



Einsatz Lawinenunfall Pakistan

2012









**Siachen_Gayari,
Jammu and Kashmir,
Disputed Area**

5 km



Teram Shehr Glacier

Lolofand Glacier

Siachen Glacier



KHUMBUNG LA

ཁུམ་བུང་ལ་

16580 FEET

HIGHEST MOTORABLE ROAD IN THE WORLD

MAINTAINED BY

PROJECT HIMANK

INDIA ROADS ORGANISATION

Military Camp





Siachen-Gayari Mountain Range



KARDU

Tansham

Khorkondus

Mandik

Saltoro Range

Bilafond Glacier

76°49'47.72" E 35°12'26.74" N

Gayari Valley

Goma

6.76 km

Image © 2012 DigitalGlobe
© 2012 Mapabc.com
© 2012 Google
Image © 2012 GeoEye

Google earth

Siachen, Gayari Valley, North Glaciers, 3D oblique

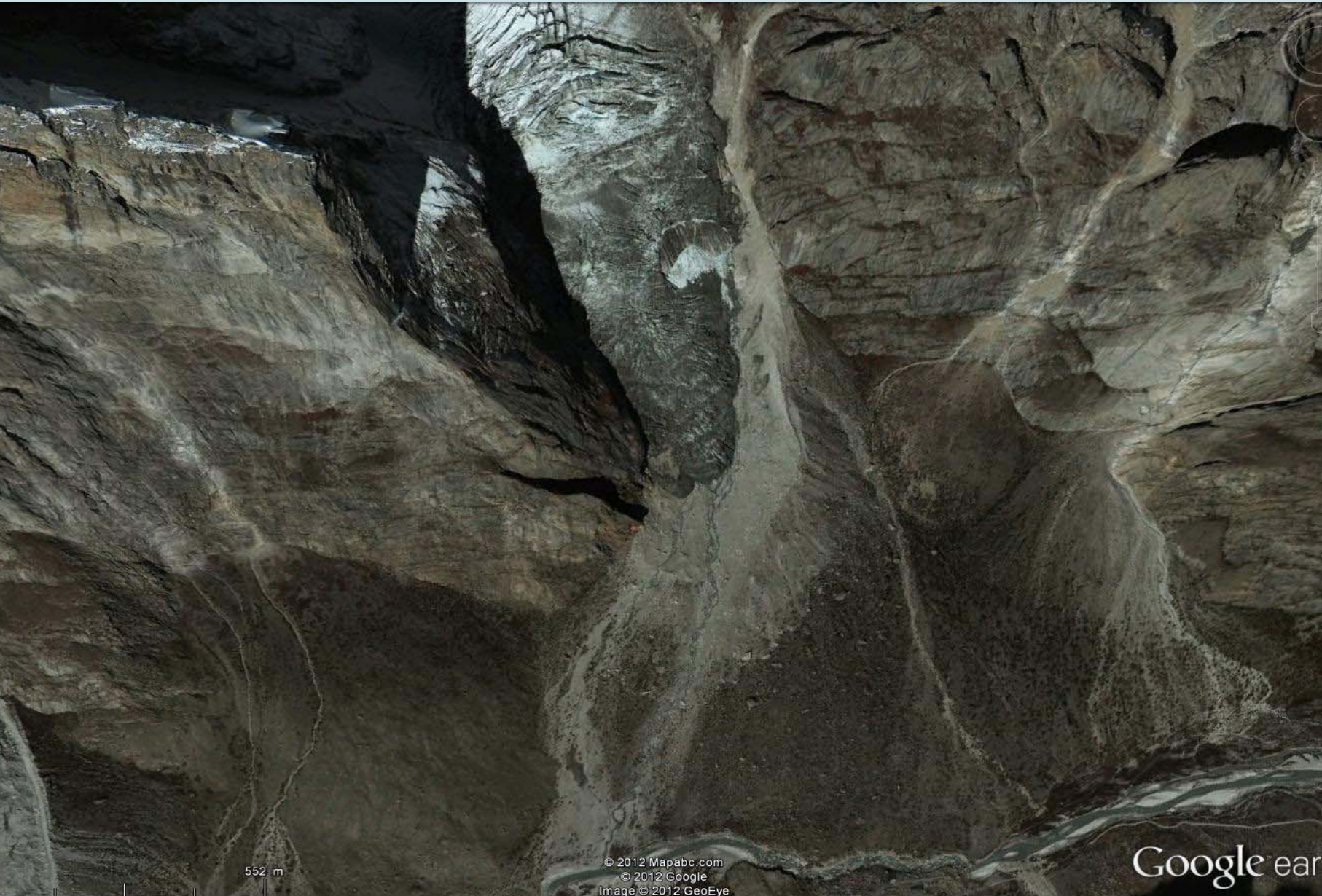


781 m

US Dept of State Geographer
© 2012 Cnes/Spot Image
© 2012 Google
Image © 2012 GeoEye

Google earth

Gayari North Glacier Tongue Pre-Event



552 m

© 2012 Mapabc.com
© 2012 Google
Image © 2012 GeoEye

Google earth

Avalanche

6 NLI

Shadow

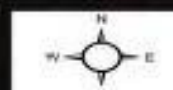
76°48'58.623"E
35°12'38.884"N

358 m

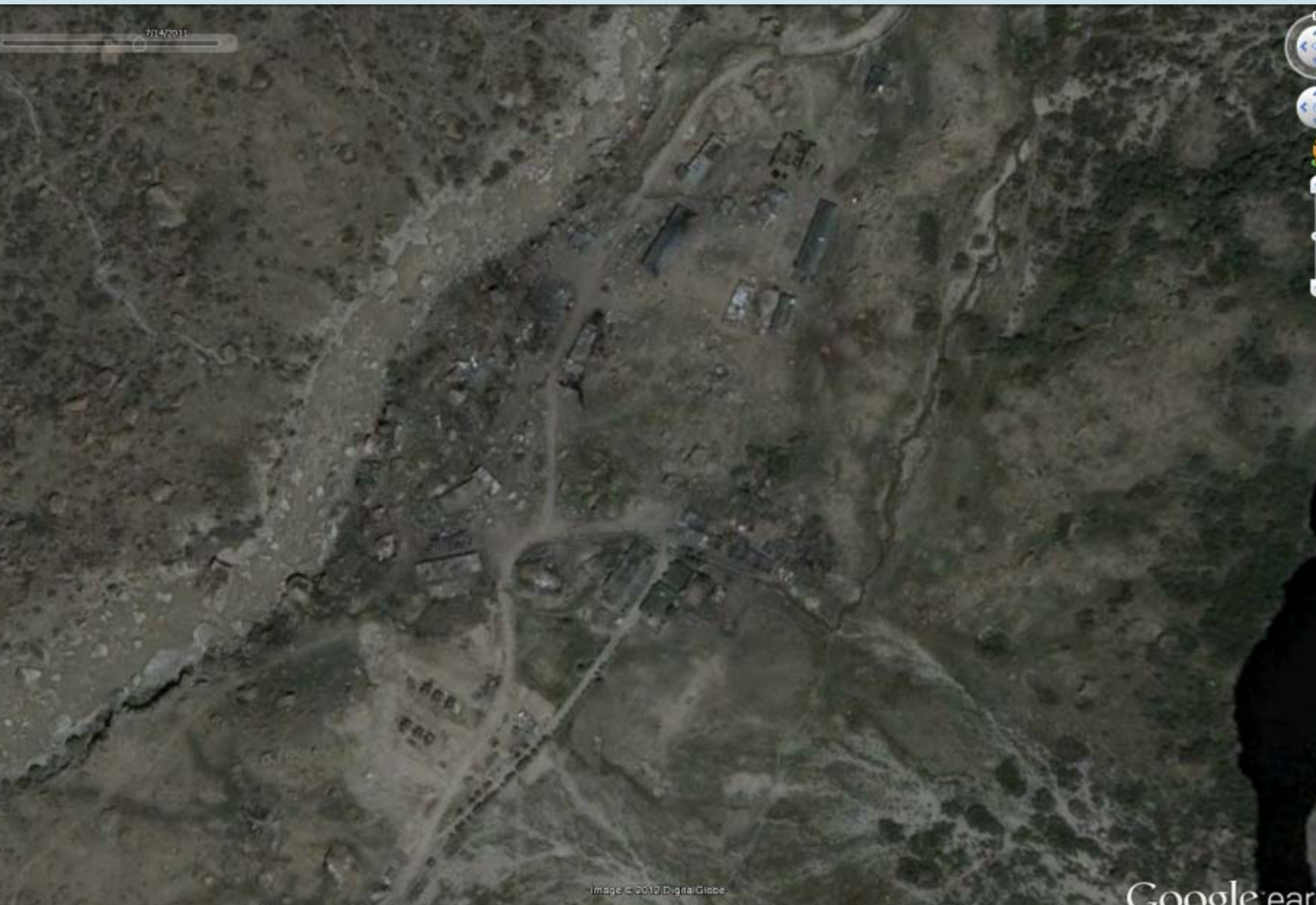
297 m

328 m

Road	River path
Camp Elements	6 NLI
Down Road	Distance from



Siachen_Gayari Military Camp Pre-Event



7/14/2011

Siachen_Gayari Military Camp Pre-Event

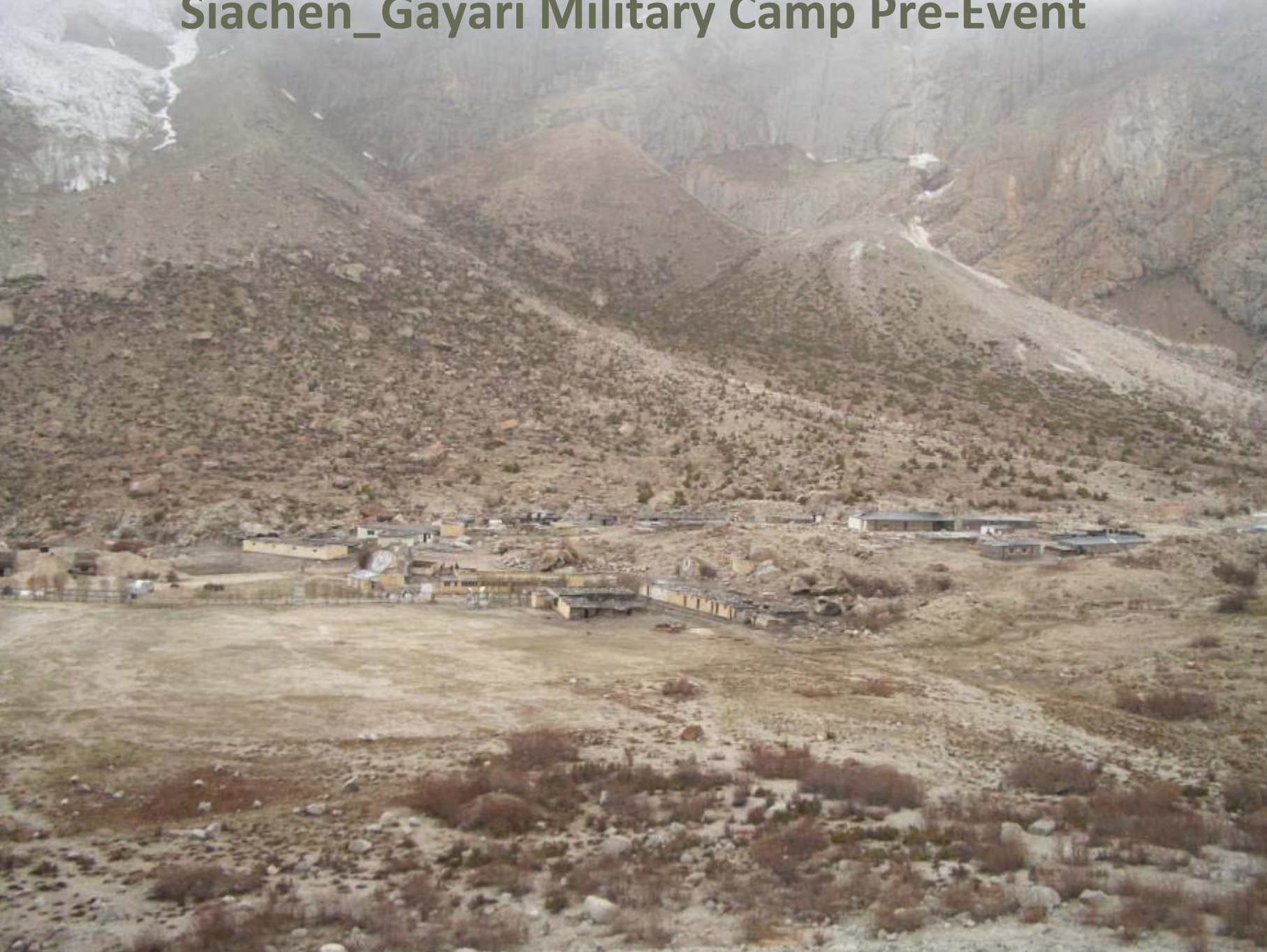


110 m

© 2012 Mapabc.com
© 2012 Google
Image © 2012 GeoEye

Google earth

Siachen_Gayari Military Camp Pre-Event

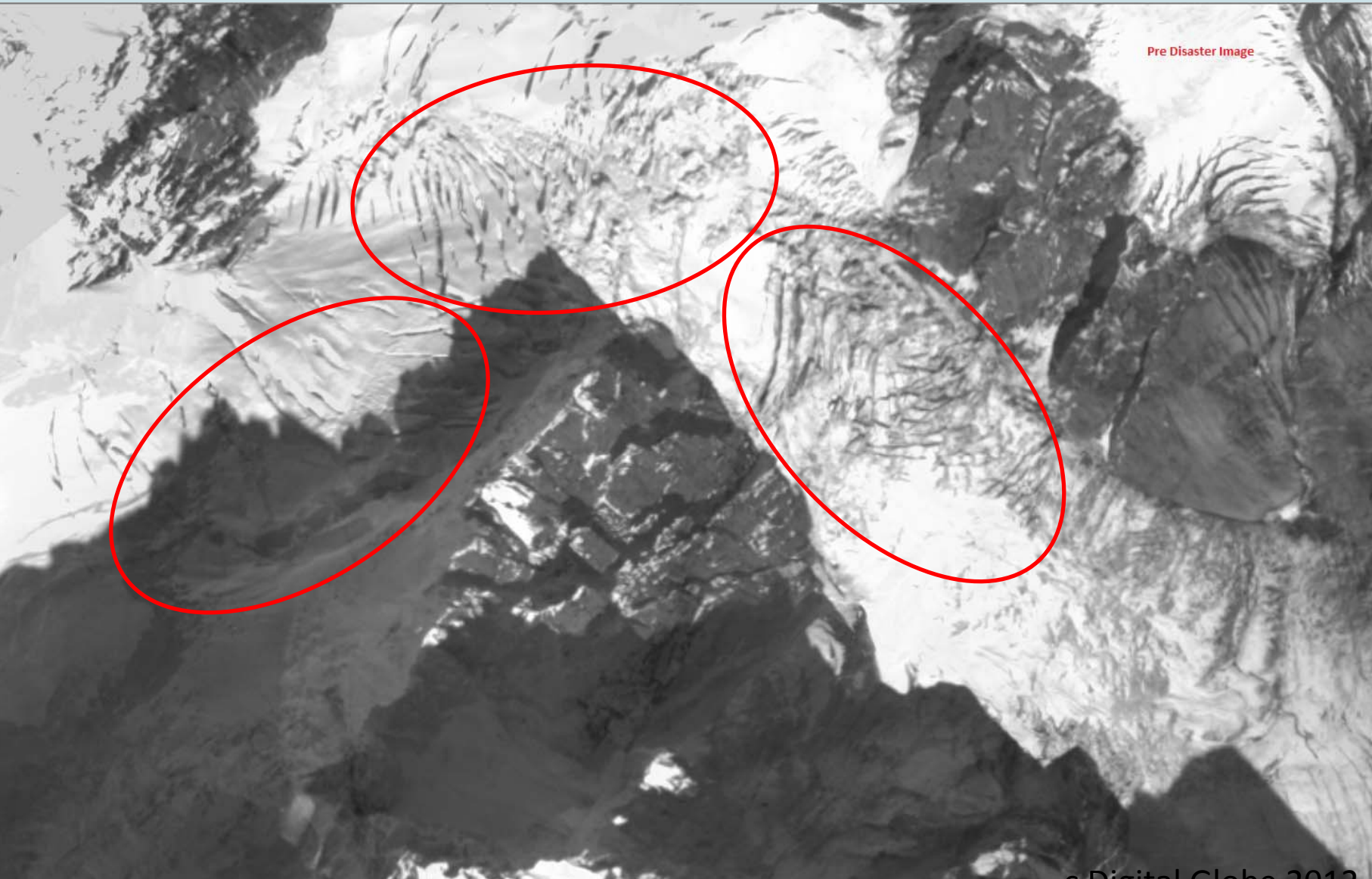


Slacien_Gayan Ice/Rock avalanche April 6, 2012, Origin?



Siachen_Gayari ice/rock avalanche April 6, 2012

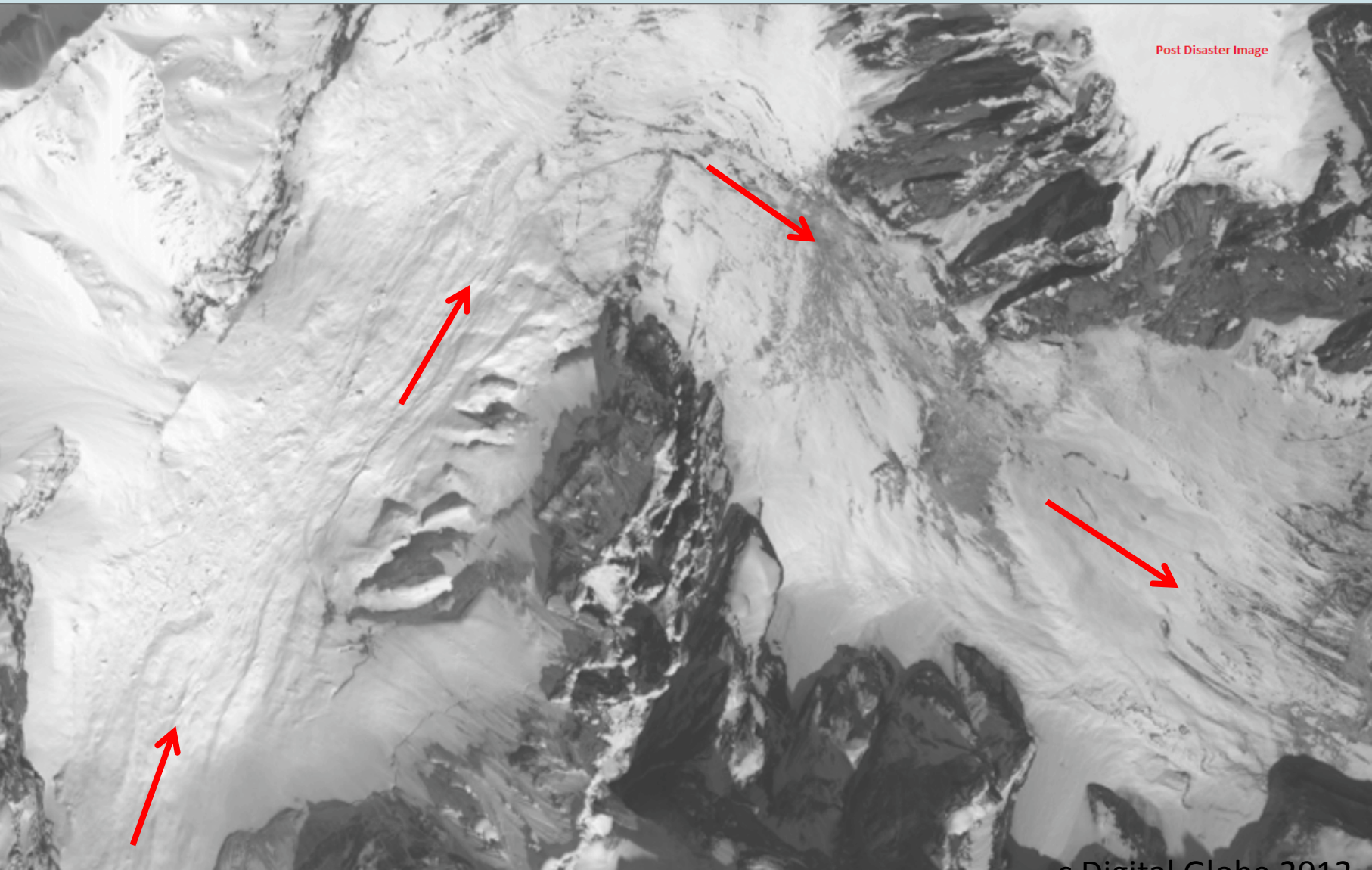
Upper glacier, pre disaster image. Seracs!



Pre Disaster Image

Siachen_Gayari ice/rock avalanche April 6, 2012

Upper glacier, post disaster image. Avalanche!



Gayari Military North Glacier Post-Event



7th April 2011















BLN
3547



































MAMMUT

457 kHz

SEND
press 2sec.
MODE
press 3x
SEARCH

Barryvox®











Gayari Slide
Formation of Lake
8 Apr12



Gayari Slide
Formation of Lake
8 Apr12



Gayari Disaster, Debris Cone, Front Wall, emponded Lake, opposite Avalanche 19. 04. 2012

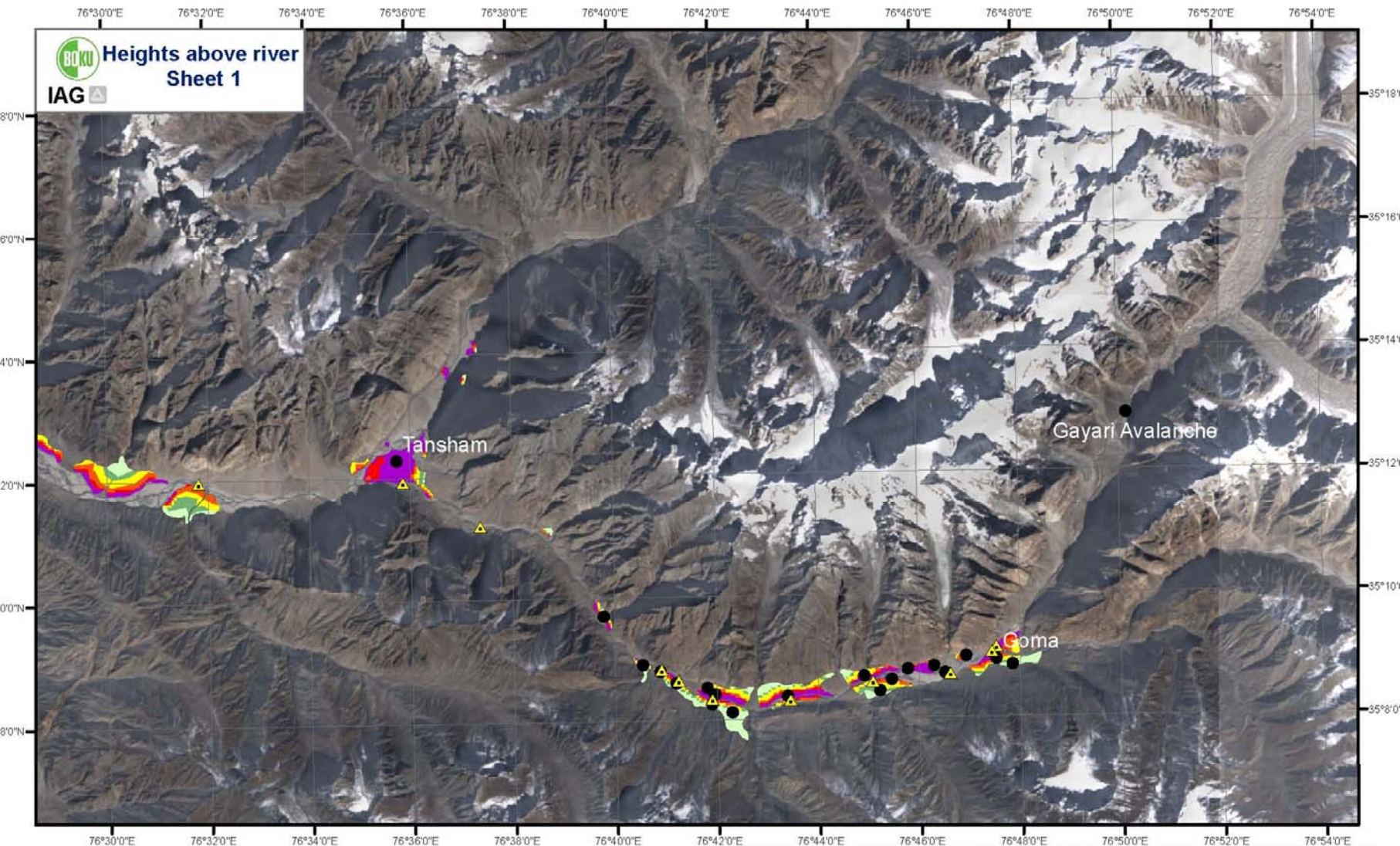


Gayari Debris Cone, Glacier, Moraine 19. 04. 2012

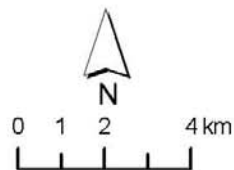








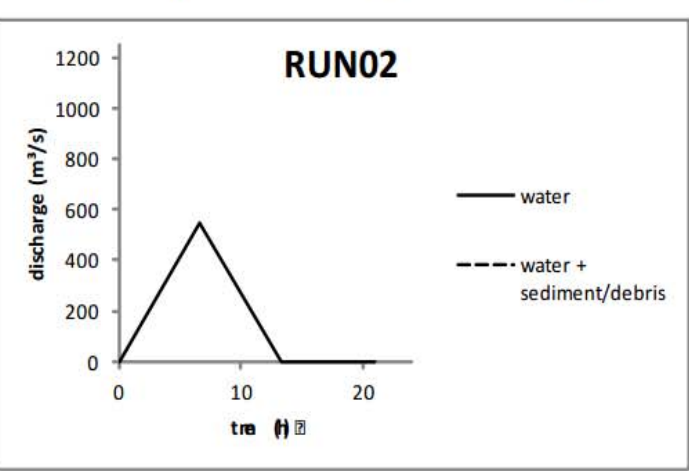
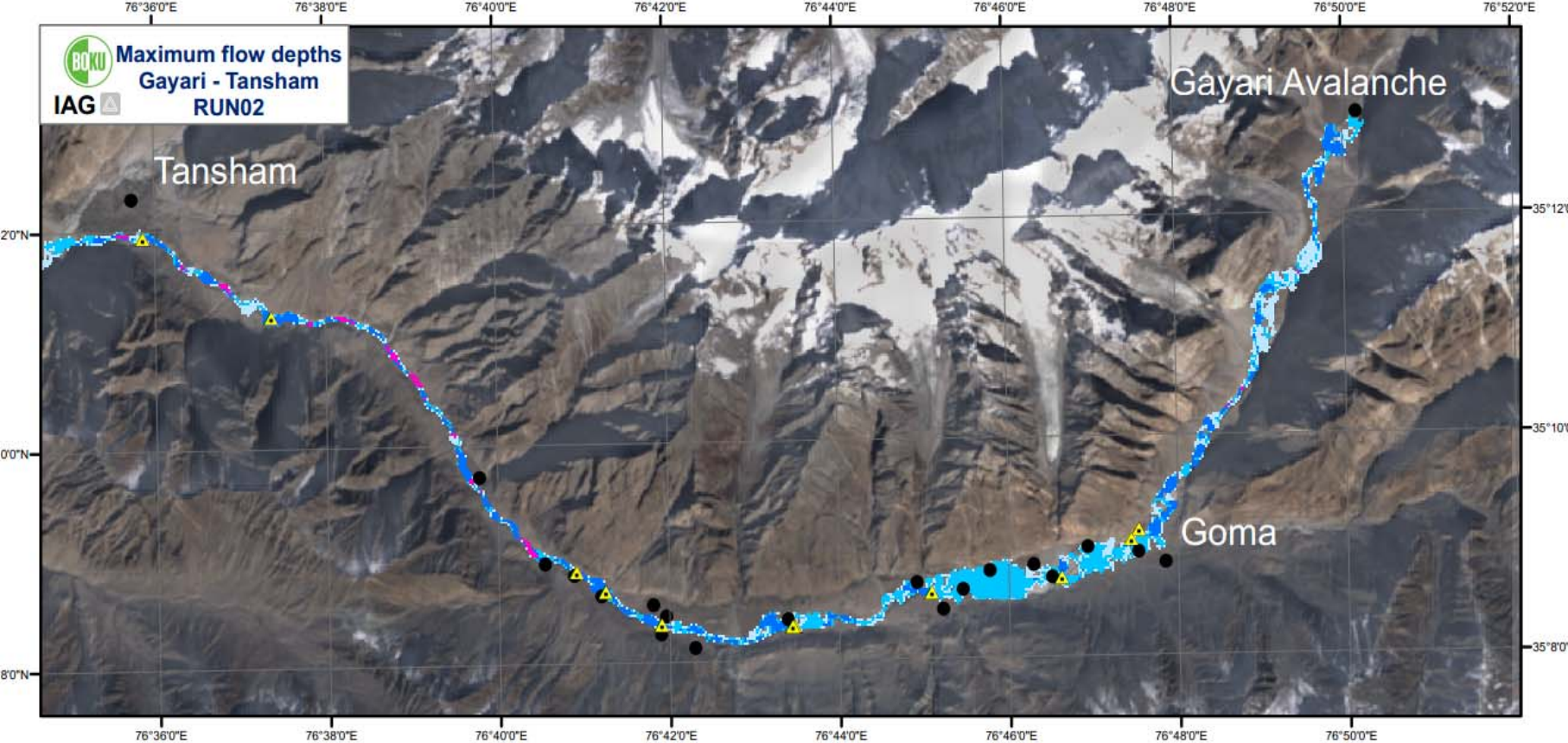
Elevation of cultivated areas above river



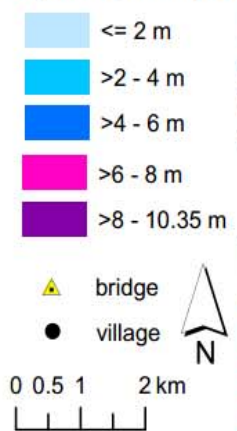
Terrain related layers derived from SRTM-4 (CIAT 2004)
 Cultivated areas mapped from LANDSAT-ETM+ composite image (NASA/USGS)
 Village names and locations of bridges taken from Google Earth

IAG BOKU

Please be aware that this map is only a rough overview of potentially threatened areas and not a hazard map. Uncertainties do exist, regarding the accuracy of the elevation model and interpretation of the LANDSAT imagery. Small patches of threatened cultivated land may not be shown.



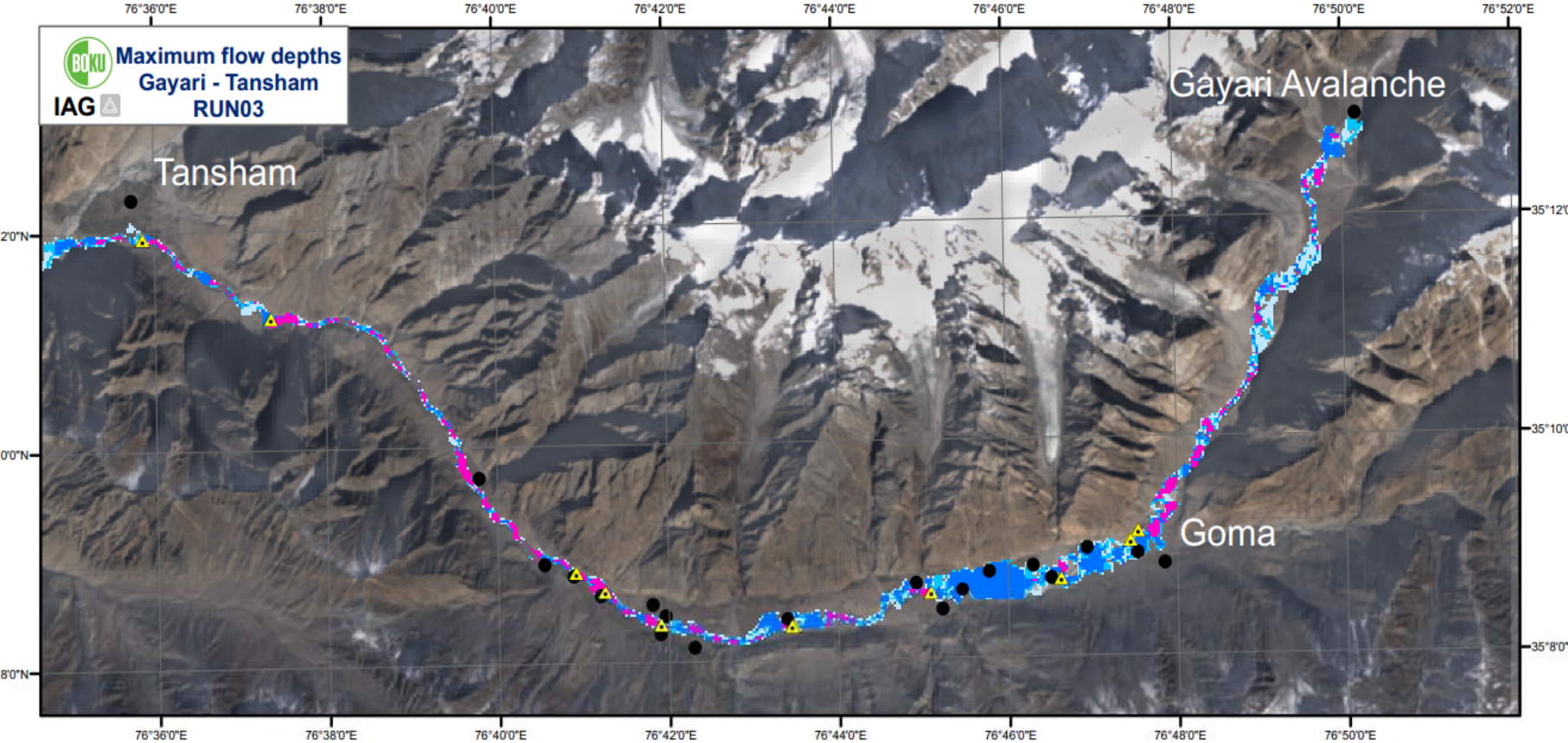
maximum flow depths from model runs (FLO-2D)



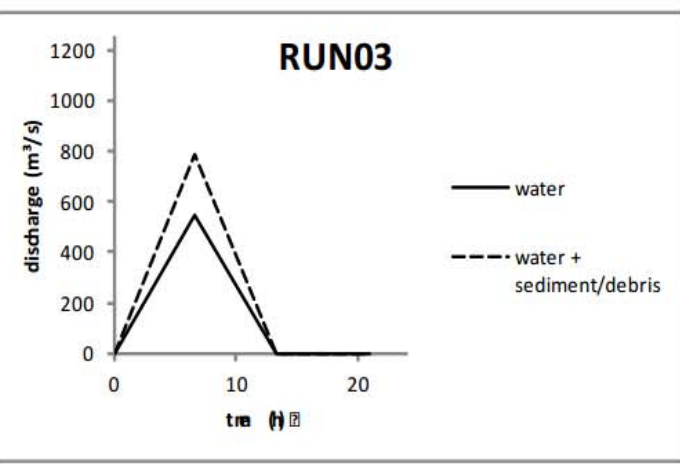
RUN02 assumes a clear water hydrograph with a peak discharge of 550 m³/s at t= 6.66 h. This is based on a dam height of 35 m and GDEM elevation data giving a lake area of approx. 1,225,000 m².

Terrain related layers derived from GDEM V2 (METI, NASA) and SRTM-4 (CIAT 2004)
Cultivated areas mapped from LANDSAT-ETM+ composite image (NASA/USGS)
Village names and locations of bridges taken from Google Earth

IAG BOKU
Please be aware that this map is only a rough overview of potentially threatened areas and not a hazard map. Uncertainties do exist, regarding the accuracy of the elevation model, interpretation of the LANDSAT imagery and modeling.



BOKU Maximum flow depths
IAG Gayari - Tansham
 RUN03



maximum flow depths from model runs (FLO-2D)

- <= 2 m
- >2 - 4 m
- >4 - 6 m
- >6 - 8 m
- >8 - 10.35 m

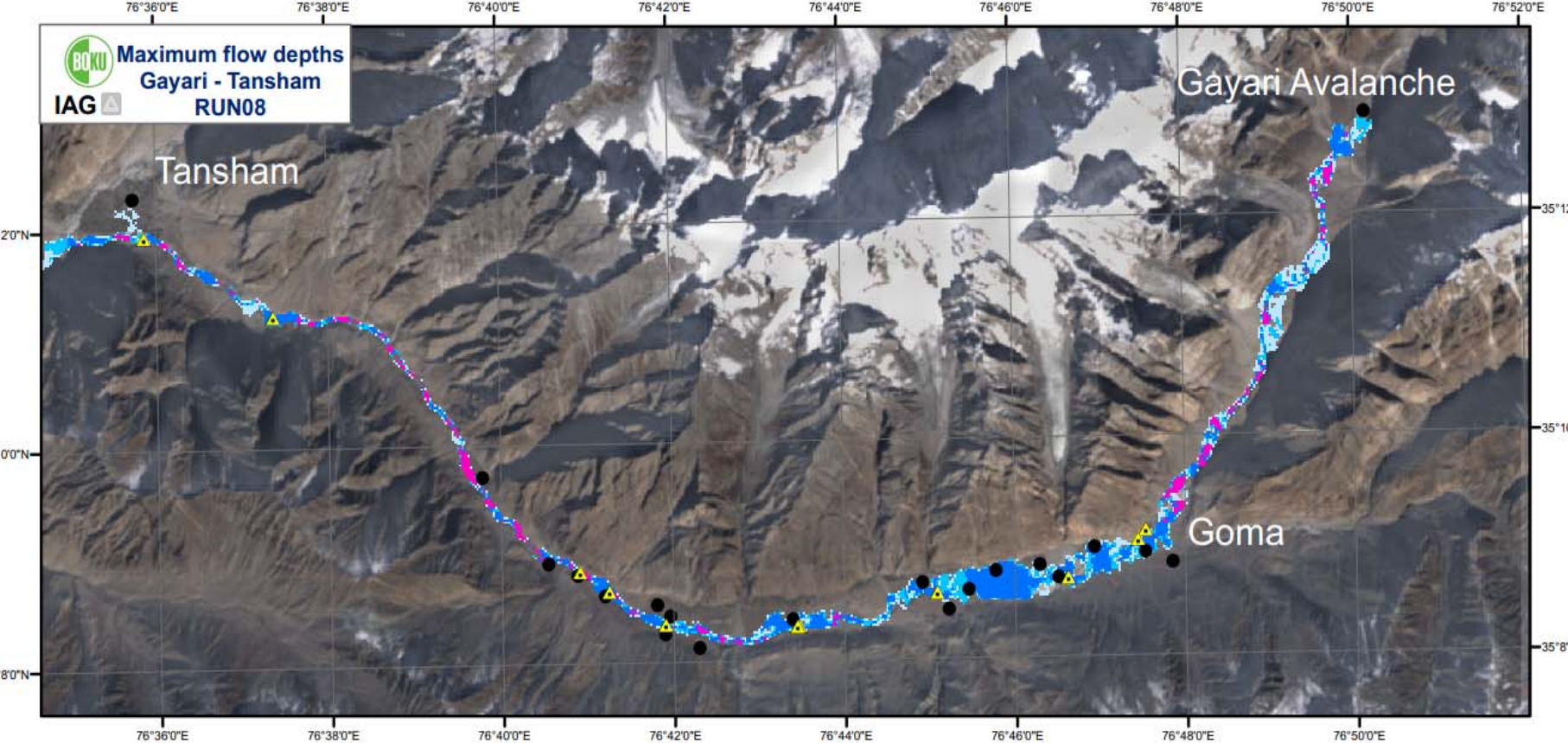
- bridge
 - village
- 0 0.5 1 2 km

RUN03 assumes entrainment of dam material and debris leading to a debris flow with a peak discharge of 785 m³ at t = 6.66 h. This is based on a dam height of 35 m and GDEM elevation data giving a lake area of approx. 1,225,000 m²

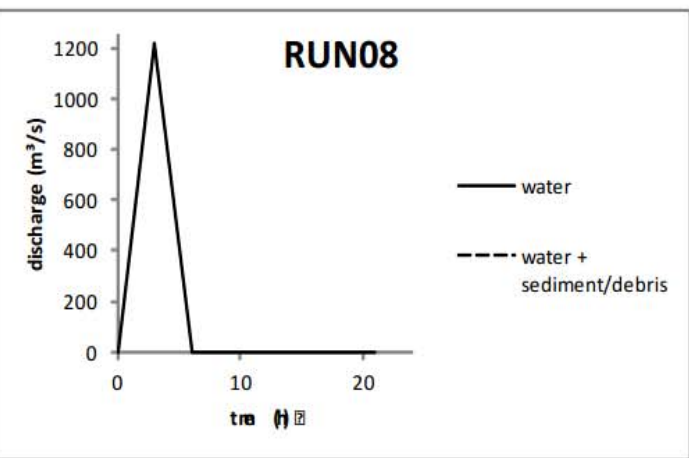
Terrain related layers derived from GDEM V2 (METI, NASA) and SRTM-4 (CIAT 2004)
 Cultivated areas mapped from LANDSAT-ETM+ composite image (NASA/USGS)
 Village names and locations of bridges taken from Google Earth

IAG BOKU


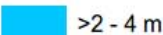


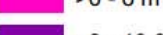
Please be aware that this map is only a rough overview of potentially threatened areas and not a hazard map. Uncertainties do exist, regarding the accuracy of the elevation model, interpretation of the LANDSAT imagery and modeling.





Maximum flow depths
 Gayari - Tansham
 IAG  **RUN08**

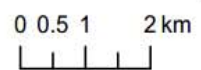


maximum flow depths from model runs (FLO-2D)

-  <= 2 m
-  >2 - 4 m
-  >4 - 6 m
-  >6 - 8 m
-  >8 - 10.35 m

RUN08 assumes that the peak discharge of a clear water flow occurs at $t = 3$ h, leading to a peak discharge of $1221 \text{ m}^3/\text{s}$. This is based on a dam height of 35 m and GDEM elevation data giving a lake area of approx. $1,225,000 \text{ m}^2$.

-  bridge
-  village

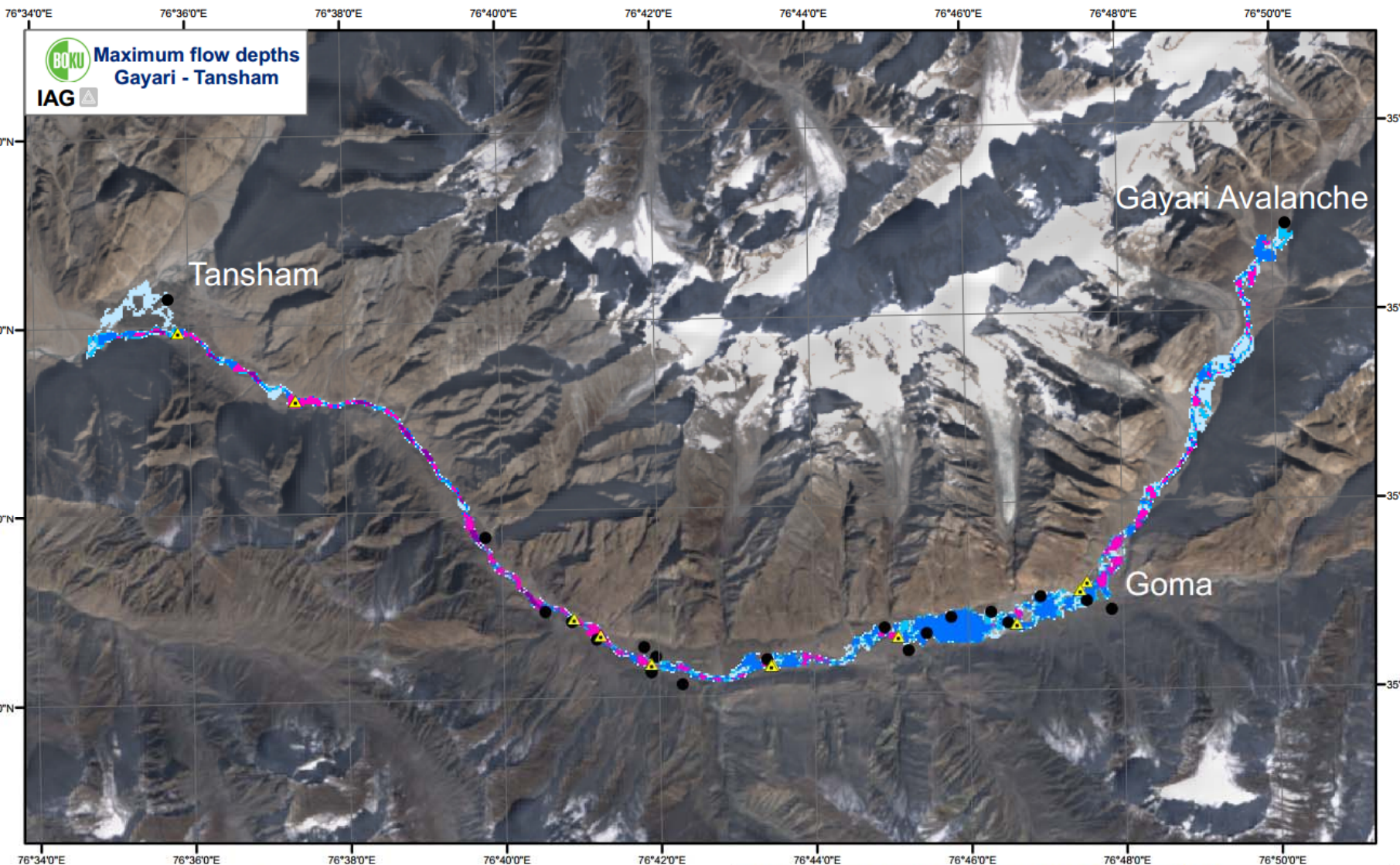


Terrain related layers derived from GDEM V2 (METI, NASA) and SRTM-4 (CIAT 2000). Cultivated areas mapped from LANDSAT-ETM+ composite image (NASA/USGS). Village names and locations of bridges taken from Google Earth.

IAG BOKU

Please be aware that this map is only a rough overview of potentially threatened areas and not a hazard map. Uncertainties do exist, regarding the accuracy of the elevation model, interpretation of the LANDSAT imagery and modeling.

Summary 2: Maximum Flow Depths



Maximum flow depths from model runs (FLO-2D)



Terrain related layers derived from GDEM V2 (METI, NASA)
Cultivated areas mapped from LANDSAT-ETM+ composite image (NASA/USGS)
Village names and locations of bridges taken from Google Earth

IAG BOKU
Please be aware that this map is only a rough overview of potentially threatened areas and not a hazard map. Uncertainties do exist, regarding the accuracy of the elevation model, interpretation of the LANDSAT imagery and modeling.



The surface of the lake on 12 April 2012 was approx. 12ha

Approx. 1430 meters of road have been blocked/flooded

Avalanche/Landslide measuring approx. area of 1.11 km²



Approx. 27 structures are under the deposition zone



The surface of the lake on 04 May 2012 was approx. 24.5ha

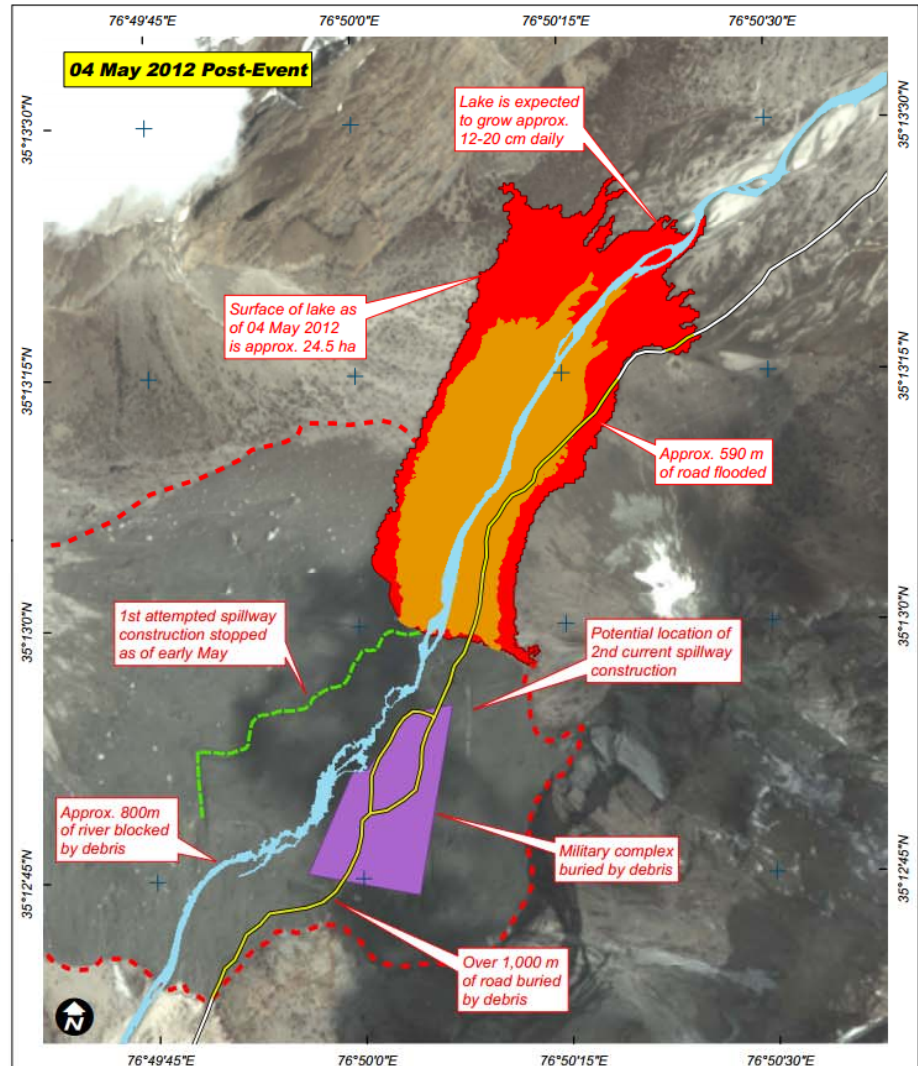
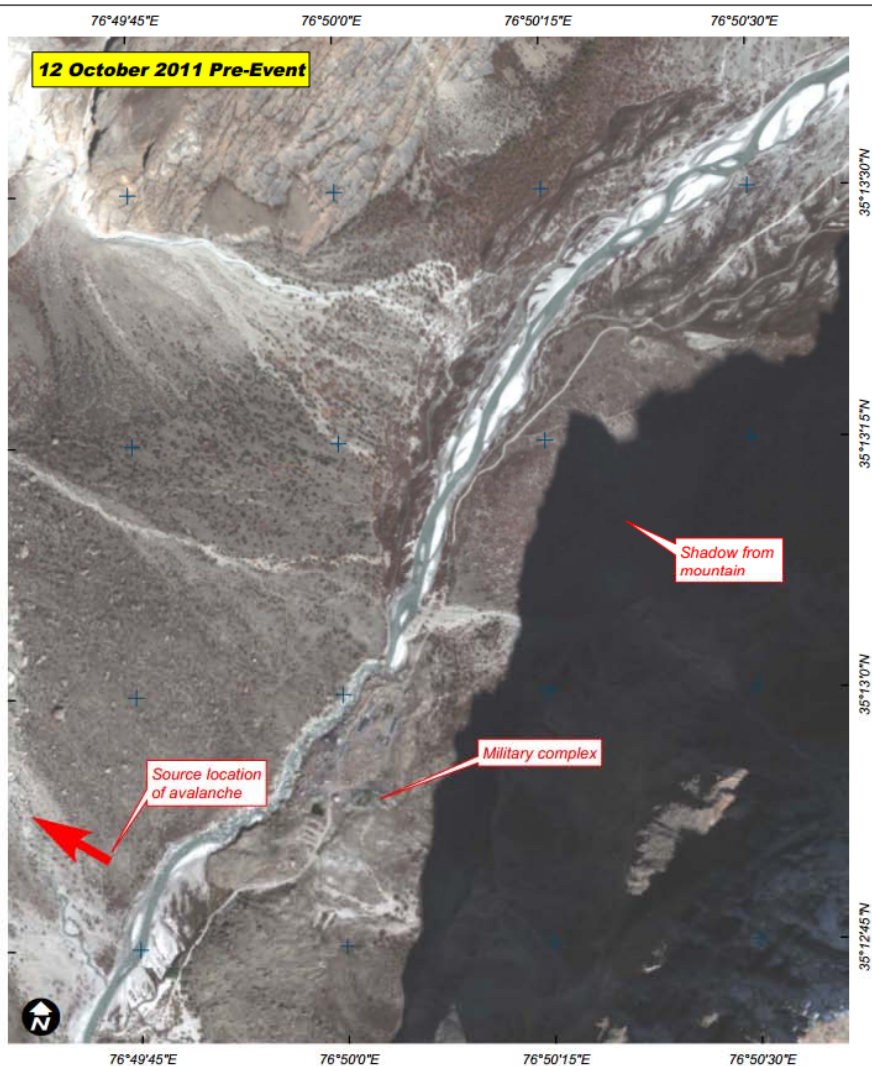
Approx. 1600 meters of road have been blocked/flooded

1st attempted spillway construction stopped as of early May

Potential location of 2nd current spillway construction

Avalanche/Landslide measuring approx. area of 1.11 km²

Shadows in imagery resulting from clouds

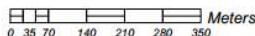


LEGEND

- Likely Undamaged Segment of Road
- Likely Flooded/Buried Segment of Road
- First Spillway Construction Attempt
- Location of Military Complex
- Lake Extent as of 04 May 2012
- Lake Extent as of 12 April 2012
- Pre-disaster River Extent

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24/7 Hotline: +41 76 487 4998

Map Scale for A4: 1:11,870



Satellite Data (Post-Event): Ikonos
Imagery Dates: 04 May 2012
Resolution: 4m
Source: KSAT
Satellite Data (Pre-Event): GeoEye
Imagery Date: 12 October 2011
Resolution: 5m
Source: KSAT

Other Data: USGS, NASA, NGA
Analysis: UNITAR / UNOSAT
Production: UNITAR / UNOSAT
Analysis conducted with ArcGIS v10
Coordinate System: WGS 1984 UTM Zone
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter

Slachen_Gayari Ice/Rock avalanche April 6, 2012, lateral moraine wall capped!



Next Slide

500 m

Siachen_Gayari ice/rock avalanche April 6, 2012



OpenStreetMap Streets Aerial Aerial with labels Topo

g™

50 m

200 ft **Latitude: 35.42186 Longitude: 76.83362 Northing: 4192957 Easting: 8553371 m Scale 1m, 128**

04. 05. 2012

UNOSAT

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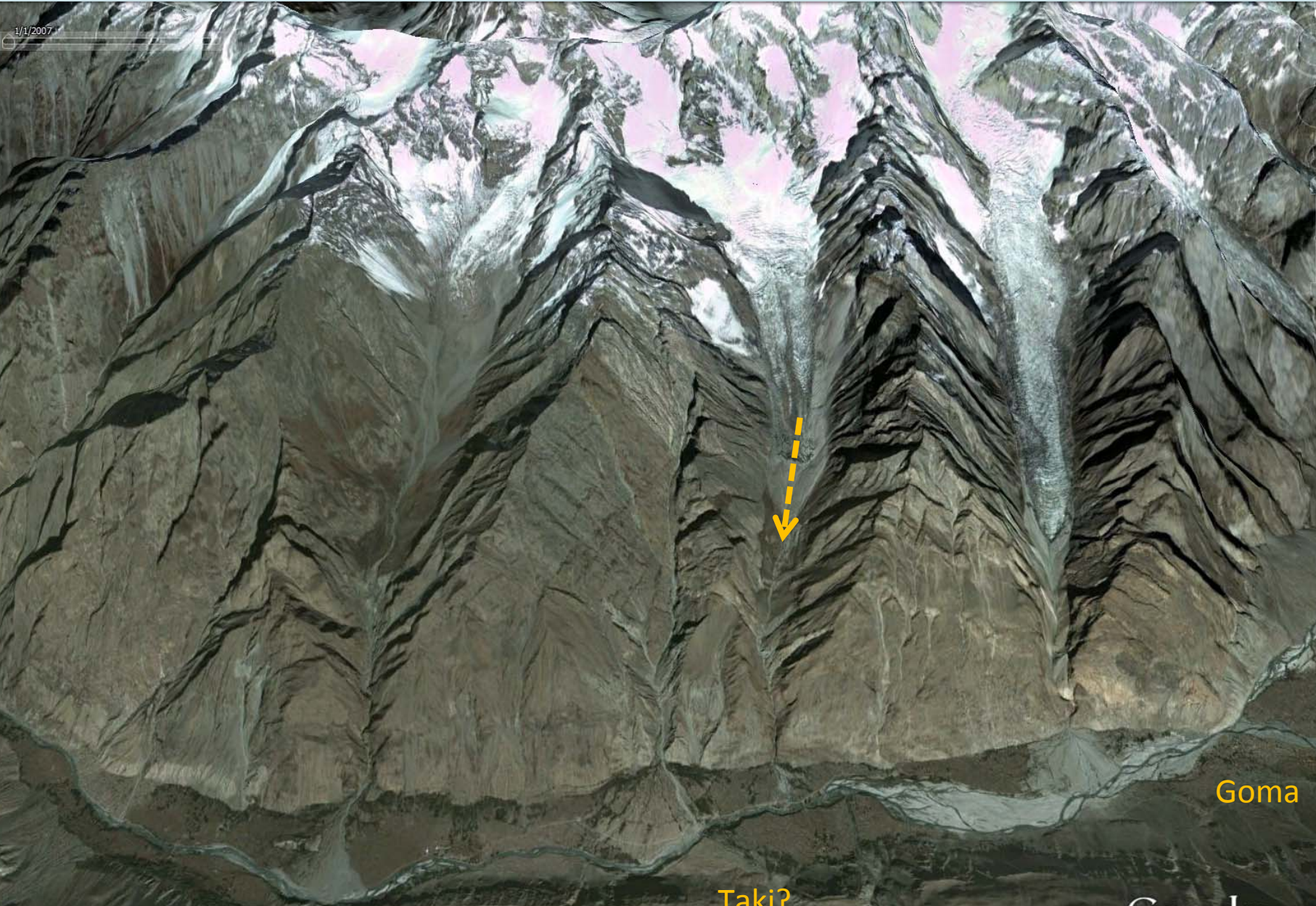
Proposed Cut

NF TRIM

Gayari artificial channel



Slachen, continued Glacial Threads



1/1/2007

Goma

Taki?

1828 m

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