Olav Coast in Lützow-Holm Bay, the traffic by weasel was greatly troubled by the existence of innumerable puddles on the fast ice fixed to the coast. But the

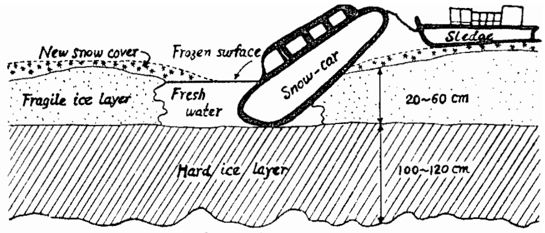

Fig. 1. Profile of the puddle on the fixed ice, by Kotaro Morita.

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puddle water contains only a trace of sea salt, and is good for drinking.

Fig. 1 shows a typical structure of the puddles concerned. Such a puddle is not a pool of water supplied from its surroundings, but the snow and fragile ice on the fast ice have changed into a pool by melting. When the air temperature falls a little the puddles are covered with a thin sheet of ice, upon which snow deposits, concealing the existence of the puddles. When the summer is over and the air temperature goes to fall, the ice becomes thicker and at last the puddles freeze up wholly.

According to the first wintering observation, the puddles were formed on November 22–23, 1957, and disappeared on February 6, 1958. From the climatological point of view, this period at Syowa Base corresponds to the early spring in snowy province in middle latitudes. Thus, such innumerable puddles may be compared with the patches of disappearing snow on the ground in the spring in middle latitudes. In the Syowa Base area, however, winter comes again before the snow melts entirely, and so the puddles exist during the whole summer.

On November 22 in the first wintering, when the wet-bulb temperature of air got over freezing point, the lower parts of the sastrugi-like snow surface became darkish. On the next day these darkish parts changed into puddles. This fact suggests that the puddles are formed from the interior of snow deposit, namely, before a distinct formation of puddles the snow and fragile ice down to a certain depth has fairly melted, leaving the surface unmelted. This may be explained from a "hot-house phenomenon" of the snow, as described below.

The snow is a semi-transparent medium for solar and long-wave radiations, but its absorption coefficient is larger for the latter than for the former. According to our observation, for example, the solar and nocturnal radiations cause the direct temperature rise and fall of dry compact snow to the depth of 10 cm and 3 cm respectively. That is, the snow would be warmed from its interior, and cooled from near its surface.

The heat conduction between the snow and the air goes to compensate more or less the radiative warming and cooling of the snow. Here, the deeper the layer where the absorption or the radiation takes place is, the less the gain or loss of heat is compensated by the transfer of heat through the surface of the snow, as it is clear from our calculations. Consequently, even if the gain of heat by the absorption of solar radiation is equal in amount to the loss of heat by the nocturnal radiation, that is, the net flux of the incoming and outgoing radiations vanishes to zero every day, the heat is accumulated little by little within the snow. Thus, the snow is a good hot-house itself.

Water and ice admit solar radiation much deeper than snow, but they are opaque for long-wave radiation, and so they are much better

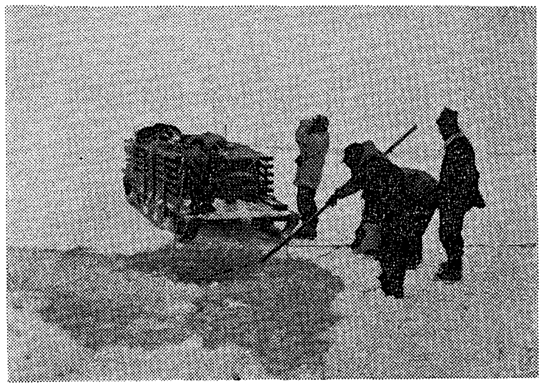

Fig. 2. Puddles in the vicinity of Ongul Island.

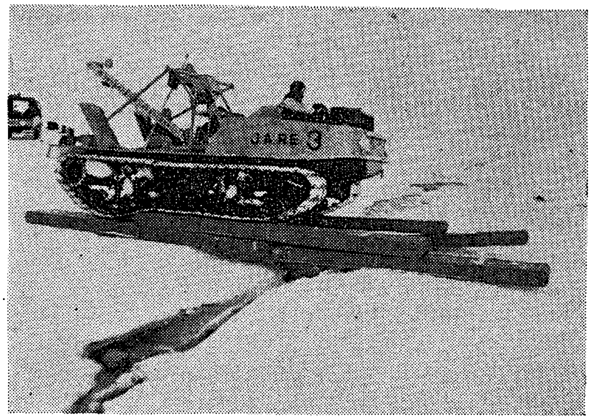

Fig. 3. Ccack in the fast ice.

hot-houses themselves. Therefore, once when the snow deposit gets wet or becomes icy, its melting will be accelerated by the increasing hot-house effect. This is the reason that the puddles are formed in the lower parts, getting wet first, of the uneven snow surface.

The puddles dealt with here are formed only in the fixed ice field, and none on land nor on island. This may be explained as follows. The surface temperature of the snow deposit approaching to 0°C in summer, the temperature throughout the layers of snow, fragile ice, and fast ice also approaches to 0°C, because the lower surface of the fast ice is kept at the temperature of about −1.5°C all the year by sea water. Thus, the snow and fragile ice on the fixed ice are easily melted when summer comes.

GEOMORPHIC FEATURES OF THE EAST COAST OF LÜTZOW-HOLM BAY, EAST ANTARCTICA*

Torao YOSHIKAWA** and Hiroshi TOYA***

リュッツォウ・ホルム湾東岸の地形*

吉川虎雄**・戸谷 洋***

Among landforms on bared rock areas along the east coast of Lützow-Holm Bay, glacially quarried surfaces and glacial throughs are most remarkable. And minor characteristic features of former glaciation, such as polishing, striation, grooving, and existence of erratic boulders, can be found throughout every height in these areas, the highest of which reaches 542 meters above sea-level in the SE part of the Langhovde District. The direction of movement of pre-existing ice suggested by these topographies is generally from E to W or from SE to NW, and is discordant to geologic structure.

A small glacial cirque which cuts in the smoothed surface formerly made by the ice sheet exists in the southern mountains of the Langhovde District; the bottom of which is about 270 meters above sea-level, and has a shallow pond. On the other hand, raised beaches about 15 to 20 meters high can be seen at several places in the Ongul Islands and the Langhovde district, which are partly covered by thin veneers of sand and gravel bearing fossil shells.

Present conditions, in short, are of the cold desert type. Desquamation, exfoliation, and wind erosion are most remarkable, and nivation is also in process. But geocryological processes are poorly developed, owing to dryness of loose deposits and their coarse-grained composition. On the one hand, cellular deflation of rocks and boulders of the kind associated with deserts can be seen in many places, but the process of its formation is still exactly uncertain. These erosive agencies have modified the original landscapes made by the ice sheet. It must be noticed here that minor features of glaciation on rock surfaces have been less subjected to these agencies in the southern region, i. e. the Skallen District

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