GLOF Quick Analysis (SA Activation on Flash Flood in Barun River, Nepal)

Description on disaster situation

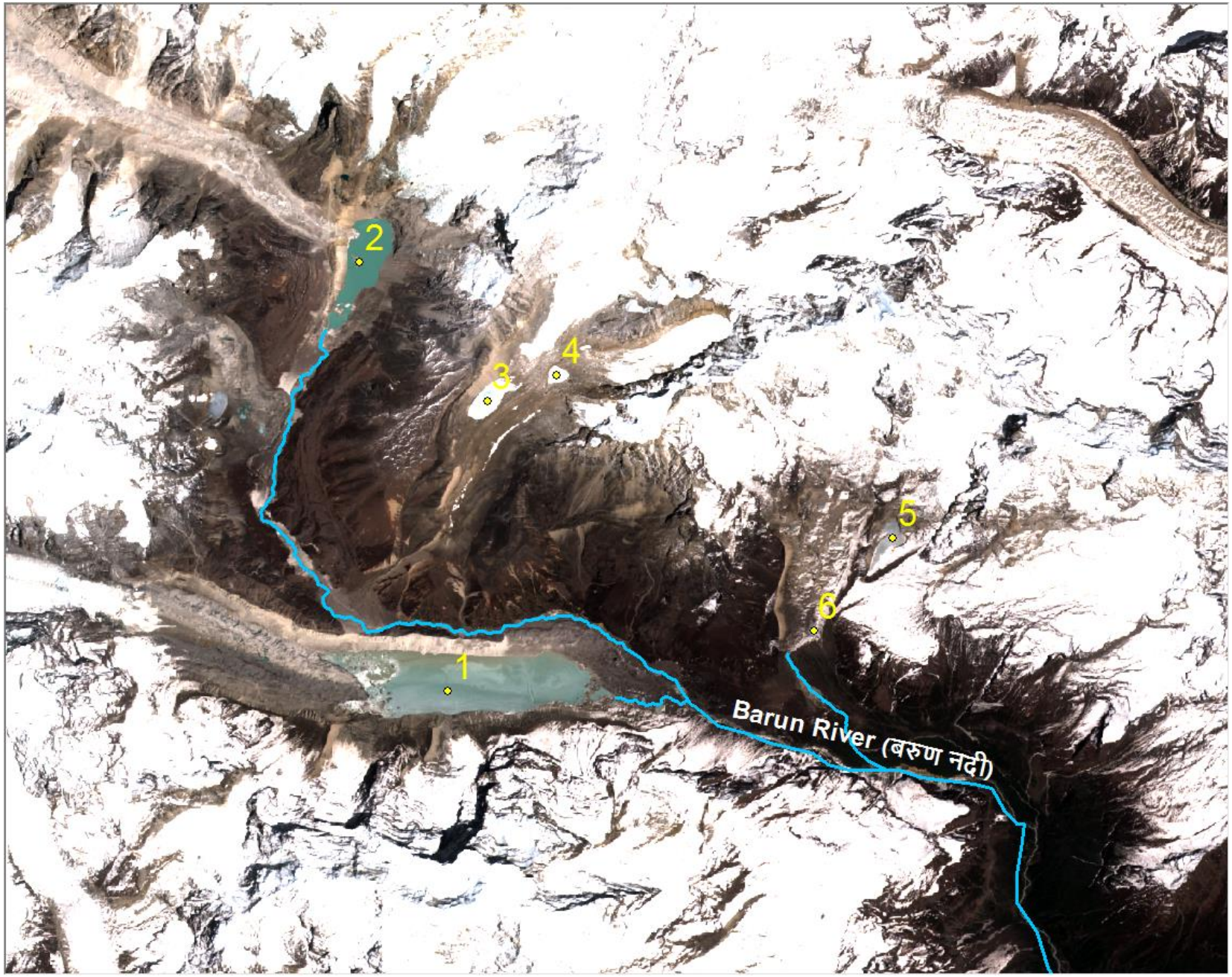
A big flash flood occurs on 20 April 2017 in Barun River (a Major tributary of Arun River) of Nepal from remote mountain area, that swept away several bridges, hundreds of cattle causalities and 5 houses were completely damaged. The debris taken by the flash flood has blocked the Arun River at the confluence forming a lake of 2 km length and 500m width in the gorge. Sentinel Asia was activated on 25 April 2017 with the following request:

1) To know the cause of flood and debris flow either landslide or glacier lake outburst?
2) To know the areal extent of the lake formed near the confluence

Data Used

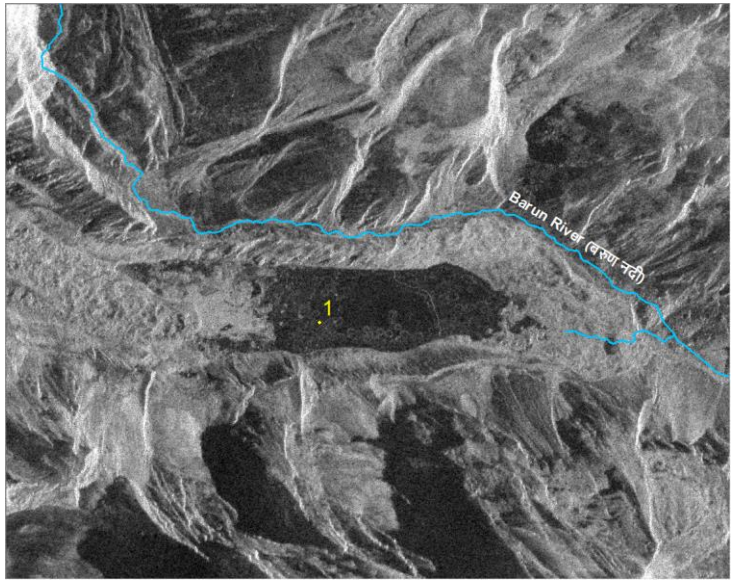
- ALOS-2/PALSAR-2 © JAXA
  - Observation on 23 December 2014 (archive) and 25 April 2017 (post-disaster)
  - HH polarization, Off-nadir angle 38.6 deg, 2.5m resolution
- Landsat-8 © USGS
  - Observation on 27 March 2017 and 18 April 2017 (archive)
  - Pansharpening, 15m resolution
- Sentinel-2 © ESA
  - Observation on 18 April 2017 (archive)
  - 10m resolution
- GIS data on River, Glacier lakes, Glacier
  - Source: OpenStreetMap (OSM)

Location of glacier lakes on the headwaters of Barun River, Nepal

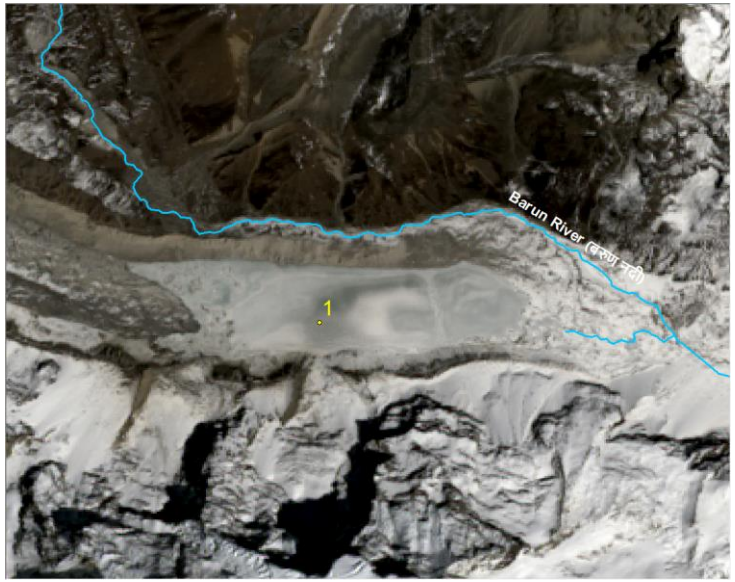


Point coordinate of
Lake 1: 27.7969 (lat); 87.091 (long)
Lake 2: 27.8443 (lat); 87.0812 (long)
Lake 3: 27.829 (lat); 87.0953 (long)
Lake 4: 27.8319 (lat); 87.103 (long)
Lake 5: 27.8138 (lat); 87.1401 (long)
Lake 6: 27.8036 (lat); 87.1314 (long)

Multi-temporal satellite data analysis: Glacier Lake 1.



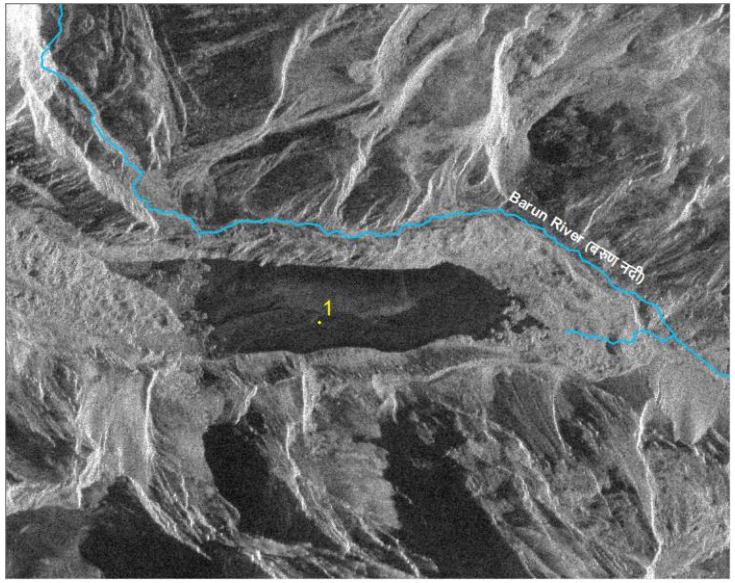
ALOS-2: 23 December 2014



LANDSAT-8: 27 March 2017

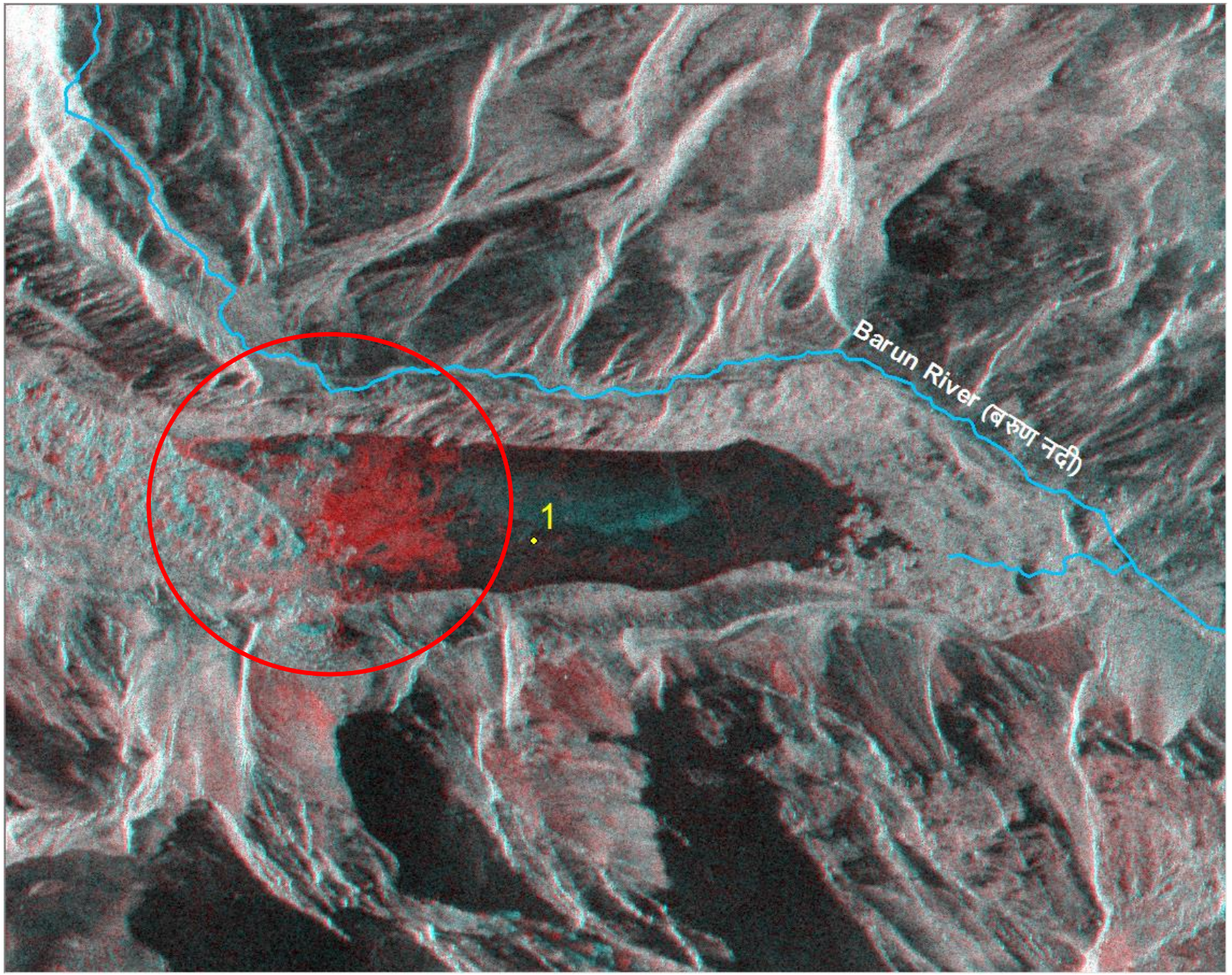
LANDSAT-8: 12 April 2017

SENTINEL-2: 18 April 2017



ALOS-2: 25 April 2017

There is no significant visual changes can be observed on the shape and size of Glacier Lake 1.



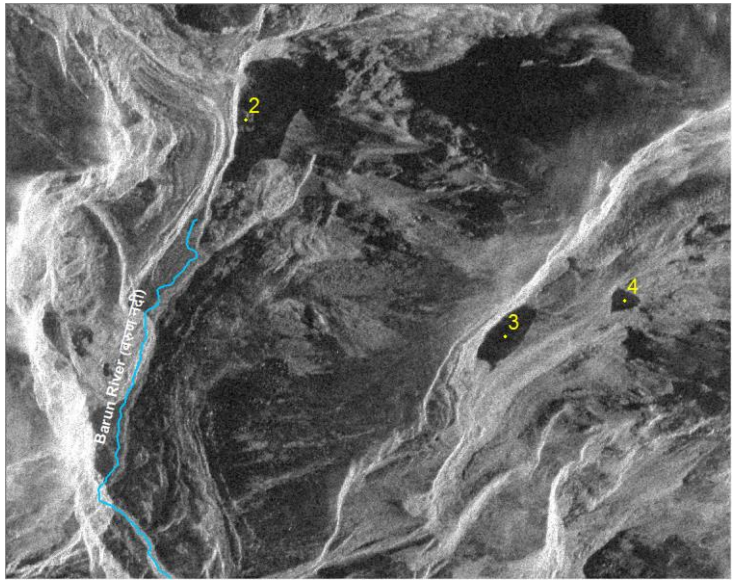
ALOS-2 RGB: R (23 December 2014), G (25 April 2017), B (25 April 2017)

There is a significant backscatter changes on the upper part of Glacier Lake 1 (shows in red circle).

Notes:

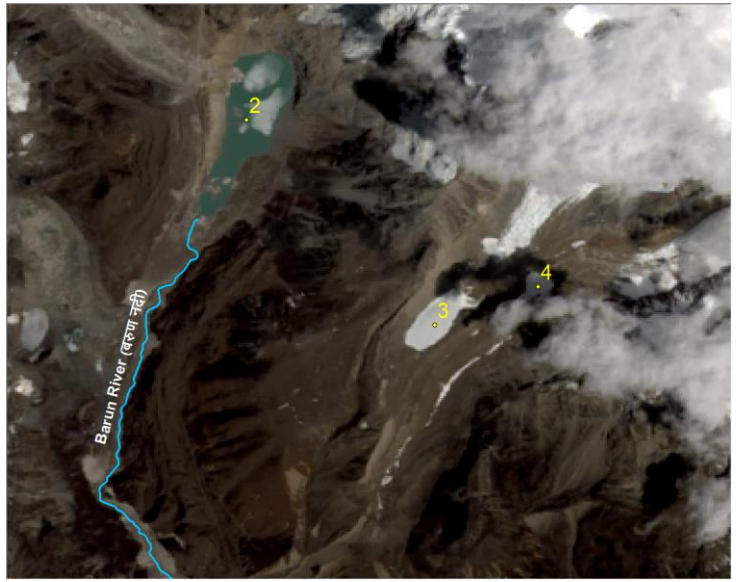
- the timespan of ALOS-2 data is very long (2.5 years), so it might be difficult to conclude a GLOF only from the backscatter changes.
- terrain correction is not performed here, so there might be error with geometry.

Multi-temporal satellite data analysis: Glacier Lake 2, 3, and 4.

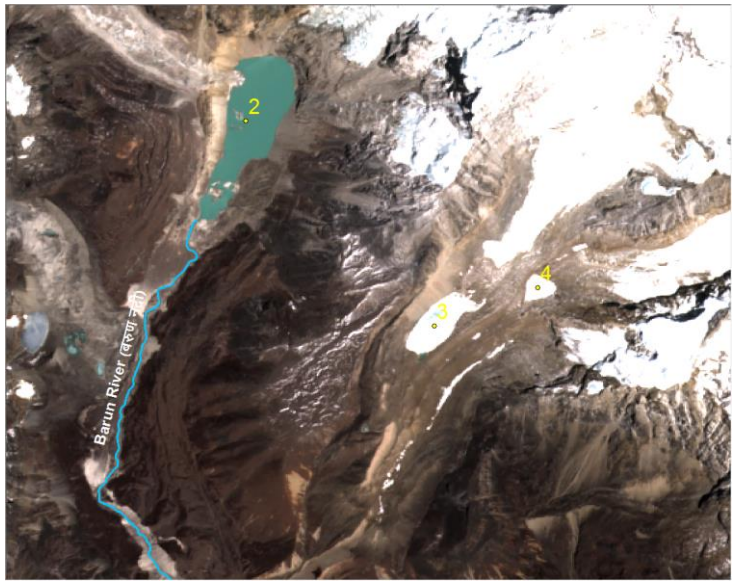


ALOS-2: 23 December 2014

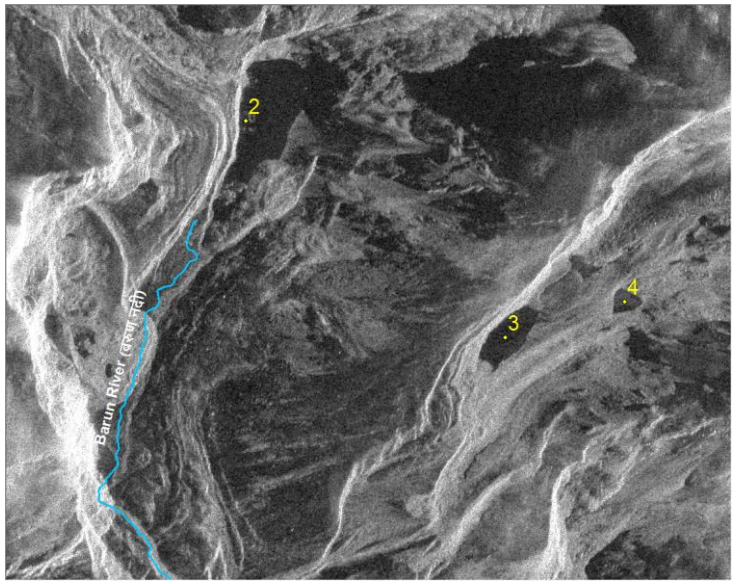
LANDSAT-8: 27 March 2017



LANDSAT-8: 12 April 2017

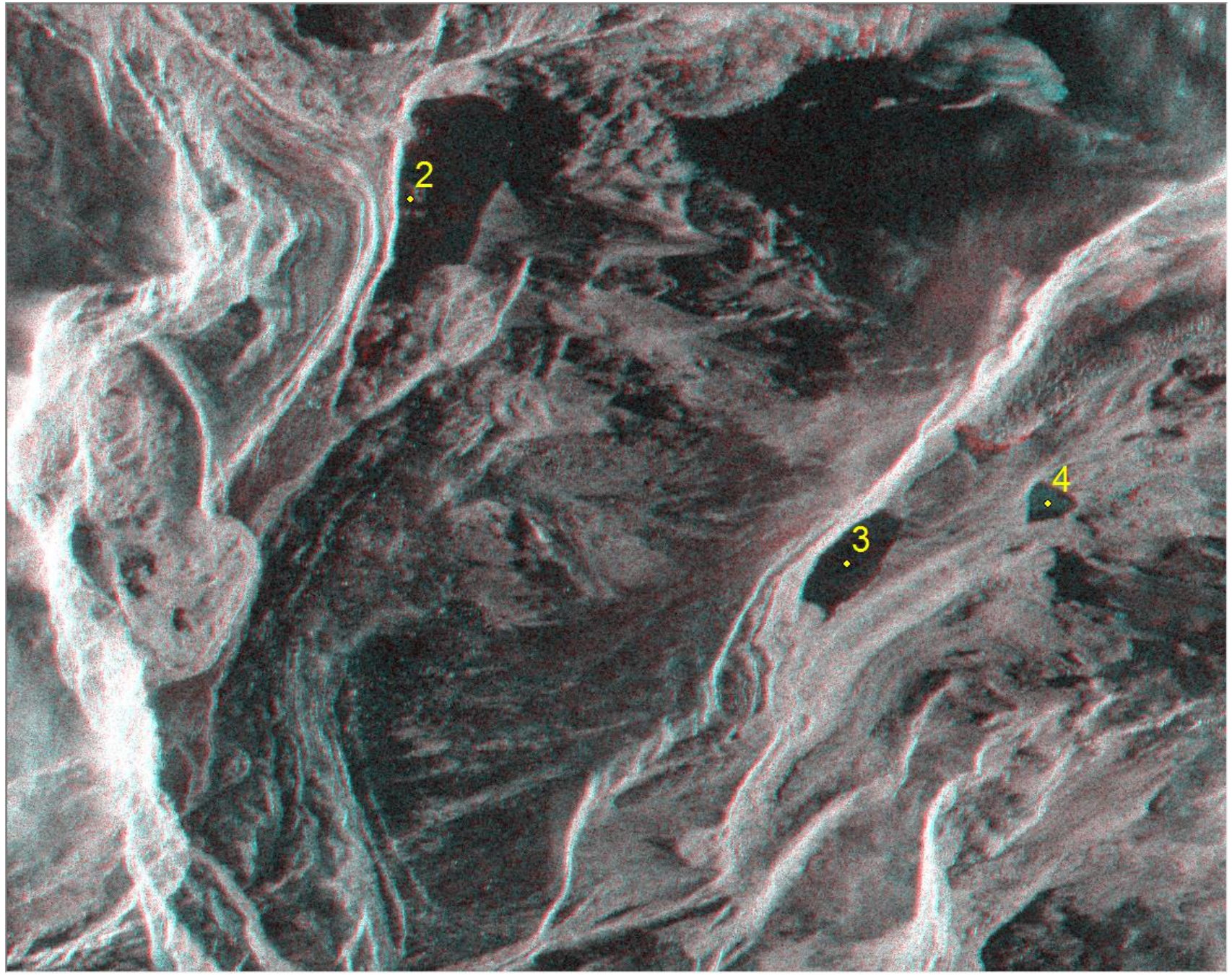


SENTINEL-2: 18 April 2017



ALOS-2: 25 April 2017

There is no significant visual changes can be observed on the shape and size of Glacier Lake 1.



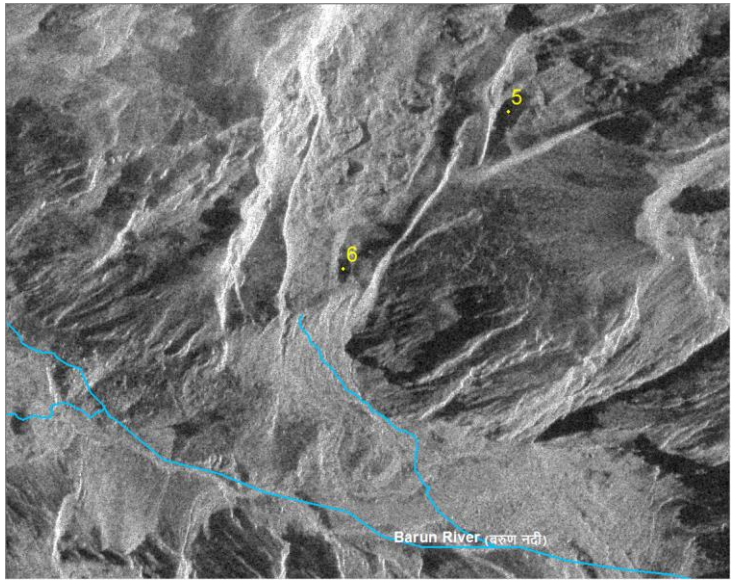
ALOS-2 RGB: R (23 December 2014), G (25 April 2017), B (25 April 2017)

There is no significant backscatter changes on Glacier Lake 2, 3, and 4.

Notes:

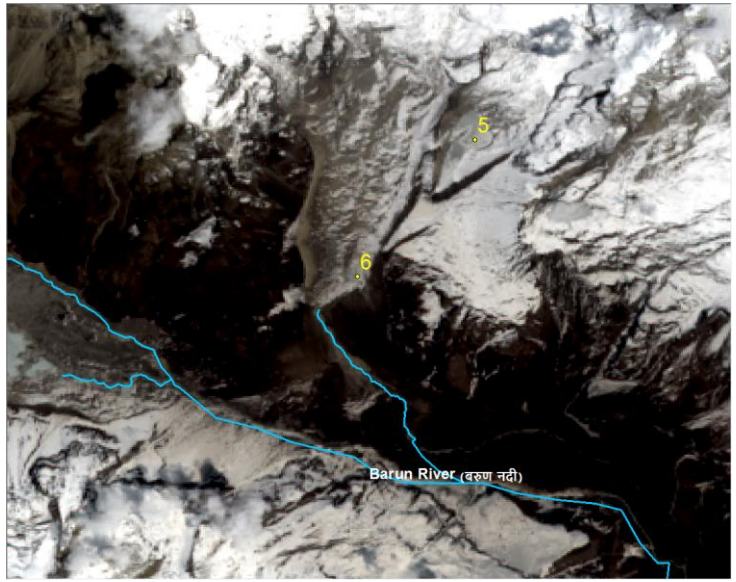
- the timespan of ALOS-2 data is very long (2.5 years), so it might be difficult to conclude a GLOF only from the backscatter changes.
- terrain correction is not performed here, so there might be error with geometry.

Multi-temporal satellite data analysis: Glacier Lake 5 and 6.

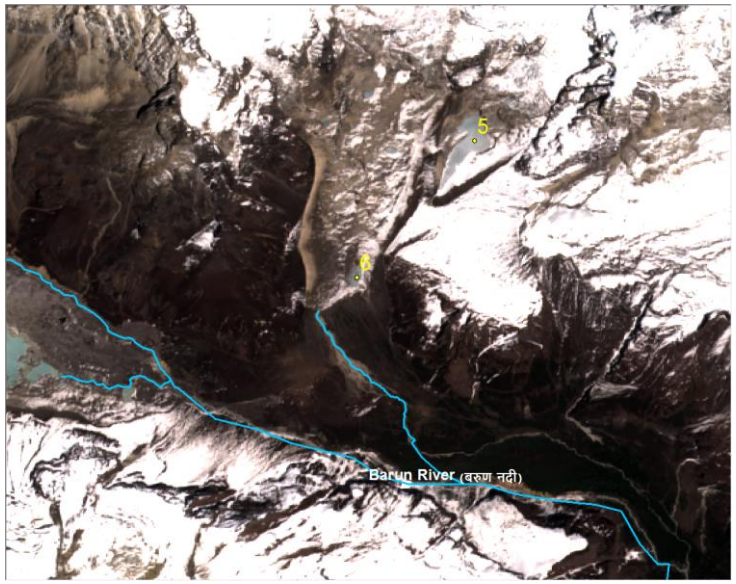


ALOS-2: 23 December 2014

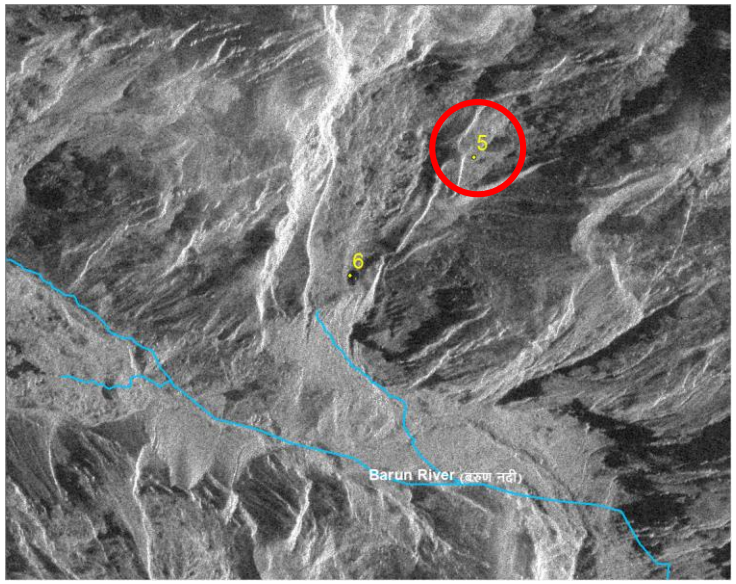
LANDSAT-8: 27 March 2017



LANDSAT-8: 12 April 2017

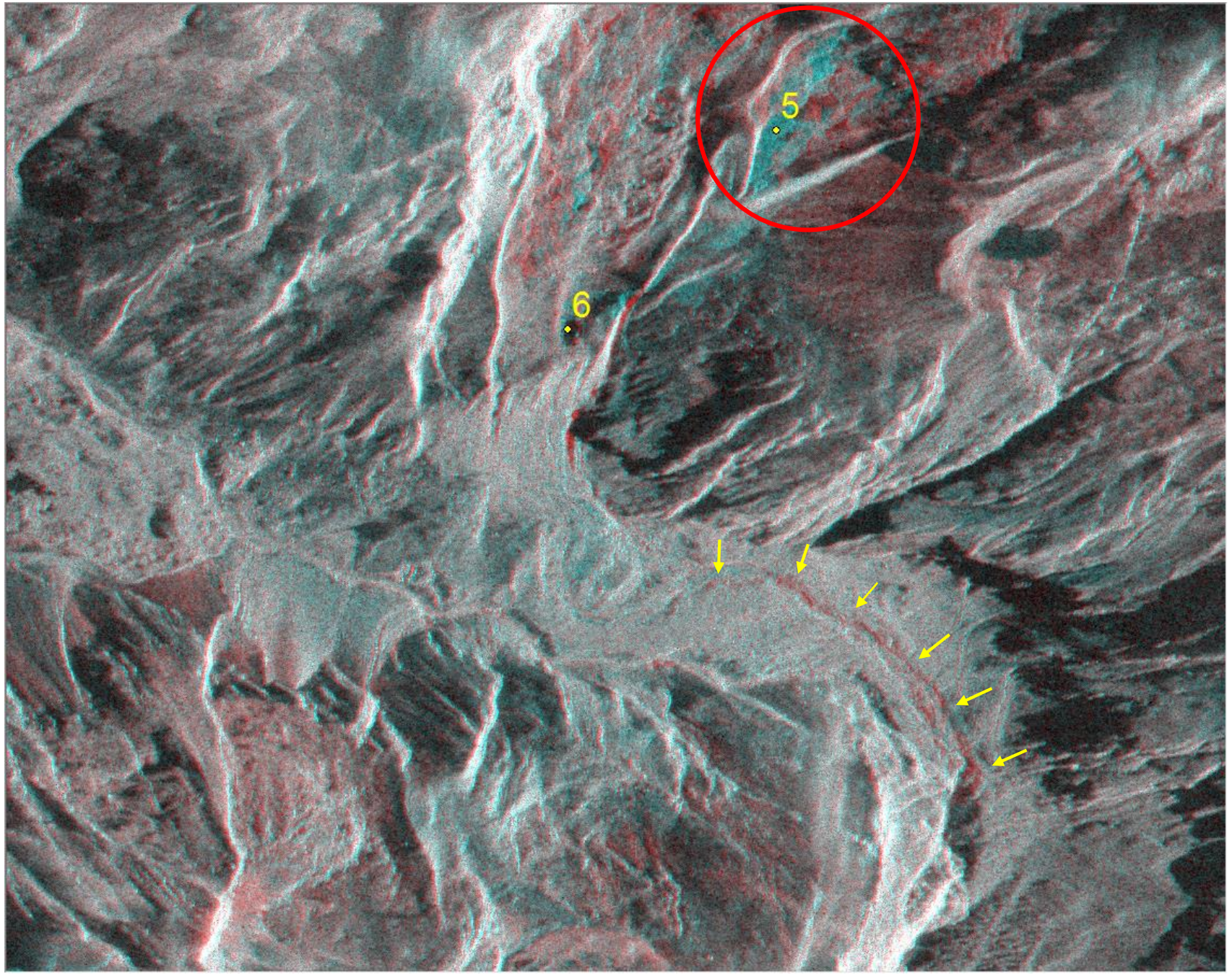


SENTINEL-2: 18 April 2017



ALOS-2: 25 April 2017

There is a significant visual changes can be observed on the shape and size of Glacier Lake 5 (shows in red circle). Probably GLOF?



ALOS-2 RGB: R (23 December 2014), G (25 April 2017), B (25 April 2017)

There is a significant backscatter changes on the upper part of Glacier Lake 5 (shows in red circle). Probably GLOF?

There is a significant backscatter changes on the River (shows in yellow arrow). Probably the debris taken by the flash flood that blocked the River?

Notes:

- the timespan of ALOS-2 data is very long (2.5 years), so it might be difficult to conclude a GLOF only from the backscatter changes.
- terrain correction is not performed here, so there might be error with geometry.