

7) REPORT ON GLACIER RECESSION IN PERU

by

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Since June 1945, nine bench marks, (consisting of a prominent cairn) have been established in the Southern and Central parts of the Peruvian Andes in order to determine the actual position of glacier termini and to measure possible glacier recession by later surveys. Those bench marks are distributed from S to N as follows :

1. — « San Francisco Glacier » ($14^{\circ} 37'$ South $69^{\circ} 20'$ West) at the « Ananea Mountain » situated in the « Cordillera de Carabaya » which is a continuation of the « Cordillera Real » coming from Bolivia, and which forms the hydrographic divide between the Titicaca- and Amazon Basins. Altitude of bench mark approx. 14604 ft. (see : Bol. del Inst. Geol. del Perú, No. 5, Lima 1946, Phot. 1 y 4).

2. — « Ampato Glacier » at the eastern slopes of « Volcano Ampato » ($13^{\circ} 47'$ South $71^{\circ} 14'$ West) North of the City of Arequipa. Altitude of bench mark approx. 18077 fr. (see : Bol. del Inst. Geol. der Peru, No. 5, Lima, Phot. 22, 23, 24).

3. — « Paccopampa Glacier » ($13^{\circ} 26'$ South $71^{\circ} 10'$ West) at the Southern slopes of « Peak Paccopampa », belonging to the « Ausangate Range » which forms a continuation of the « Cordillera de Carabaya » to the northwest. Altitude of bench mark approx. 14764 dt. (see : Bol. del Inst. Geol. del Perú, No. 5, Lima 1946, Phot. 19, 20).

4 — « Incachirascca Glacier » ($13^{\circ} 16'$ South $72^{\circ} 36'$ West), at the southern slopes of « Mount Salccantay », enormous peak northwest of the City of Cuzco between the Apurimac- and Urubamba Valleys. Altitude of bench mark approx. 15076 ft. (see : Bol. del Inst. Geol. del Perú, No. 5, Lima 1946, Phot. 13).

5 — « Umantay Glacier » ($13^{\circ} 15'$ South $72^{\circ} 35'$ West) at the WNW slopes of « Mount Umantay » north west of the City of Cuzco between Apurimac and Urubamba Valleys. Altitude of bench mark approx. 15748 ft.

6. — « Huaytapayana Glacier », in the « Huaytapayana Mountain Range » ($12^{\circ} 6'$ South $75^{\circ} 10'$ West) NE of the City of Huancayo, situated in the eastern Cordillera. Altitude of bench mark approx. 15420 ft.

7. — « Tuyujutu Glacier » ($12^{\circ} 5'$ South 76° West) on the south-eastern slopes of « Mount Tuyujutu » situated in the Western Cordillera «. Altitude of bench mark approx. 16076 ft.

8. — « Yanasinga Glacier » ($11^{\circ} 35'$ South $76^{\circ} 10'$ West) located in the « Western Cordillera », east of Lima. Altitude of bench mark approx. 15802 ft. (see : Bol. del Inst. Geol. del Perú, No. 5, Lima 1946, Phot. page 16).

9. — « Huagoruncho Glacier » ($10^{\circ} 30'$ South $75^{\circ} 50'$ West) at the western slopes of « Mount Huagoruncho » located in the Eastern Cordillera » in Central Peru, east of the town of Cerro de Pasco. Altitude of bench mark approx. 16732 ft

Of all these glaciers mentioned above only three have been remeasured in the recent past :

« San Francisco Glacier » is one of the few which may be considered still a valley glacier. Its tongue descends more than 1000 m from the area of nourishment. A bench mark was set in front of the terminus in Sept. 1945 by the present writer and revisited by Arnold Heim in March 1947. According to these investigations the glacier terminus had receded horizontally an amount approx. 16 m in only 19 month. This is not astonishing if we remember that its marginal recession had been almost

9 m in only 5 month and 35.5 m in more or less 5 years. (see : V. Oppenheim y Hans J. Spann, « Investigaciones Glaciológicas en el Perú », Bol. 5 del Instituto Geológico des Perú, page 27). Although there are no data on volume shrinkage it is obvious that the glacier is waning away rapidly.

In Sept. 1945 a bench mark was established at the ice-front of « Incachirasca Glacier », a transection type, and revisited eleven month later. A recession of 2 m was calculated which may be due to recession, but more likely to lack of exactness in our measuring methods.

The behavior of « Yanasinga Glacier », a small hanging icefield nearly reduced to its cirque and once a tributary of a huge glacier which occupied the Morococha Valley, has been summarized by several observers (Oppenheim 1944; Spann 1945; Spann and Petersen 1947) indicating a recession of about 14 m during that time.

It is to be mentioned that our methods of measuring (with tapemeasure and Brunton Compass only) are not at all satisfactory and the data obtained lack exactness; on the other hand surface ablation and volume shrinkage in general are not taken into consideration. It seems highly desirable that not only the ice-fronts (glacier terminus) but also the area of nourishment is mapped in a convenient scale. The planetable survey of the ice-front should be repeated every two years in order to accumulate enough data to record glacier oscillation in considerable detail.

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