Landcover changes in the Rwenzori Mountains: the glaciers retreat

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FAO Information Products for the Nile Basin, GPC/INT/945/ITA

East Africa and the Rift Valley

East Africa and the two arms of the Rift Valley enclosing Lake Victoria between them. The Eastern Rift has several volcanic mountains – Kilimanjaro, Kenya, Elgon, The Western Rift instead contains a block mountain – Rwenzori.

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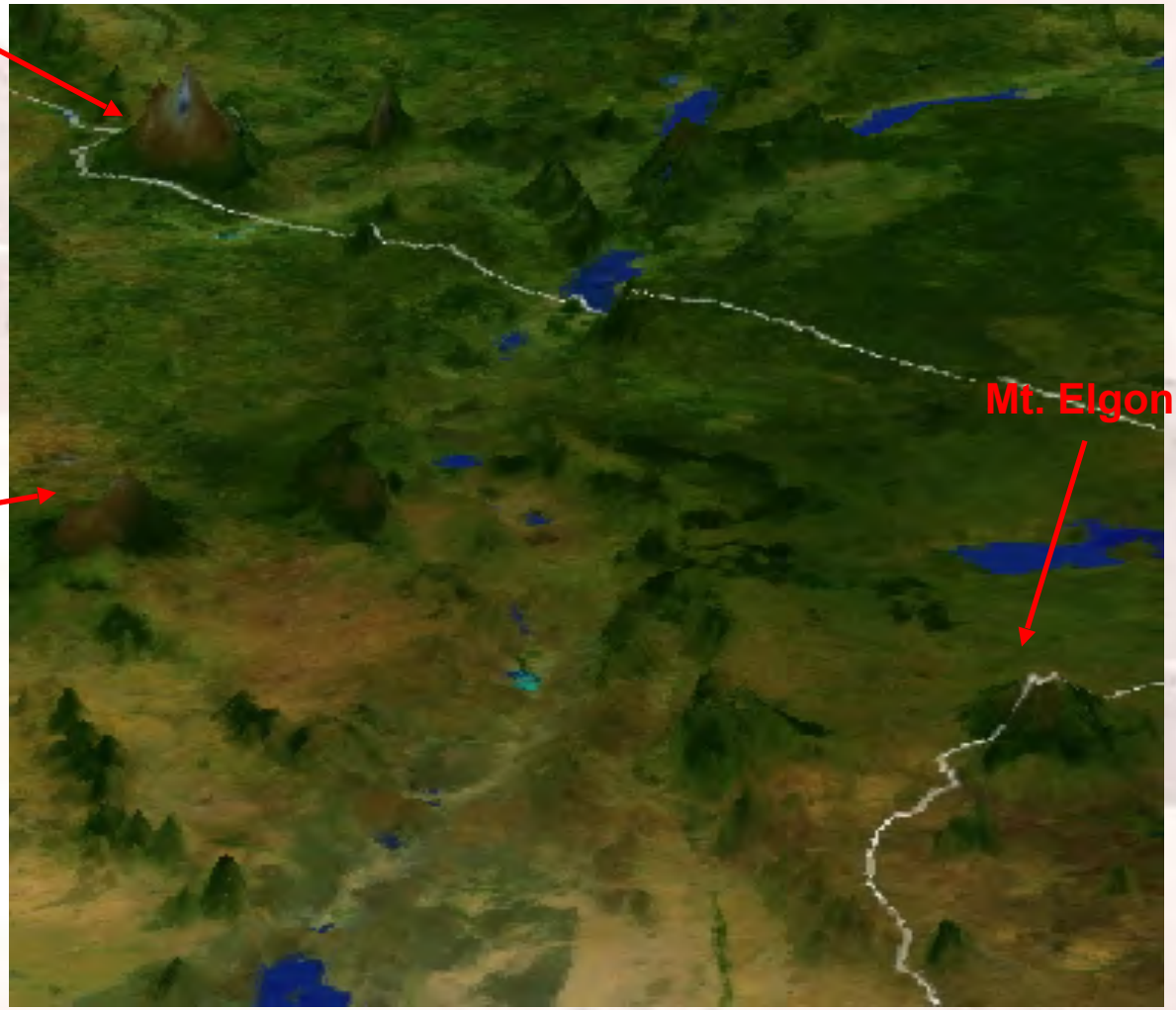
East Africa and the Rift Valley

Mt. Kilimangiaro



Detail showing the Eastern arm of the Rift Valley, with the volcanic mountains Kilimanjaro, Kenya and Elgon.

Mt. Kenya

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Mountain Rwenzori straddling the Uganda- DRC border

MODIS satellite image showing the Rwenzori Mountains. The Rwenzori Mountains lay in the Western arm of the East African Rift Valley, and is a block mountain (it is not a volcanic mountain)

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Mountain Rwenzori straddling the Uganda- DRC border

TERRA ASTER satellite image showing the Rwenzori Mountains. The edges of the Rift valley can be seen in the upper part of the image.

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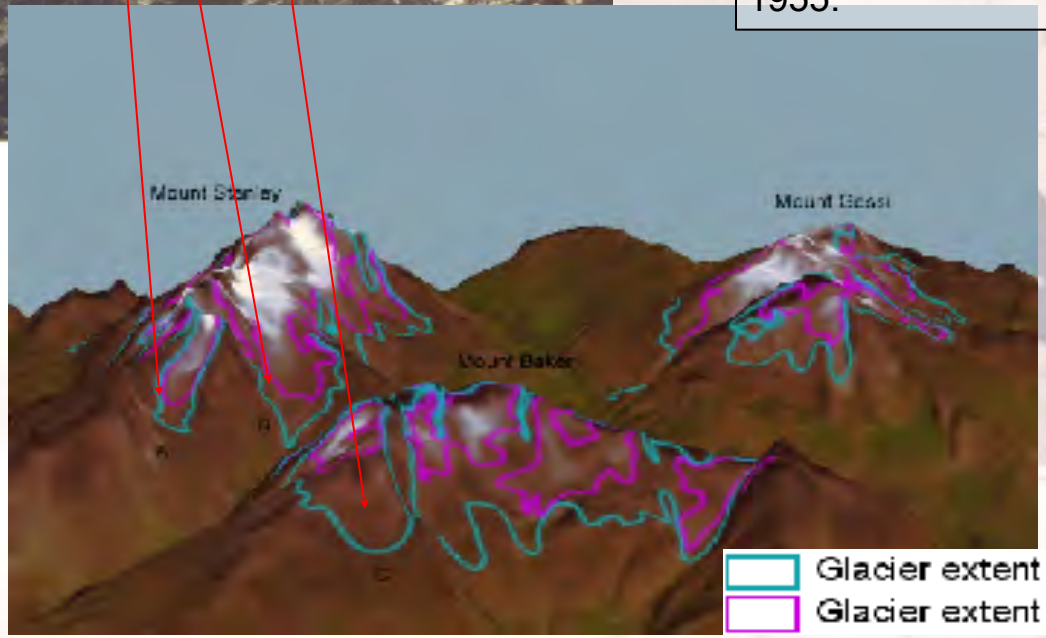
Glaciers in the Rwenzori Mountains: a reinterpretation

Photograph by Sella taken the 12th of July 1906 from Stairs Peak, showing Mount Baker and Mount Stanley.



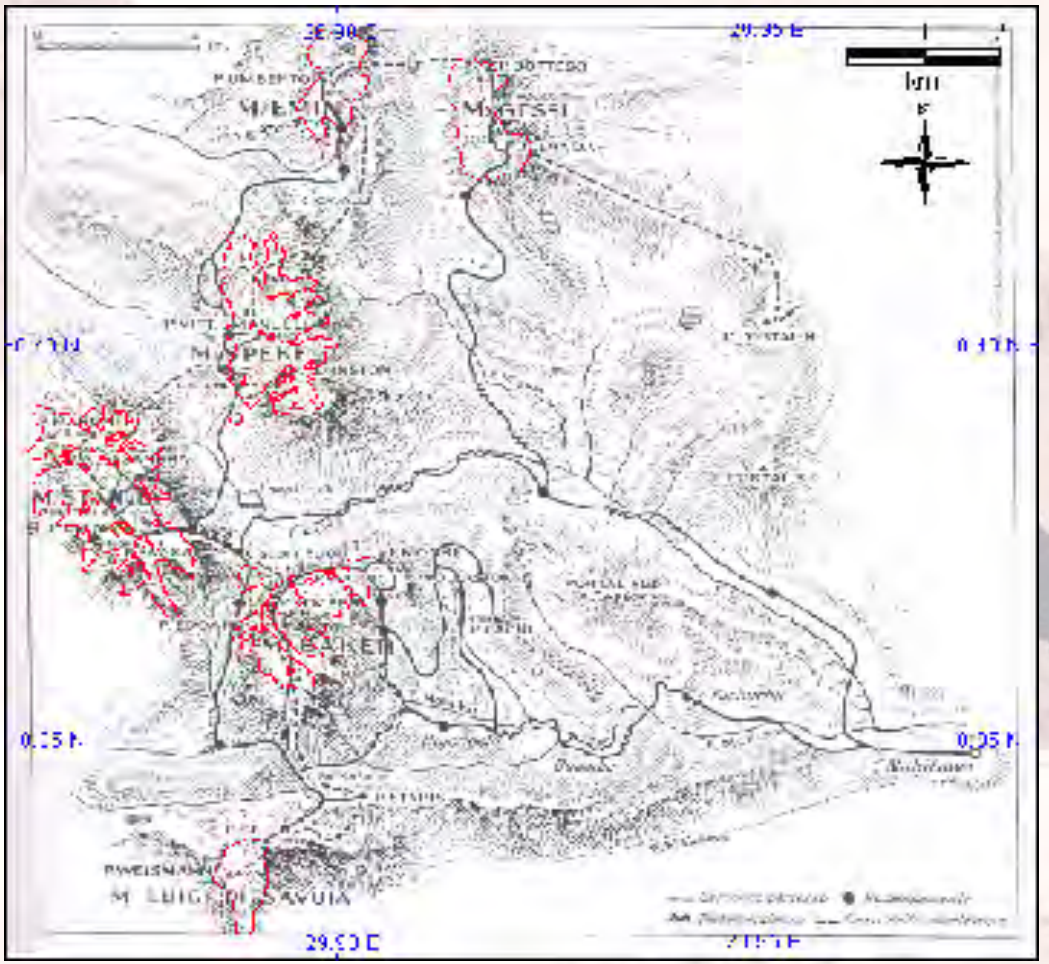
Satellite generated image of the peaks of the Rwenzori Mountains (2005), also showing glacial extents in 1906 and 1955.

Duke of Abruzzi expedition peak map from 1906

Map published in Geographical Journal, 1907. Reprint by A.A. Michieli, Milan, 1937.

Duke of Abruzzi expedition peak map from 1906

The extent of the glaciers 1906 as mapped by the Duke of Abruzzi expedition. Interpreted by Kaser and Noggler, 1996.



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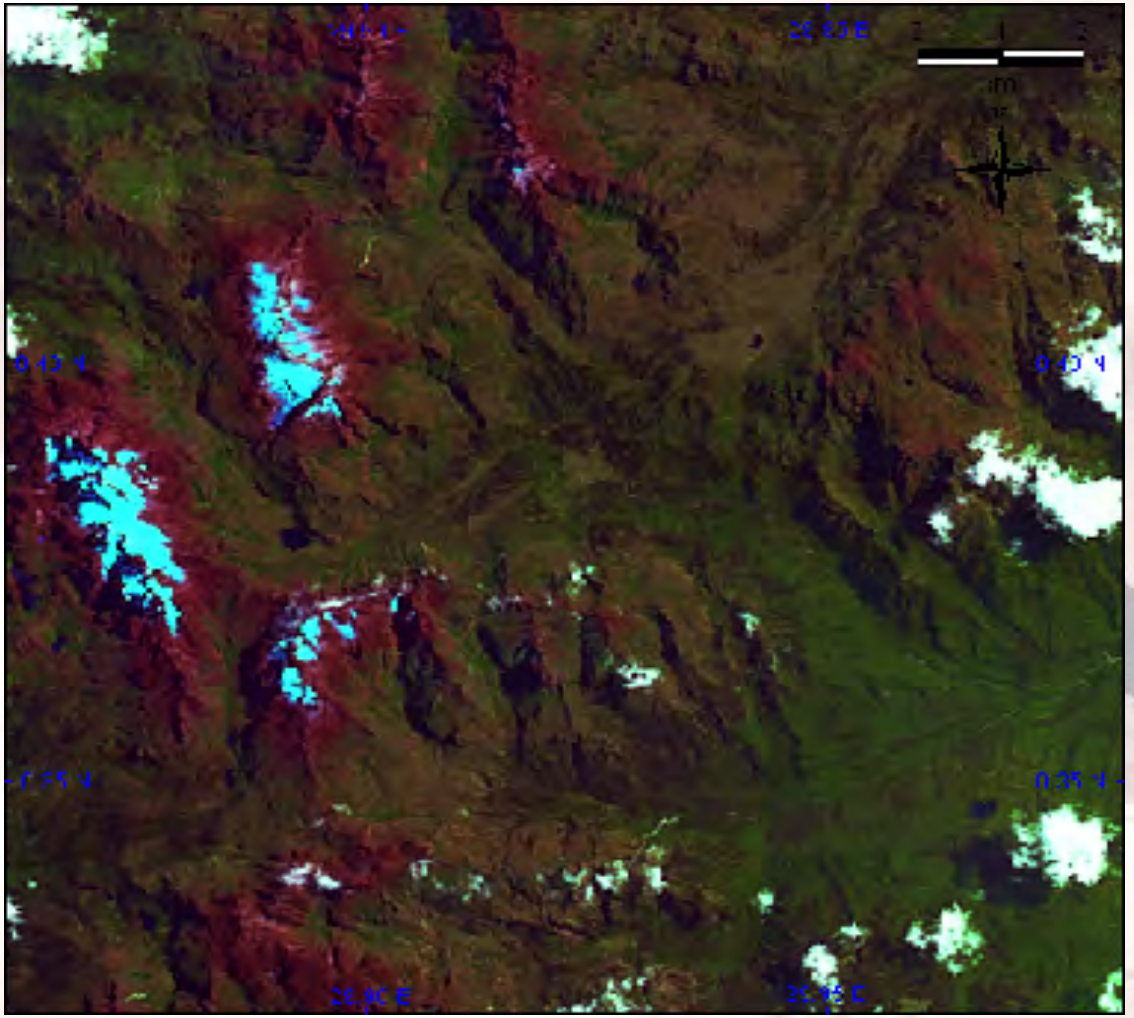
Landsat TM satellite image acquired 7th of August 1987



In this satellite image the glaciers stand out as light blue. Clouds are white.

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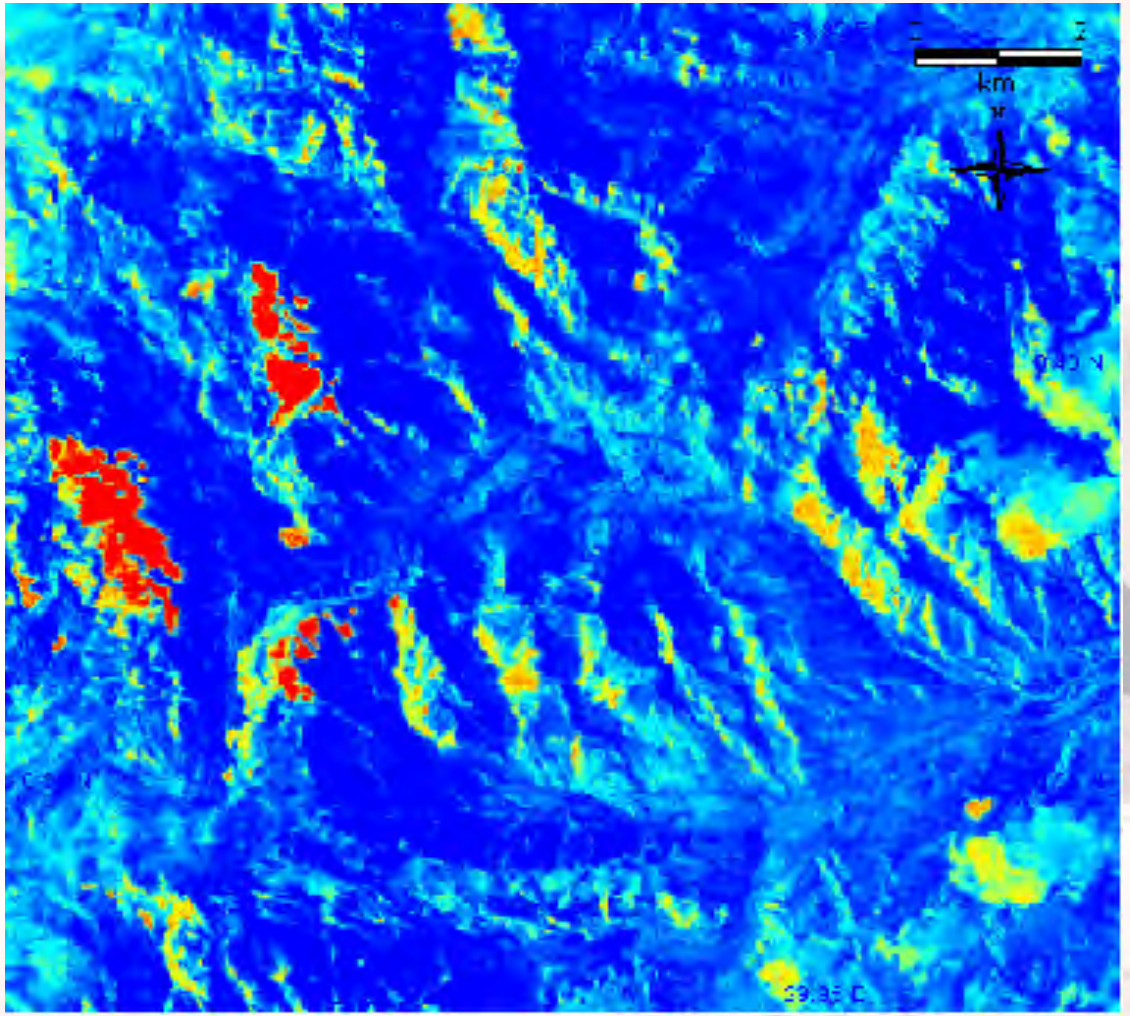
Landsat TM satellite image acquired 7th of August 1987

This image shows the snow content (red) in the satellite image.



*Normalised Difference Snow Index (**NDSI**)*
(Band2 – Band5) / (Band2+Band5)

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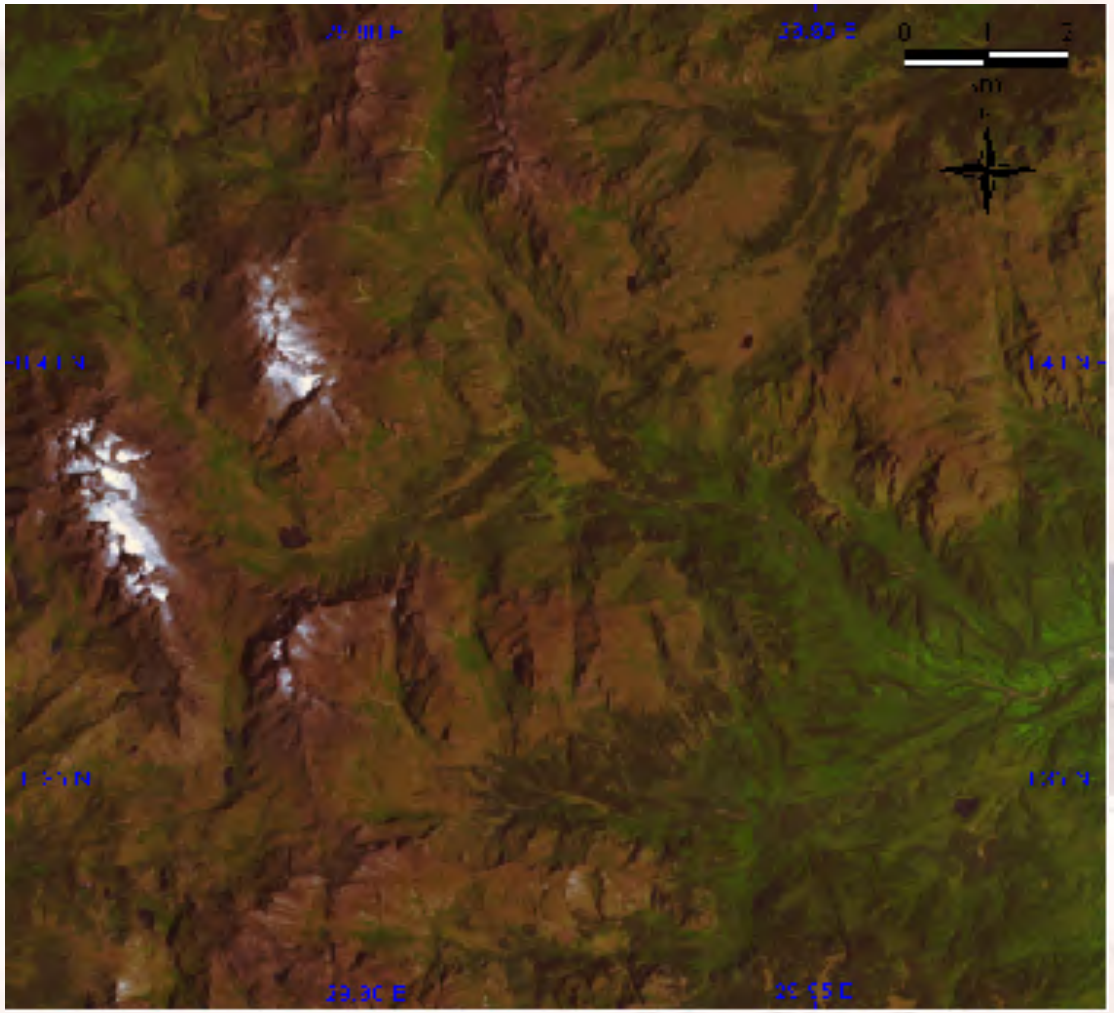
Landcover changes in the Rwenzori Mountains: the glaciers retreat

TERRA ASTER satellite image acquired 22nd of February 2005



There are no clouds in this image and the glaciers stand out as white, with off-white probably representing newly fallen snow and exposed rock (glacial retreat)

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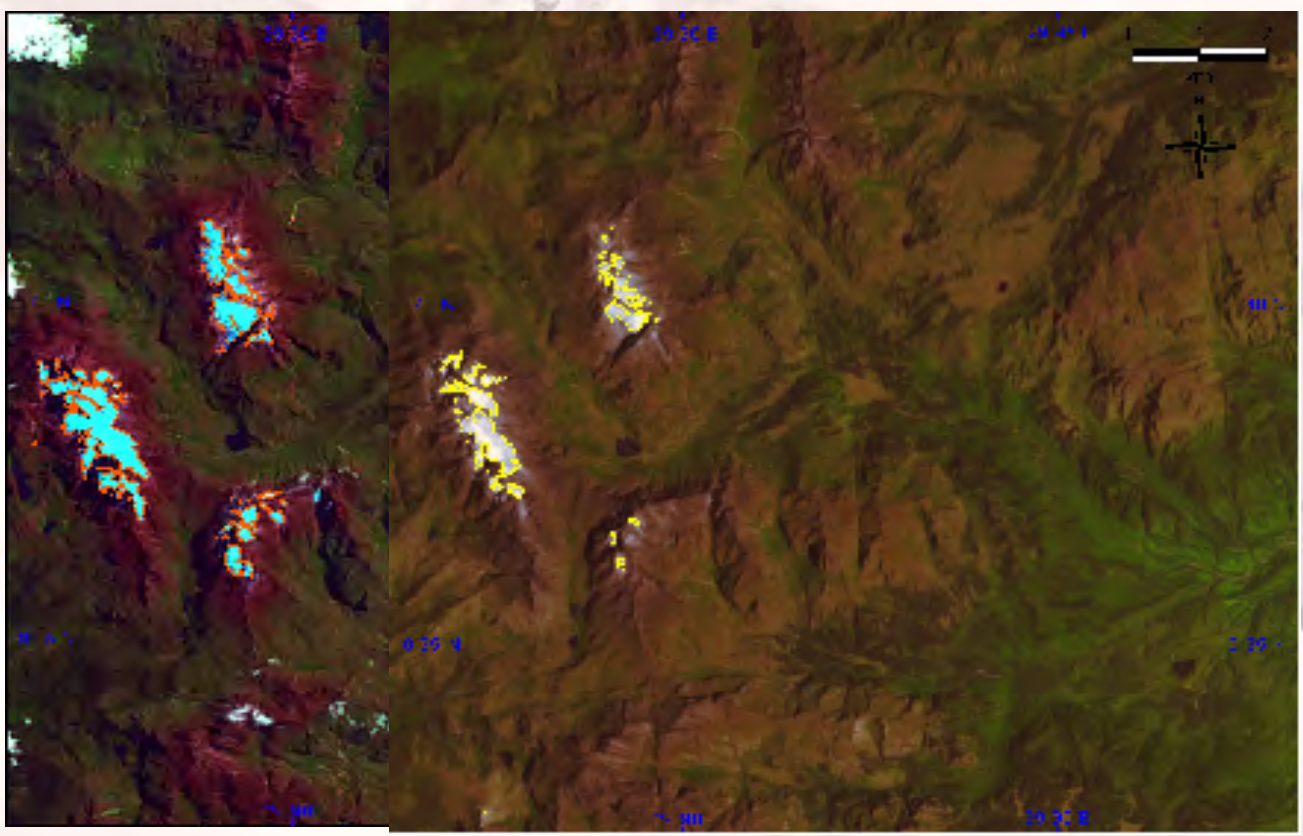
Landcover changes in the Rwenzori Mountains: the glaciers retreat

Comparison Landsat TM 1987 and TERRA ASTER 2005

Comparison of extent of the glaciers in 1987 and 2005 interpreted from the backdrop satellite image.



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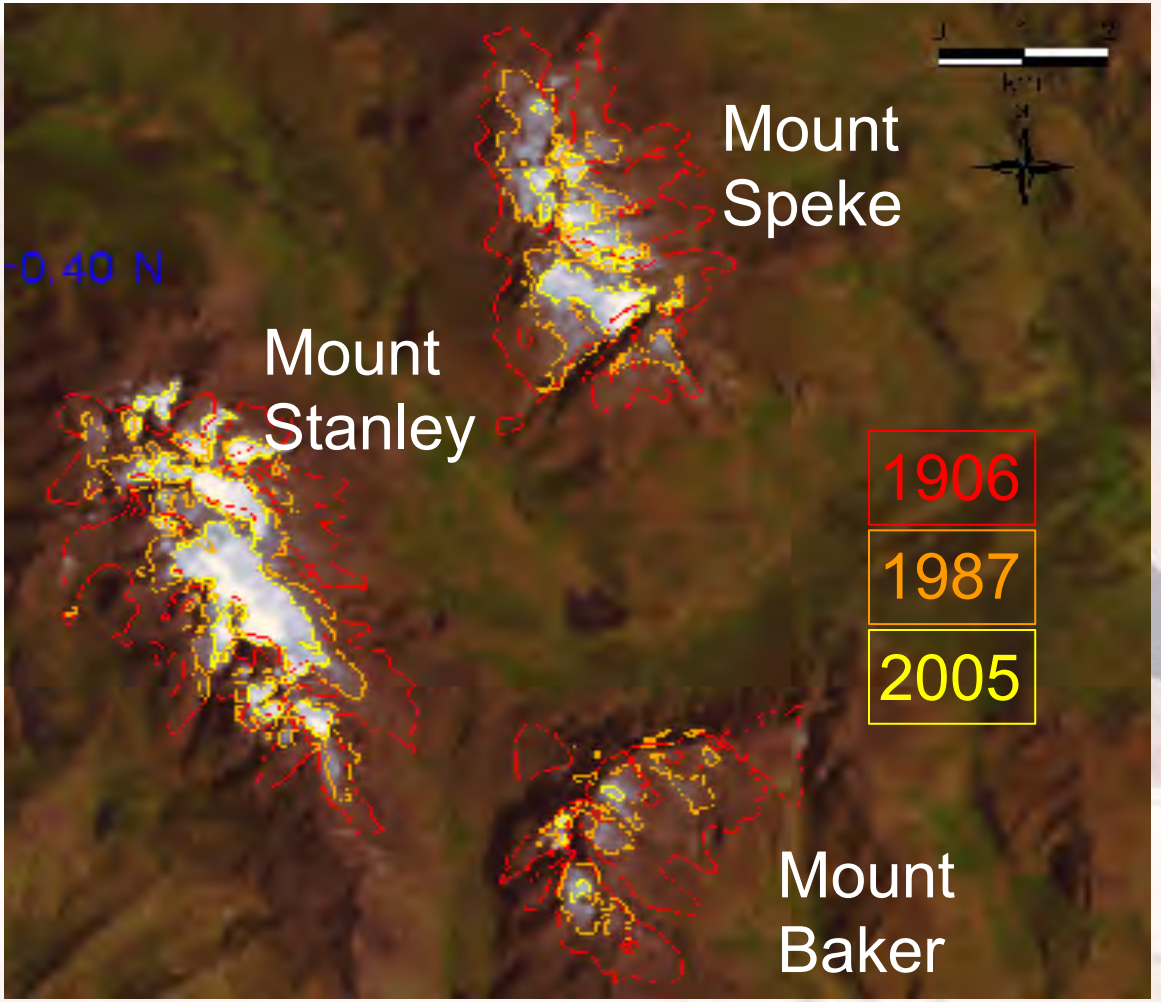
Mountain Rwenzori Glacier Changes 1906-2005

The extent of the glaciers of Mountain Rwenzori 1906, 1987 and 2005.



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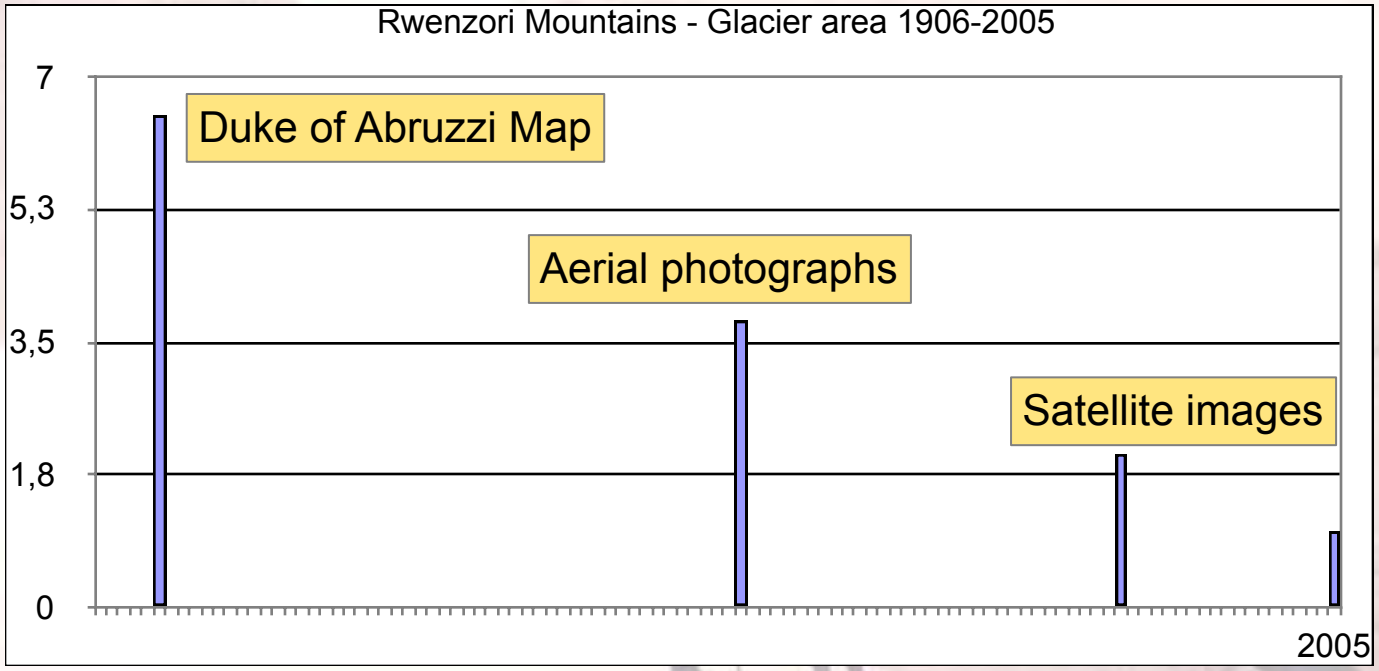
Duke of Abruzzi expedition peak map from 1906

Since 1906 the glaciers of the Rwenzori Mountains have decreased from around 6.5 km2 to 1.0 km2. If the trend continues the glaciers will disappear in 20 years.



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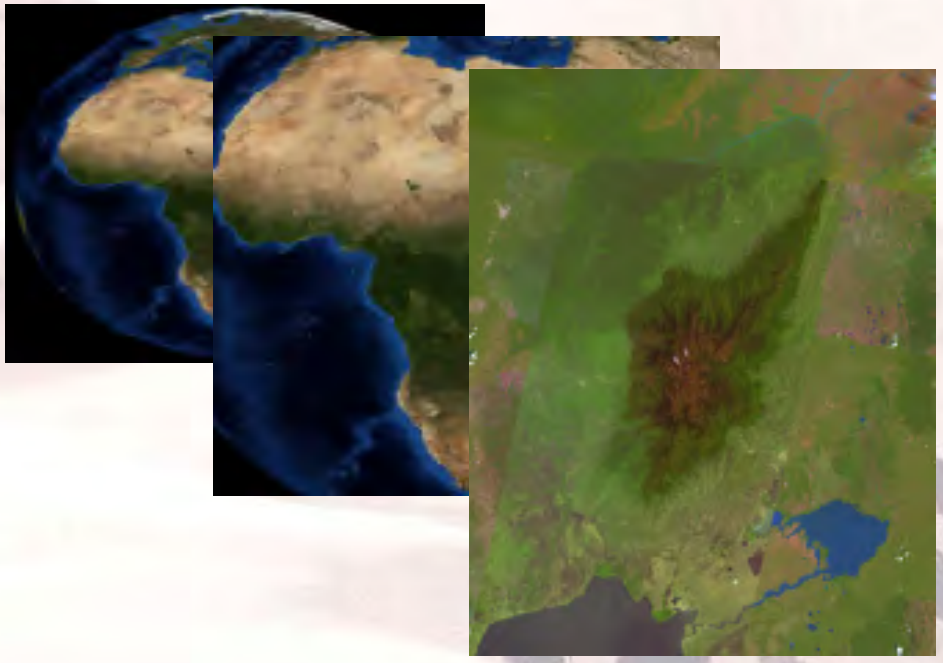
Driving forces contributing to glacier retreat



a) Global changes in temperature and atmospheric circulation patterns.

b) Continental drying (less precipitation and more sunshine)

c) Local changes in land use and land cover (documented in other Mountains in East Africa, but not the Rwenzoris)

Local changes in land use and land cover

Population growth (3% yr)

↓

Agricultural activity (slush&burn)

↓

Reduction of cloudness

↓

Increase of insulation

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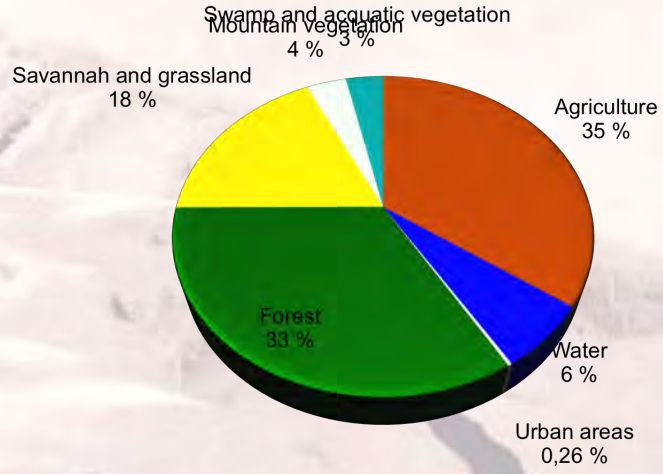
Landcover changes in the Rwenzori Mountains: the glaciers retreat

Landcover and vegetation



Land and Population figures	
Total Population	~ 1,8 Mln
Total Area	~ 1,415,000 ha
Average density (Total)	~ 1,3 pers/ha

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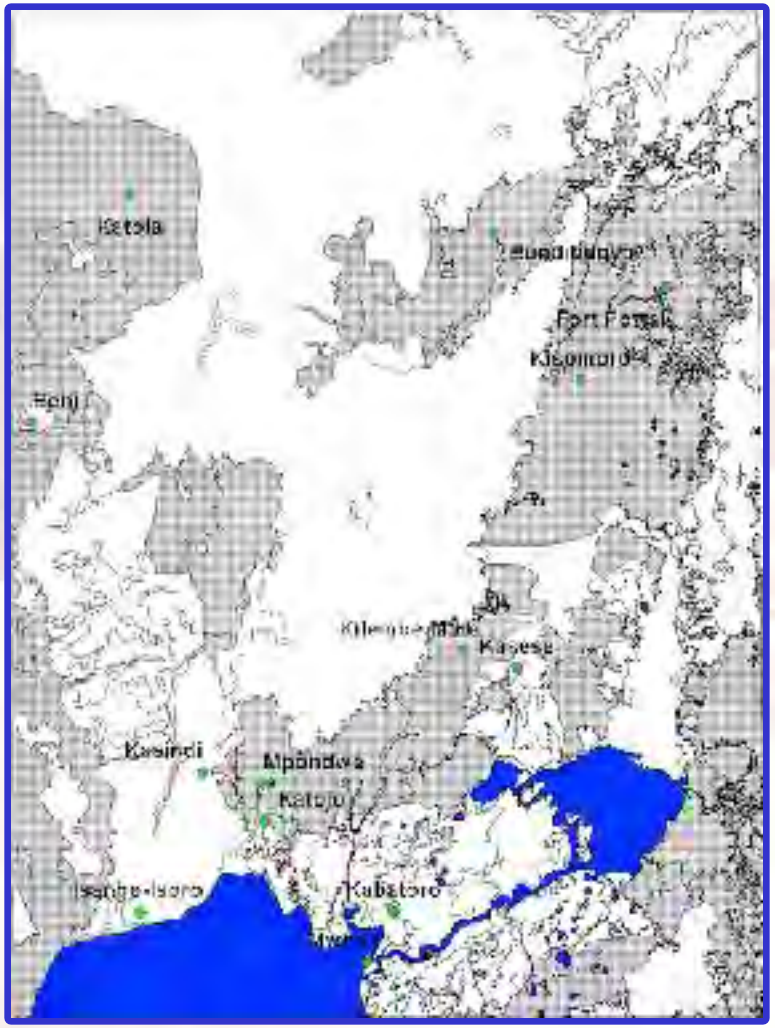
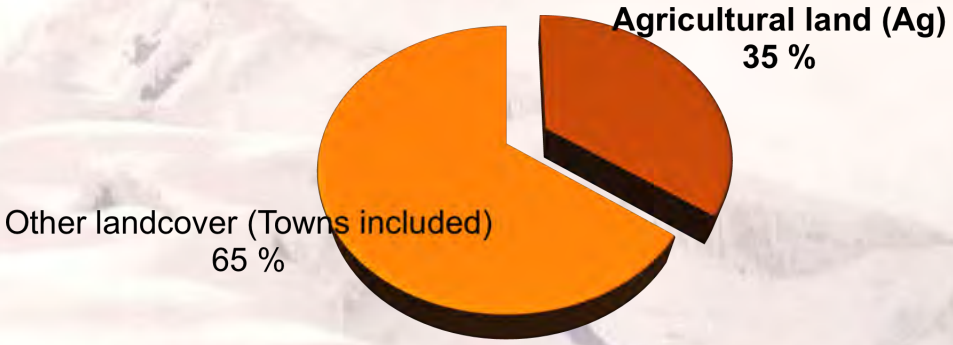
Landcover changes in the Rwenzori Mountains: the glaciers retreat

Agricultural land (Ag)





Land and Population figures	
Total Population	~ 1.07 Mln
Total Area	~ 495,000 ha
Average density Ag	~ 2,1 pers/ha

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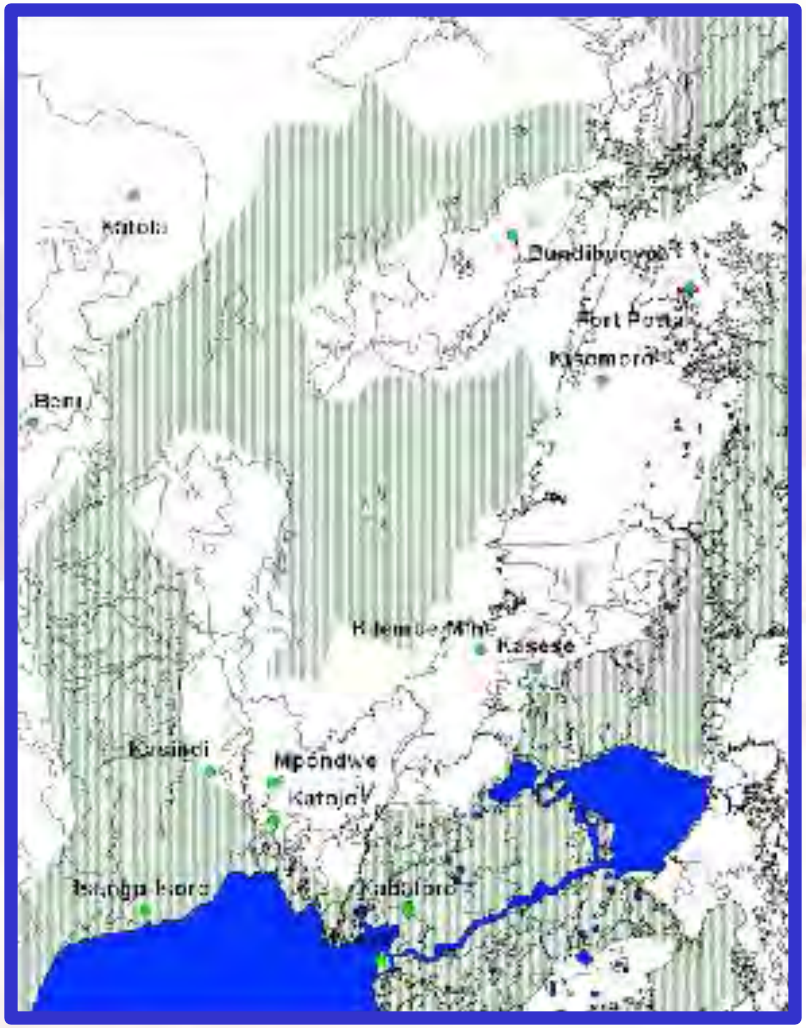
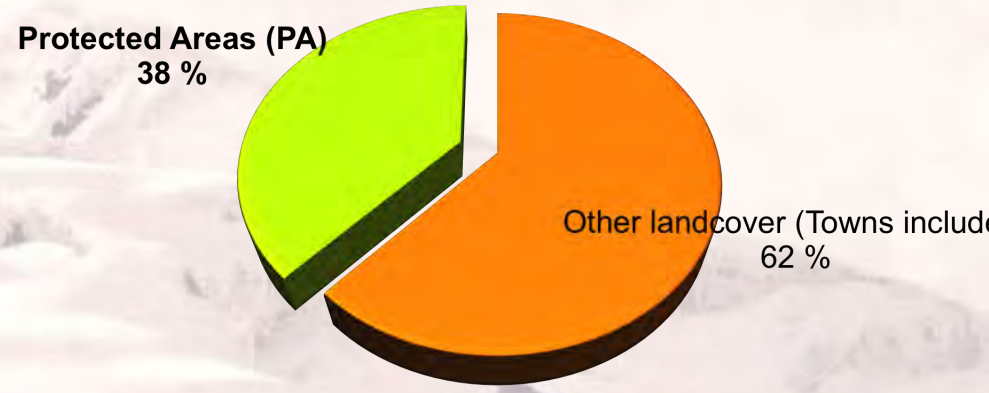
Landcover changes in the Rwenzori Mountains: the glaciers retreat

Protected Areas (PA)





Land and Population figures	
Total Population	~ 110,000
Total Area	~ 637,000 ha
Average density in PA	~ 0.17 pers/ha

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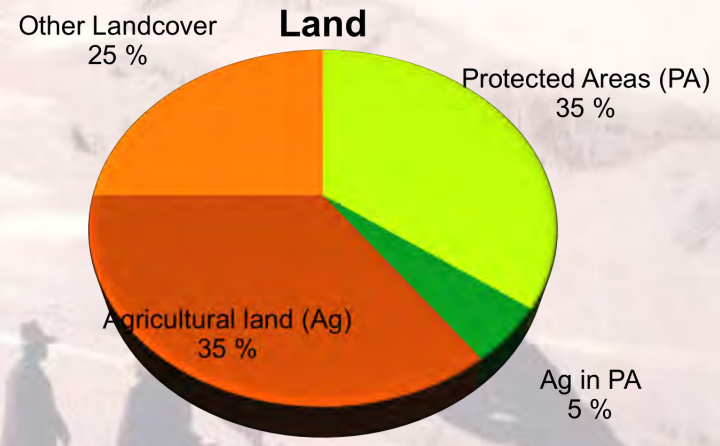
Landcover changes in the Rwenzori Mountains: the glaciers retreat

Ag + PA



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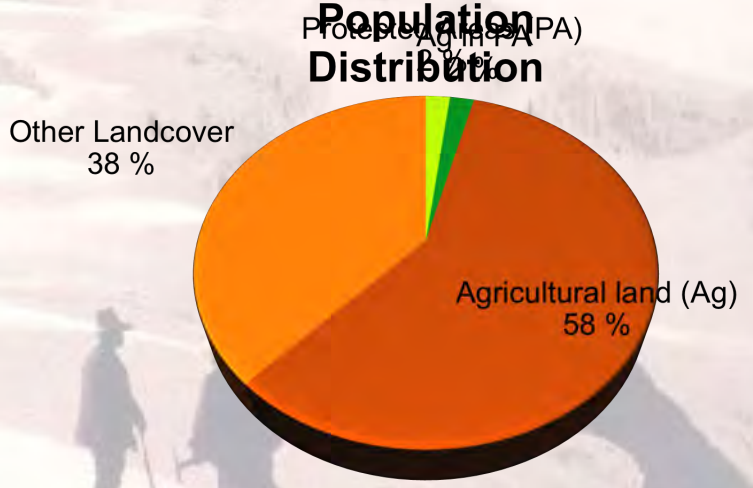
Landcover changes in the Rwenzori Mountains: the glaciers retreat

Population distribution (Landscan 2002)



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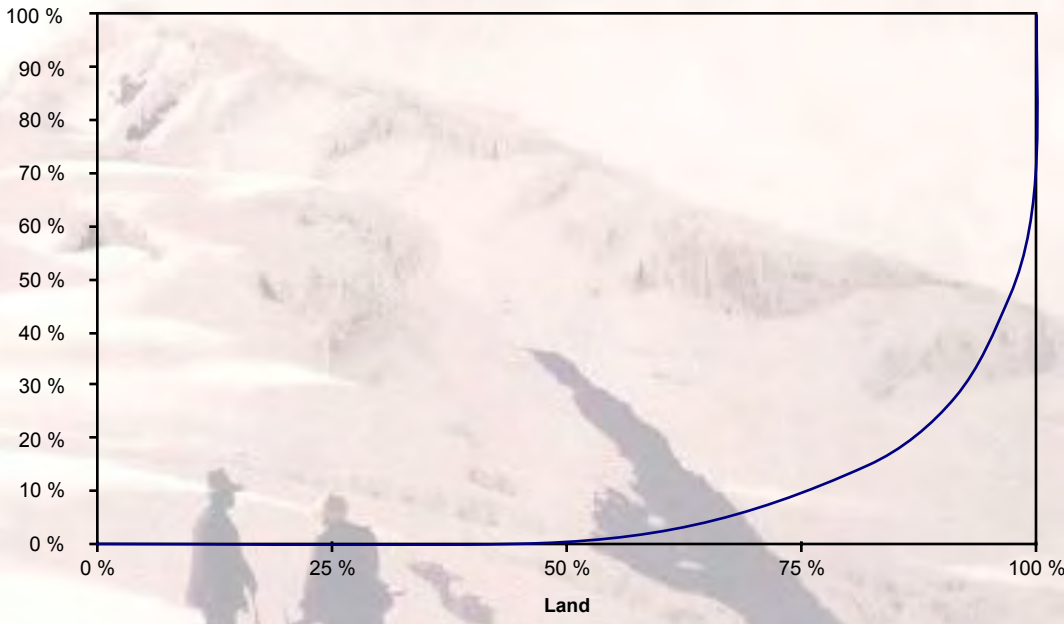
Population distribution (2002)

Population distribution



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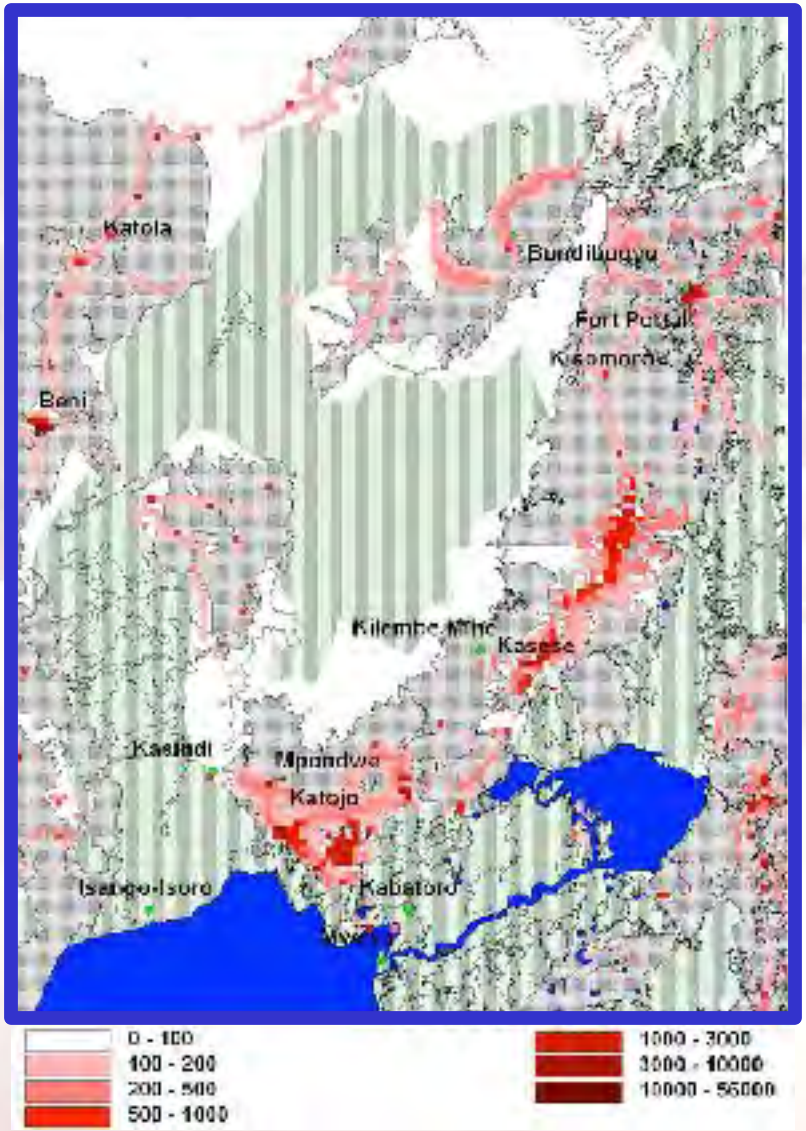
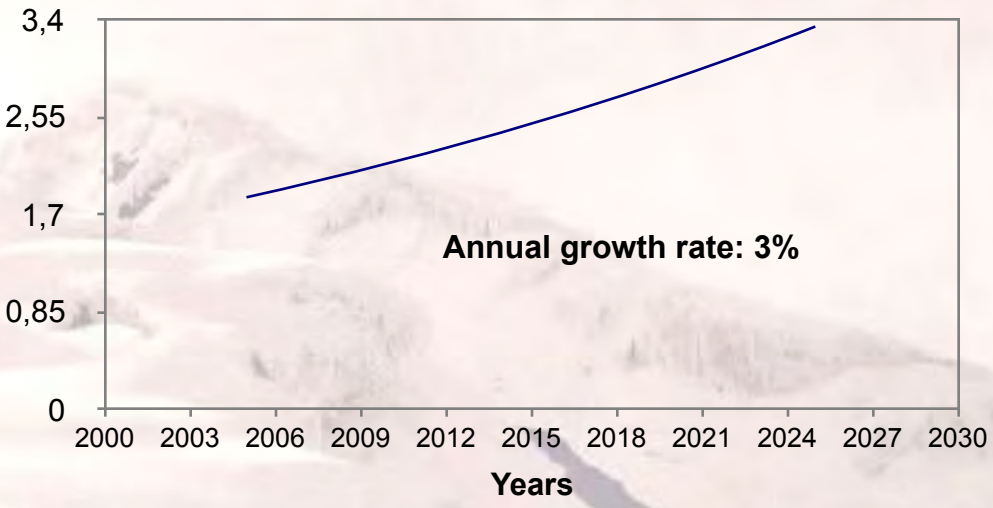
Landcover changes in the Rwenzori Mountains: the glaciers retreat

Population 1975 (interpretation)



Population growth



Population figures (1975)	
Total Population	~ 0.82 Mln
Total Area	~ 1,415,000 ha
Average density	0.58 pers/ha

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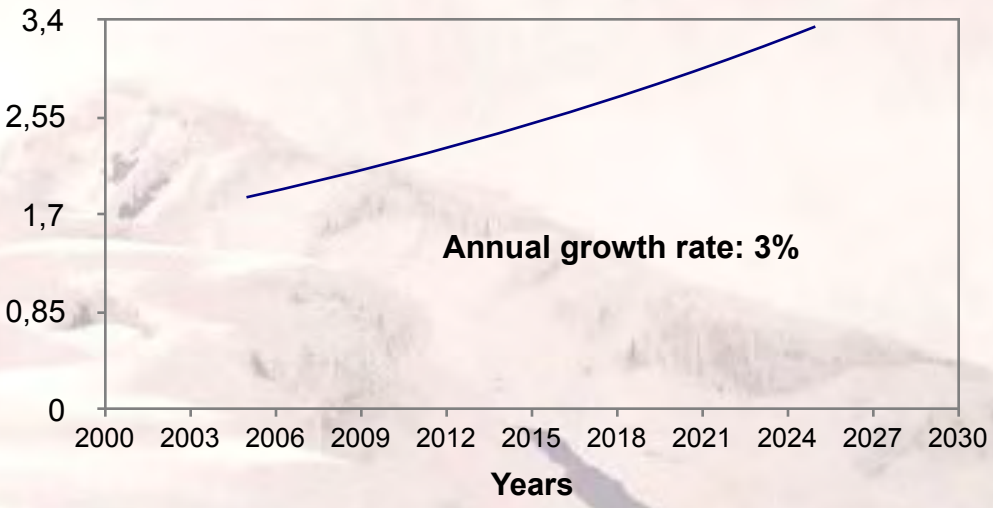
Population projection (2025)

Population growth



Population figures (2025)	
Total Population	~ 3.35 Mln
Total Area	~ 1,415,000 ha
Average density	2.35 pers/ha

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Facts

- Glaciers reduced from **6,5** Km^2 to **1** Km^2
- LUC contributes to glaciers retreat (together with global warming and continental drying)
- Population will double in 25-30 years
- More agricultural land will be reclaimed
- If the trend continues the glaciers will disappear in 20 years

Thank you

Guido Santini and Thomas Gumbricht

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