Applications of NASA Earth Observations for Monitoring Forest Loss in the Madre de Dios Region of Peru

Andrea Nicolau¹, Kelsey Herndon², Africa Flores², Robert Griffin¹,²
¹UAH Department of Atmospheric Science, ²NASA SERVIR SCO

Overview
Over the last twenty years, the Peruvian Amazon has experienced a rapid decrease in forest cover due to the expansion of agriculture and extractive activities. This study uses Spectral Mixture Analysis (SMA) in a cloud-computing platform to map forest loss within and outside key land tenure areas in the Madre de Dios region of Peru. Landsat 7 Enhanced Thematic Mapper plus (ETM+) and Landsat 8 Operational Land Imager (OLI) Surface Reflectance data were utilized spanning 2013 and 2017 and spectral unmixing was performed to identify patterns of forest loss for each year. Planet Scope and RapidEye imagery were used to conduct an accuracy assessment and to identify potential drivers.

Satellites and Methodology

Key Findings/Results

Progression of Forest Loss (2013-2017)

Concessions

Potential Drivers

Visual Inspection of High Resolution Imagery

Protected Areas 151 58 430 169 202 808
Tambopata National Reserve 86 32 280 124 154 614
Buffer Zones 1743 1706 1425 2183 1762 7047
Kotsimba Indigenous Community 217 382 302 124 154 614
Within Mining Concessions 1538 1572 1314 1760 1546 6184
Outside Mining Concessions 1670 1386 1515 2086 1664 6657
Reforestation Concessions (whole) 757 548 629 1244 523 2093
Reforestation - Mining Concessions 730 396 314 653 523 2093
Overlapping Mining + Reforestation 514 233 234 104 271 1085
Study Area 3207 2958 2830 3846 3210 12841

Conclusions
Progressive forest loss expansion continues to prevail in this region, threatening protected areas like the Tambopata National Reserve and the Indigenous Community of Kotsimba. The maps created with the use of Landsat data provide information for subsequent assessments on land cover planning and monitoring. The use of the spectral mixture algorithm as a change detection technique provides accurate results (Overall accuracy = 95%), and the use of a cloud-computing platform for accessing and processing time-series data is promising.

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