

The Impact of Forest Cover on Landslide Rates in the Kivu Rift



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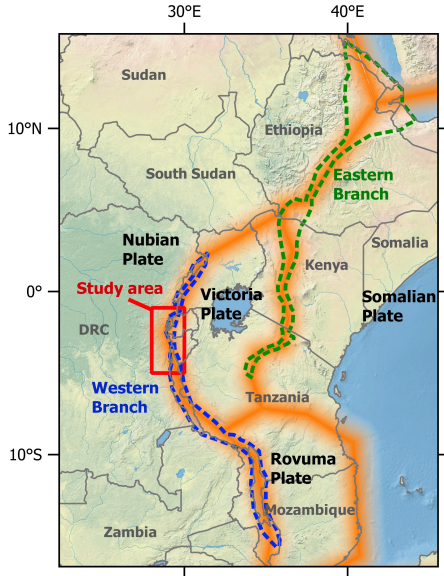
- **Kivu Rift**
- Landslide activity
- Deforestation impact

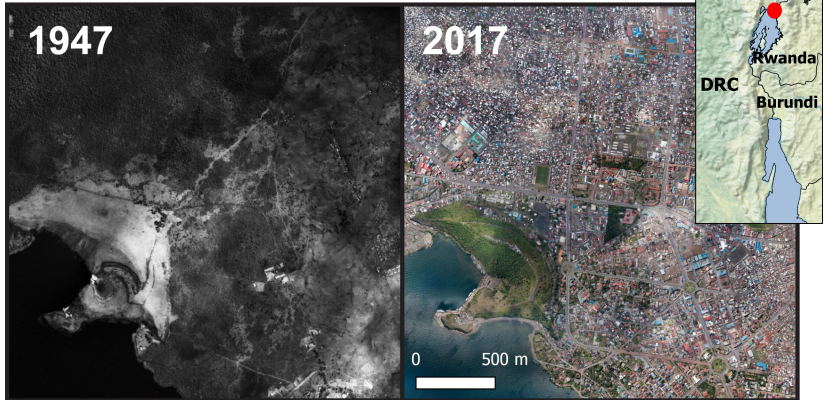


<http://pasteca.africamuseum.be/>



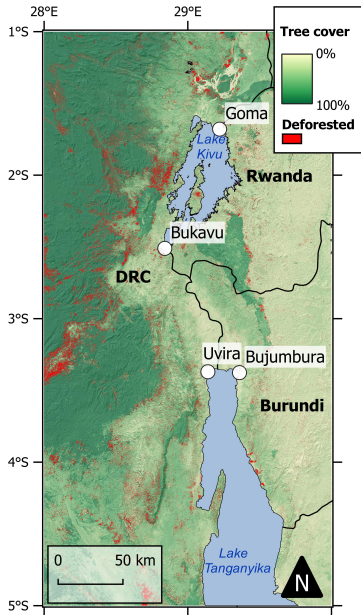
- Population ↑
- Forest ↓
- Complex
 - active rifting
 - diverse lithology
- Landslides





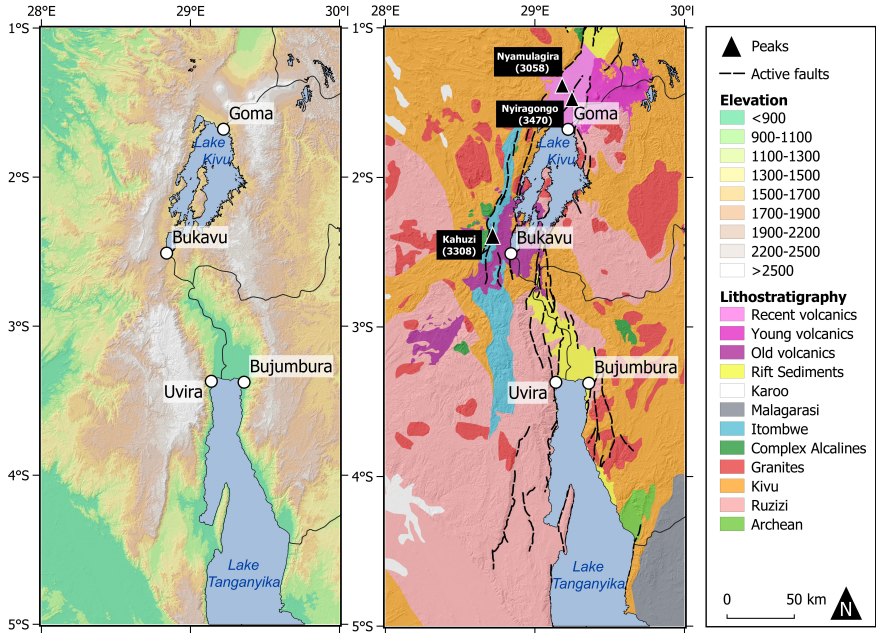
Urban expansion of Goma between 1947 and 2017

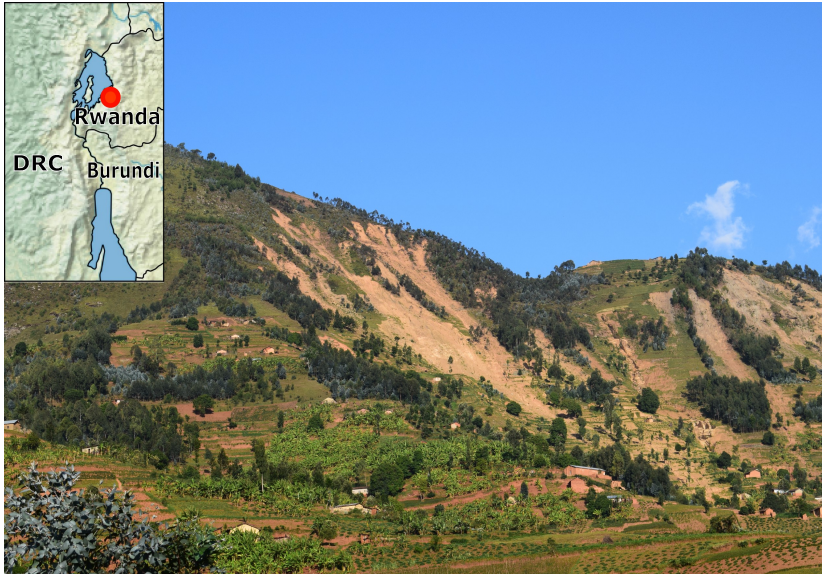
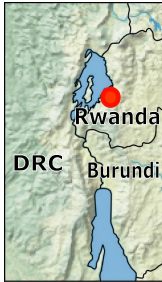
Kivu Rift



- Hansen et al. (2013)
- 52.1% forest in 2000
- 7% deforested

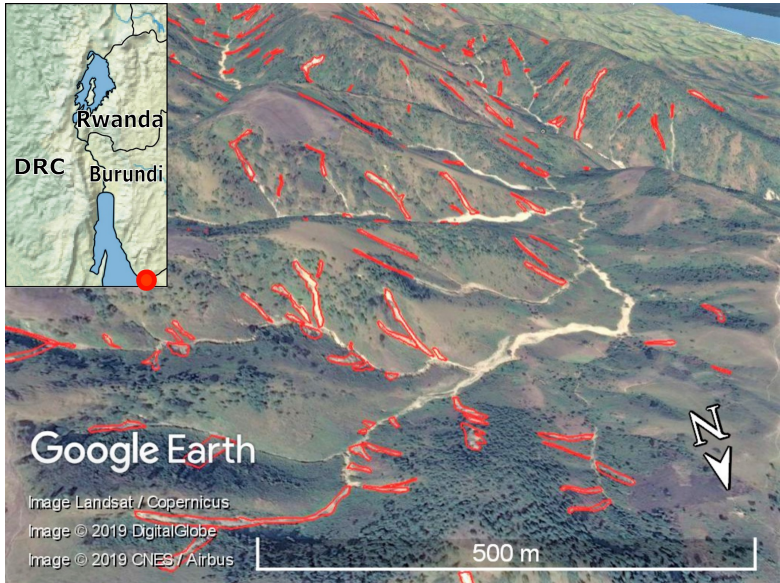
Kivu Rift





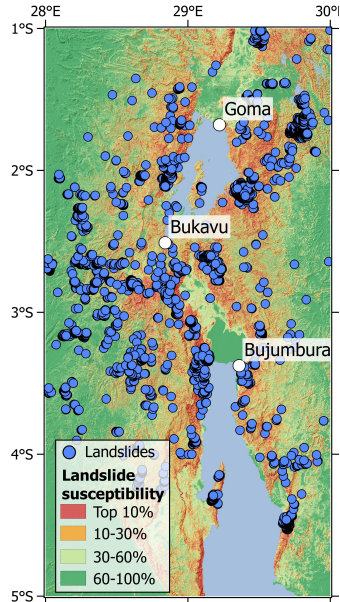
Debris slides in Bucyurabuhoro, Karongi District, Rwanda.

Kivu Rift



Debris flows near Kalinzi, Tanzania.

- 7944 shallow recent landslides
 - Google Earth
 - Depicker et al. (2019)

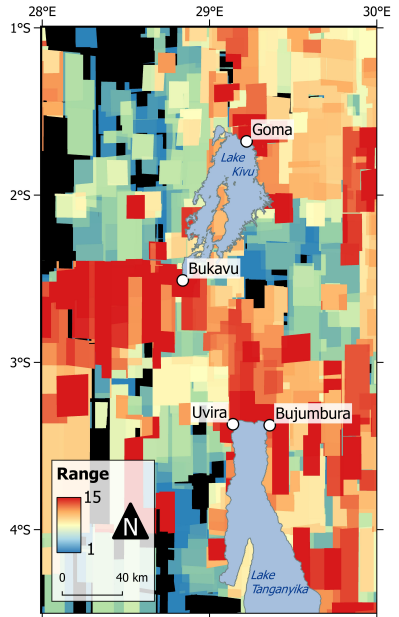
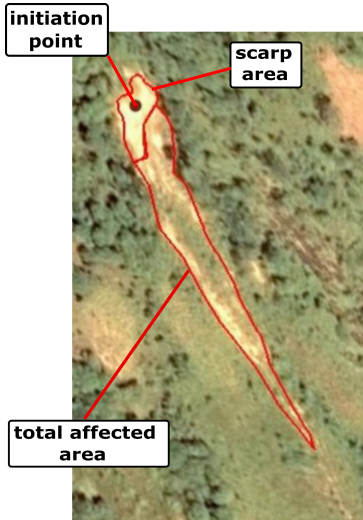


Objective

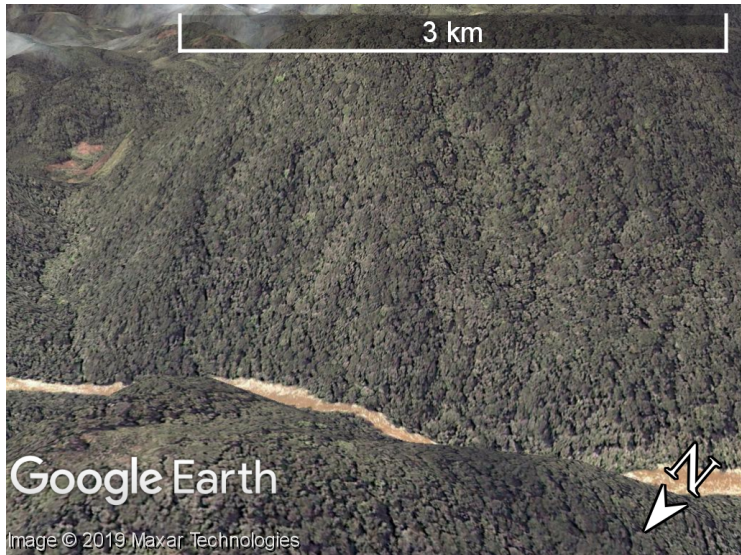
Quantify the **impact of deforestation on landslide activity**,
considering the effects of:

- (i) slope steepness,
- (ii) rock strength, and
- (iii) uplift

Landslide activity

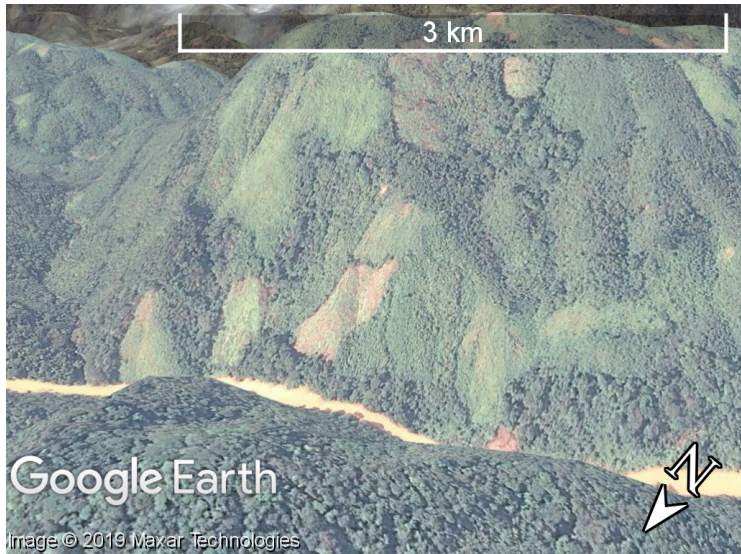


Deforestation impact



April 2, 2003

Deforestation impact

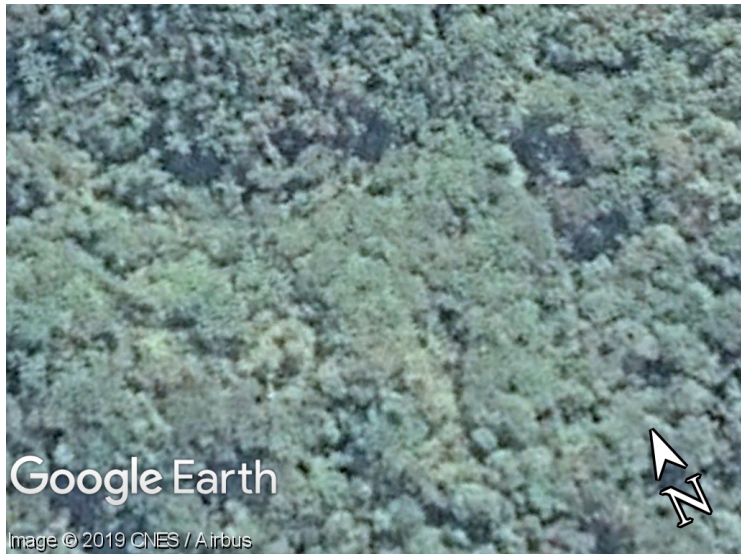


June 24, 2014

Deforestation impact

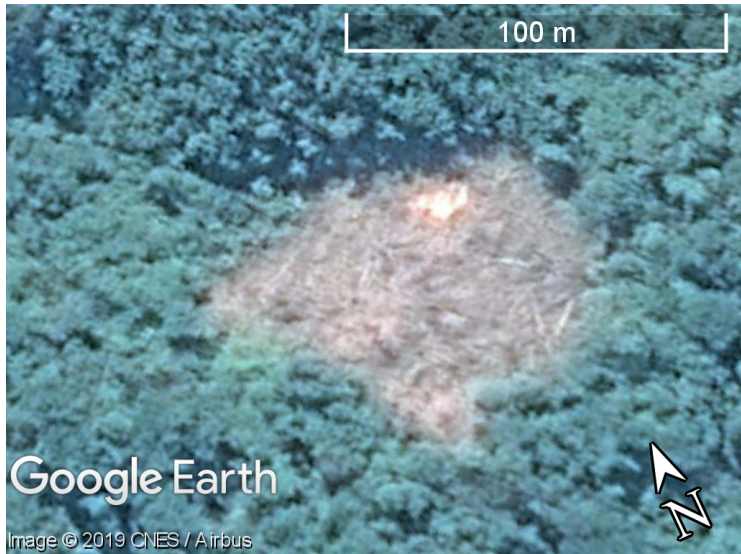


January 21, 2017



June 24, 2014

Deforestation impact



May 30, 2015

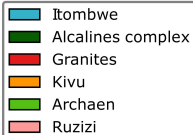
Deforestation impact



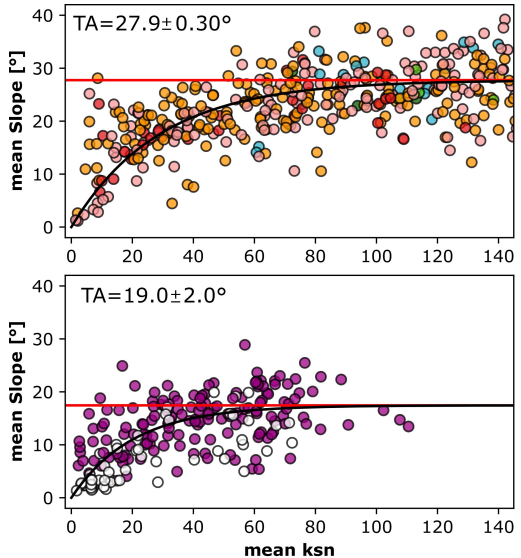
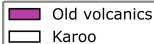
June 27, 2017

- Threshold angle
- 95% of LS in strong rocks

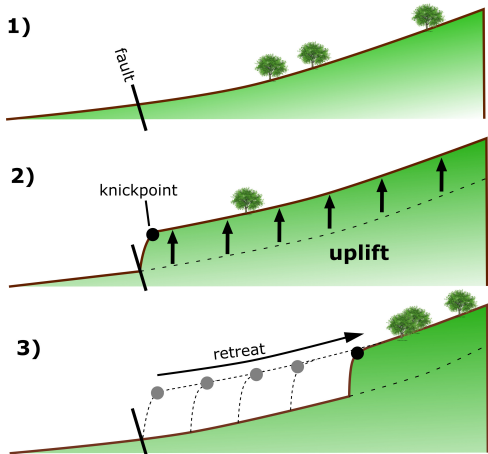
Strong

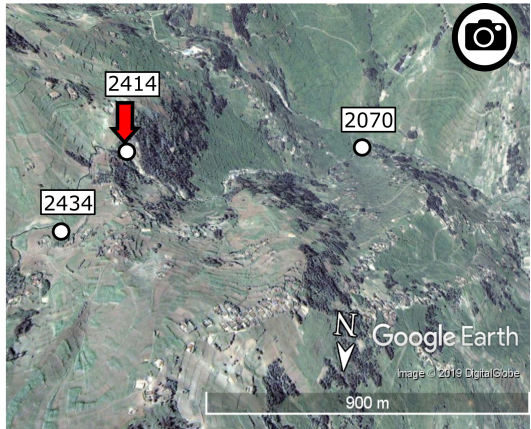


Weak

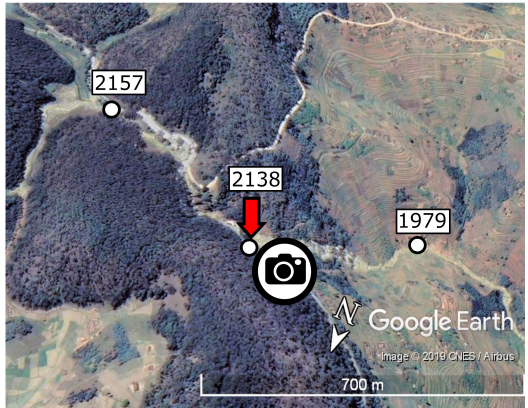


- Uplift → incision
- **knickpoint** retreat
- Relict - rejuvenated
- Erosion wave

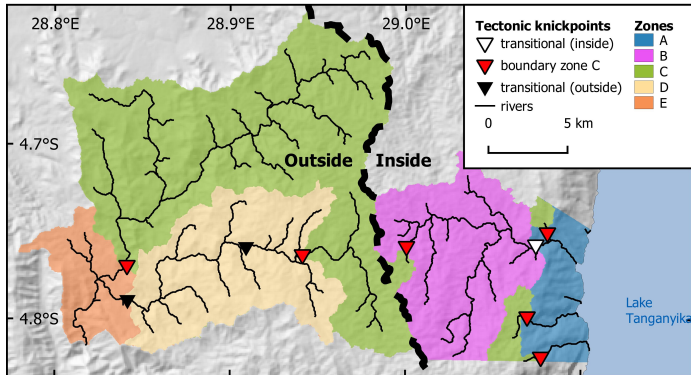
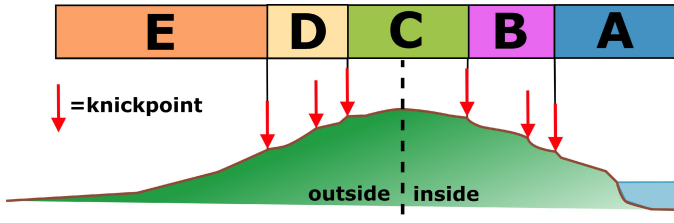






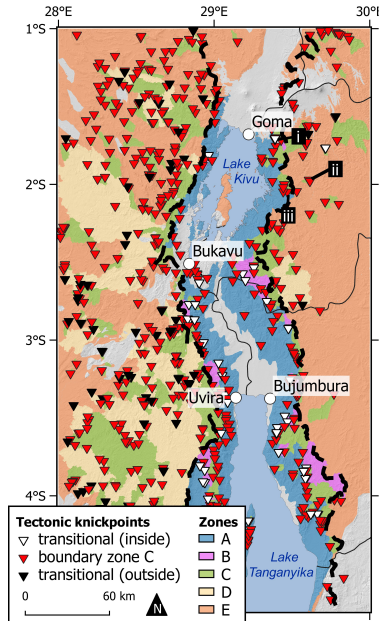


Deforestation impact

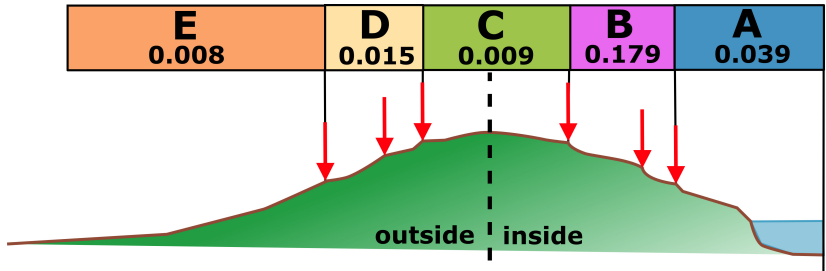


Deforestation impact

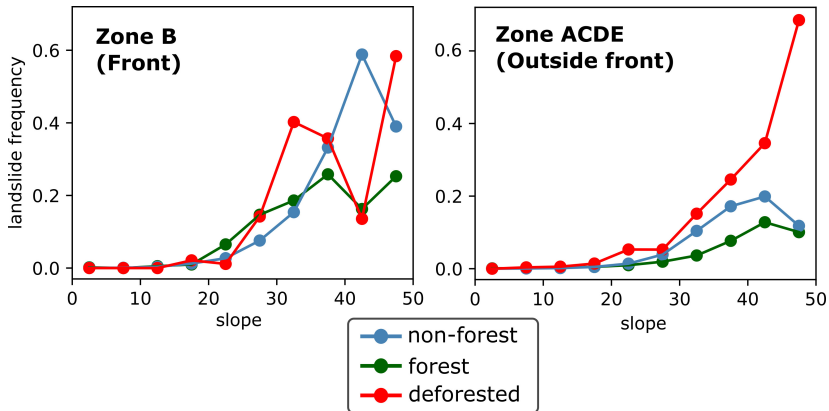
- 672 knickpoints



Landslide frequency



Frequency (#LS/km²/year)



Conclusion

- Deforestation increases landslide activity
 - especially on steeper slopes
 - 30 to 100% higher
- Highest activity at front of the uplift-induced erosion wave
 - 0.179 LS/km²/year
 - insensitive to deforestation!

Questions?



