



## Supplement of

## Ice cliff contribution to the tongue-wide ablation of Changri Nup Glacier, Nepal, central Himalaya

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Fig. S1 – Map of Changri Nup Glacier showing the extent of the UAV DEMs and the location of the markers used. The background image is the multispectral Pléiades image of November 2016 (copyright : CNES 2016, distribution Airbus D&S).



Fig. S2 – Elevation changes on stable terrain from Pléiades DEMs of November 2015 and November 2016 as a function of curvature, slope and aspect.



Fig. S3 – Comparison of the field measured velocity with the Pléiades measured velocity. The dashed line is the 1:1 line.





Fig. S4 – Maps of elevation of Changri Nup Glacier (black outline) obtained from the original SRTM DEM (a) and from the SRTM DEM blurred with a five (b), thirty (c) and sixty (d) pixel Gaussian kernel.

Fig. S5 – Examples of the methodological processing for cliff 05, located on a slow flowing area (left panels) and cliff 11, located in a fast flowing area (right panels). For all the panels the cliff outlines are represented in UTM45/WGS84. a- influence of the glacier flow correction, and comparison with a uniform translation. B- example of analogous points needed for the triangulation regularization. c- difference between the individual cliff outlines and the cliff footprint needed to calculate the cliff contribution for gridded data (DEMs).



	Volume terrestrial		
Cliff ID	photogrammetry	Volume UAV	Volume Pléiades
	[m <sup>3</sup> a <sup>-1</sup> ]	[m <sup>3</sup> a <sup>-1</sup> ]	[m <sup>3</sup> a <sup>-1</sup> ]
Cliff 01	54066 ± 12735	51587 ± 12946	44259 ± 11303
Cliff 02	5538 ± 1361	5726 ± 1664	6464 ± 1877
Cliff 03	14374 ± 3486	9460 ± 3038	10345 ± 3318
Cliff 04	47771 ± 11733	49691 ± 12258	48075 ± 12066
Cliff 05	5543 ± 1442	6136 ± 1767	6802 ± 1975
Cliff 06	12562 ± 3020	13224 ± 3651	13459 ± 3736
Cliff 07	7146 ± 1709	7496 ± 2080	7762 ± 2169
Cliff 08	29685 ± 7092	29315 ± 7635	28748 ± 7596
Cliff 09	4034 ± 967	4203 ± 1167	3838 ± 1104
Cliff 10	10439 ± 2559	9143 ± 2472	10485 ± 2845
Cliff 11	1398 ± 386	1747 ± 595	1000 ± 431
Cliff 12	899 ± 350	542 ± 311	507 ± 339
Total	193453 ± 19647	188270 ± 20417	181744 ± 19436

Tab. S1 – Volume loss from the three methods for each cliff

Tab. S2 – 3D area changes of the twelve field monitored cliffs

	r		
			Relative
	3D area	3D area	area
Cliff ID	2015 [m²]	2016 [m²]	change (%)
Cliff 01	6126	8961	46
Cliff 02	1135	1496	32
Cliff 03	3650	2415	-34
Cliff 04	1915	1788	-7
Cliff 05	11323	11265	-1
Cliff 06	4099	6435	57
Cliff 07	749	756	1
Cliff 08	1286	1278	-1
Cliff 09	2897	1918	-34
Cliff 10	2659	2192	-18
Cliff 11	466	707	52
Cliff 12	818	732	-11
Total	37124	39942	8