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O59-05 – S59 Mapping and monitoring tropical forest degradation with remote sensing
Thursday 23 June / 14:30-17:00 – Sully I

Roadless space and logging in intact forest landscapes of the Congo Basin

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Background: Forest degradation in tropical regions is often associated with roads built for selective logging. Forest areas that are not accessible by roads are considered valuable because they provide habitat that is not immediately impacted by major human activities. The protection of such Intact Forest Landscapes (IFL) is high on the biodiversity conservation agenda, leading to a motion of the Forest Stewardship Council (FSC) to better protect IFL in certified forest concessions. However, in many parts of Central Africa logging takes place at very low intensities and most roads are abandoned after few years of timber harvesting. Taking limited road persistence into account we asked: How did road networks in FSC certified concessions affect IFL?

Methods: Intact forest landscapes can be conserved by retention of "roadless space", a concept based on distance to the nearest road from any point. We used the Empty-Space Function, a general statistical tool from stochastic geometry, to calculate roadless space based on time series of LANDSAT images. We followed the spatial and temporal dynamics of logging roads in a part of the Congo Basin that has recently seen rapid expansion of road networks for selective logging. We compared the development of roadless space in certified and non-certified logging concessions inside and outside areas declared as being IFL in the year 2000.

Results: The persistence of logging roads was limited over time, with only 12% of the overall network being permanently open. However, also taking only actively used roads into account, roadless space inside IFL has decreased rapidly due to expansion of logging into previously unlogged areas. Concessions that are now certified by FSC showed a slower rate of decrease before certification but after that their roadless space decreased to a level comparable to non-FSC concessions. The established concessions outside IFL showed a slight increase in roadless space due to forest recovery on abandoned roads.

Conclusions: We recommend that forest management should make the preservation of large connected forest areas a top priority by effectively monitoring - and limiting - the occupation of space by roads that are accessible at the same time. Given the strong dynamics in road detectability, we challenge the static definition of intact forest landscapes based on a buffer around any road ever detected. Instead we suggest the empty space function as a viable alternative to calculate roadless space.

O59-06 – S59 Mapping and monitoring tropical forest degradation with remote sensing
Thursday 23 June / 14:30-17:00 – Sully I

Gold-rush in a forested El Dorado: long-term assessment of deforestation and policy issues

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Small-scale gold-mining has been the major driver of last decade deforestation within the Guiana Shield, one of the least degraded tropical forests in the world. Its social and environmental impacts are diverse and severe: water pollution due to turbidity and mercury, over-hunting in remote and preserved areas, insecurity, prostitution or malaria expansion. Deforestation is another direct effect of small-scale gold-mining, being also the easiest way of assessing its expansion.

Using deforestation maps produced by Hansen et al. (2013) and additional Landsat based dataset during the 90's, we provide a long term assessment of deforestation due to small-scale gold-mining between 1990 and 2014 in the Guiana Shield. Quasi-annual measurements of deforestation over the whole region show a very strong exponential relationship between deforestation due to small-scale gold-mining and gold-prices, explaining its massive increase until years 2012-13, when both prices and deforestation started to drop. This highly dynamic relationship suggests low level of governance at the regional scale and raises the question of the ability of local countries to efficiently limit their level of deforestation in eventual REDD+ like projects.

A focus on each country's situation shows very different temporal patterns of deforestation between French Guiana and both Suriname and Guyana. While deforestation in the two last countries follows gold prices from the beginning until the end of the period; small-scale gold-mining activity in French Guiana seems to be sharply increasing until 2004. Then, the pressure of military interventions against illegal mining, helped by a regular monitoring using remote sensing techniques (Mining Activity Observatory managed by the French Forest Service), probably overcomes the price effect.

Studying the efficiency of local policy in reducing deforestation and associated carbon emissions is of major importance to assess the ratio between economic costs and environmental benefits of such interventions. Looking at potential deforestation leakages between countries as a response to local management is also a necessity to improve environmental governance at the regional scale.