

## Glacier Distribution in the Langtang River Region, Nepal

Hajime IIDA\*, Okitsugu WATANABE\*,  
Dhruba D. MULMI\*\* and Khadga B. THAPA\*\*

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*\*Water Research Institute, Nagoya University, Chikusa-ku, Nagoya 464*

*\*\*Meteorology Department, Tri-Chandra Campus, Tribhuvan University, Kathmandu, Nepal*

### 1. Introduction

Glacier distribution in a region is one of the most fundamental and essential factors for study in any investigation of the regional characteristics of glaciers. Study of the Himalayan glaciers, is hindered by the difficulty of obtaining a topographic map of the glaciated area, or insufficient data for the geographic accuracy. For these reasons, general statistics on the glaciers in the Himalayas and their distribution are greatly needed.

Since 1976, the glaciological research team of Nagoya University has made more than 13 flight observations of the whole area of the Nepal Himalayas (Higuchi et al., 1976, Fushimi et al., 1980). Also, during the same period field observations were carried out in the regions of Khumbu, Dhaulagiri and Langtang. Through these observations, a large amount of surface and aerial photographs and geomorphological data were accumulated. Recent image from manmade satellites have made it possible for the team to make a satellite image map of glacier distribution in the Himalayas and the Karakoram (Watanabe et al., in preparation).

Glacier inventory work are making steady progress in the following regions: Khumbu, Langtang, Dhaulagiri-Annapurna and Kanjiroba. A glacier inventory of the Khumbu region was reported by Fushimi et al. (1980), and works the Dhaulagiri-Annapurna and Kanjiroba regions are being continued.

### 2. Langtang Glacier inventory work

The Langtang region is located almost in the central part of Nepal and in the eastern part of the Gandaki River basin as seen in Fig. 1. Inventory work on glaciers along the Langtang River has been undertaken in connection with interdisciplinary studies attempting to reconstruct the climatic history of the Langtang region.

The glacier inventory work for the whole area of the Langtang region is still progressing and the final results will be reported in the future.

#### 2-1. Maps and other materials

The following maps and materials are used for this inventory work.

- a. One-inch/one-mile map made by the survey of India,
- b. A hand-made copy of the map on a scale of 1 to 50,000 made by the Government of the People's Republic of China,
- c. About 800 aerial photographs taken by the Glaciological Expedition of Nepal (GEN) during the periods 1976, 1978, 1981 and 1982. They cover two-thirds of the Langtang region,

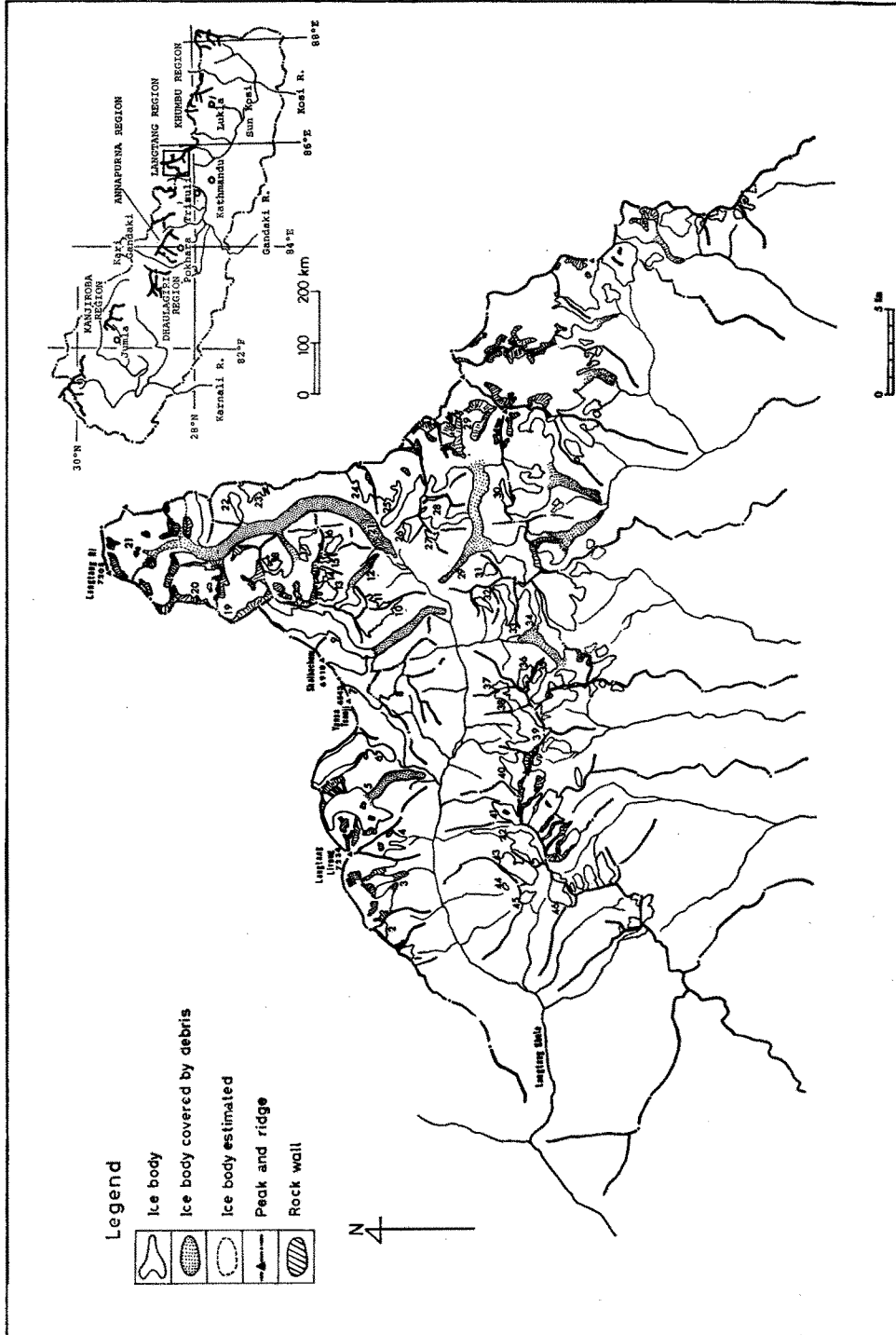


Fig. 1. Glacier distribution in the Langtang River region

**Table 1.** Glacier classification and description

Digit 1 Primary classification	Digit 2 Form	Digit 3* Frontal characteristic
0 Uncertain or misc.	uncertain or misc.	Uncertain or misc.
1 Continental ice sheet	Compound basins	Normal
2 Ice-field	Compound basins	Configurative restriction
3 Ice cap	Simple basin	Calving
4 Outlet glacier	Cirque	
5 Valley glacier	Niche	
6 Mountain glacier	Crater	
7 Glacieret	Ice aprons	
8 Ice Shelf	Groups of small units	
9 Rock glacier	Remnant	

\*Part of Digit 3 modified from IASH proposal (UNESCO/IASH, 1970)

- d. Ground photographs taken by the 1981 and 1982 Glaciological Expedition of Nepal (GEN), Boring Project team,
- e. Landsat images (e.g., images taken on September 16th, 1972 etc.)

## 2-2. Working procedure

First of all, actual glacier distribution in a region from areal photographs should be compared with glacier distribution indicated in working maps compiled by Mr. Akio Nagoshi on the bases of the same scale maps from the survey of India. Then the photographing area should be confirmed and topographic conditions examined. If necessary, errors in the working map should be corrected. When, preparations were completed, the following examinations were carried out:

- a. Confirmation of the existence (including identification of the local or official name) of a glacier and determination of its exact location on the topographic map.
- b. Estimation of the areal extent of a glacier including the surface area at altitude intervals of 500 m, together with the highest and lowest glacier elevation.
- c. Estimation of the snow line and the equilibrium line using areal photographic data and also data obtained from surveying.
- d. Morphologic matrix-type (coded as 3-digit number) classification using the table of glacier classification and description modified from the IASH proposal (shown in Table 1). The following phenomena are also to be using the following alphabetical markings: existence (0), Himalayan fluting (F), smooth appearance (S), ice fall (I), debris covered appearance (D), ogive formation (O), ablation pond (A), and latest formation of the lateral moraine (L).

Table 2 summarizes these classifications and provides a description of glaciers in the area concerned. The distribution of glaciers in the area along the Langtang River is shown in Fig. 1.

## References

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Watanabe, O., K. Higuchi, H. Fushimi, S. Takenaka and A. Nagoshi (in preparation): Glacier distribution of the Nepal Himalayas and its neighboring regions, and the Karakoram, Satellite Image Atlas of Glaciers, U.S. Geological Survey Professional Paper.

**Table 2.** Glaciers in the Langtang River region

Glacier* number	Surface area (km <sup>2</sup> )	Highest catchment elevation (m)	Highest glacier elevation (m)	Lowest glacier elevation (m)	Glacier classifica- tion description	Surface** character- istics FIOSDAL	Glacier name
01		5,334	5,334	4,877			
02		6,581	6,401	5,500			
03		7,234	7,234		681	o o x x o x x	
04		7,234	7,234	4,541	681	o o x x x x x	
05	6.24	7,234	6,100	3,962	521	o o x x o o o	Lirung gl.
06	4.38	6,745	6,300	4,221	531	o o x x x x o	Kimshun gl.
07	2.98	6,500	6,500	5,100	681	o o x x ? x x	Yala gl.
08	2.57	5,733	5,733	5,090	681	o x x o x o x	Yala gl.
09	8.42	6,715	6,506	4,114	531	o o x x o o o	Shalbachum gl.
10	2.25	5,995	5,995	4,920	671	x o x x x x x	
11	0.57	5,940	5,940	5,400	671	x x x o x x x	
12	1.42	5,995	5,957	4,721	522	o o x x o ? o	
13	0.90	6,150	6,000	5,240	641	o x x x ? ? o	
14	0.33	5,717	5,717	5,240	641	o x x x x ? x	
15	0.17	5,737	5,700	5,240	671	x x x o x x x	
16	0.56	5,737	5,460	5,150	671	x x x o x x x	
17	6.48	6,601	6,601	4,900	512	o o x x o ? o	
18	0.46	6,190	5,640	5,240	671	o x x o x x x	
19	7.29	6,601	6,100	5,020	422	o o x o o ? x	
20	4.89	6,373	6,373	5,100	432	o o x o o ? x	
21	30.86	7,239	7,239	4,450	511	o o x x o o o	Langtang gl.
22	0.70	6,032	5,620	5,010	682	o x x x x x ?	
23	1.01	6,758	6,758	6,000	682	o x x x x x x	
24	1.58	6,831	6,831	5,320	681	o x x o x x x	
25	8.02	6,831	6,831	4,520	522	o o x x o o o	
26	0.37	6,300	5,303	4,800	642	o o x x o x o	
27	0.26	6,145	6,145	5,791	671	x o x o x x x	
28	2.69	6,309	6,309	4,900	532	o o x x x x x	
29	25.71	7,007	7,007	4,206	511	o o x x o o o	Langshisa gl.
30	0.50	5,639	5,639	5,395	641	o o x x ? ? ?	
31	0.42	5,800	5,364	4,938	641	o o x x x x x	
32	0.39	5,800	5,242	4,938	641	o x x o x x x	
33	1.26	6,387	5,791	4,877	641	o o x x x x o	
34	7.10	6,387	5,547	4,694	521	o o x x x o o	
35	0.25	5,929	5,547	5,303	641	o x x o x x x	
36	0.59	5,929	5,639	5,090	641	o o x x x x o	
37	0.32	5,500	5,364	4,724	671	o x x o x x x	
38	0.76	5,639	5,364	4,694	671	o x x o x x x	
39	2.99	5,844	5,456	4,877	671	o o x o x x x	
40	1.68	5,846	5,846	4,724	641	o x x x x o x	
41	1.23	5,846	5,639	4,836	671	o o x x x x o	
42	1.77	5,862	5,639	4,938	671	o o x x x x o	
43	2.17	5,825	5,700	5,000	671	o o x x x x o	
44	0.07	5,215	5,212	5,030			
45	0.45	5,303	5,303	4,968			
46	1.44	5,303	5,303	5,000			

\*Glacier number used is provisional and unofficial

\*\* o; existing; x, absent; ?, doubtful