Using satellite radar to map biomass

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Why must we map biomass remotely?

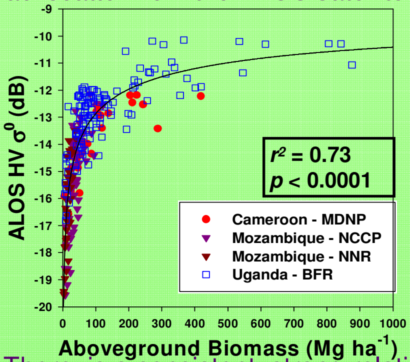
- Monitoring directly using field plots very expensive, time consuming, and hard to independently verify
- Essential to have accurate, regularly updated biomass maps for conservation, land management, carbon balance studies, voluntary-sector carbon management and REDD projects
- The above is *only achievable* through satellite-based remote mapping and monitoring

Why use radar satellite data?

- An active sensor: it sends a pulse of microwaves and detects any radiation scattered back to the sensor by the roughness of the surface.
- It therefore responds directly to biomass, not to leaf colour/area like 'conventional' satellites, and so has potential to be more accurate and universally applicable.
- It is not affected by cloud cover

How does it perform?

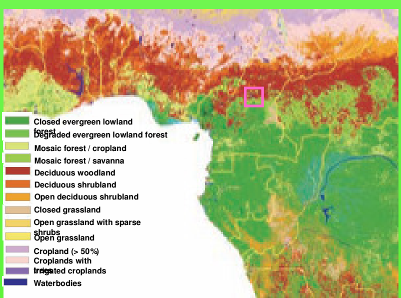
- We took 253 plots from 4 sites across Africa (Cameroon, Uganda, northern and central Mozambique) and compared their biomass to cross-polarised radar backscatter from the ALOS satellite



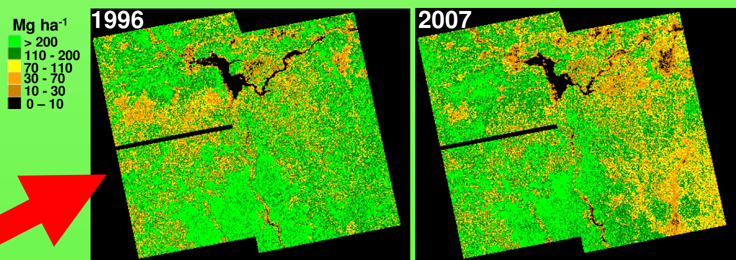
- There is a consistent, strong relationship between backscatter and biomass in African forests and savannas

Mitchard, E. T. A., S. S. Saatchi, I. H. Woodhouse, G. Nangendo, N. S. Ribeiro, M. Williams, C. M. Ryan, S. L. Lewis, T. R. Feldpausch, and P. Meir (2009), Using satellite radar backscatter to predict above-ground woody biomass: A consistent relationship across four different African landscapes, *Geophysical Research Letters.*, 36, L23401.

Case study: change detection in a 15 000 km² region on forest-savanna boundary in Cameroon



Taken from Mayaux *et al.* 2000. *J. Biogeogr.* **31**: 861-877



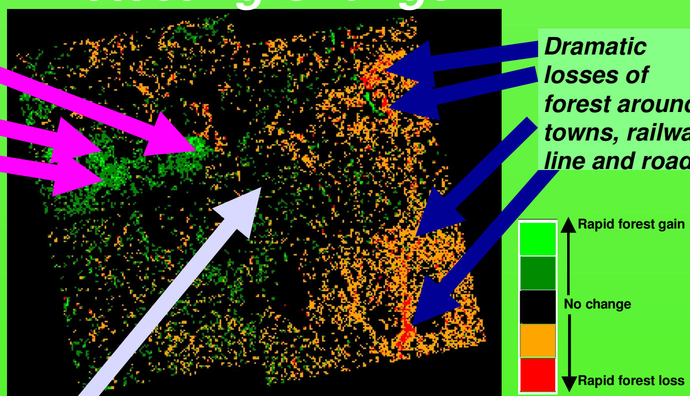
Radar data converted to aboveground biomass using field data

Net loss of 1300 km² of high-biomass forest (> 150 Mg ha^{-1}), from 2700 km² in 1996 to 1400 km² in 2007, due to degradation and deforestation. However, in some areas savannas and woodlands are rapidly increasing in biomass.

Detecting Change

Growth of forest where human impact has decreased, in and around a national park

Dramatic losses of forest around towns, railway line and roads



Location of field campaign October-December 2007

Conclusion:

Radar data can be used to determine biomass and detect changes in biomass in African savannas, woodlands and lower biomass forests.

Mitchard, E. T. A., S. S. Saatchi, I. H. Woodhouse, T. R. Feldpausch, S. L. Lewis, B. Sonke´, C. Rowland, and P. Meir (2009), Measuring biomass changes due to woody encroachment and deforestation/degradation in a forest-savanna boundary region of central Africa using multi-temporal L-band radar backscatter, *Remote Sensing of Environment.*, in press.