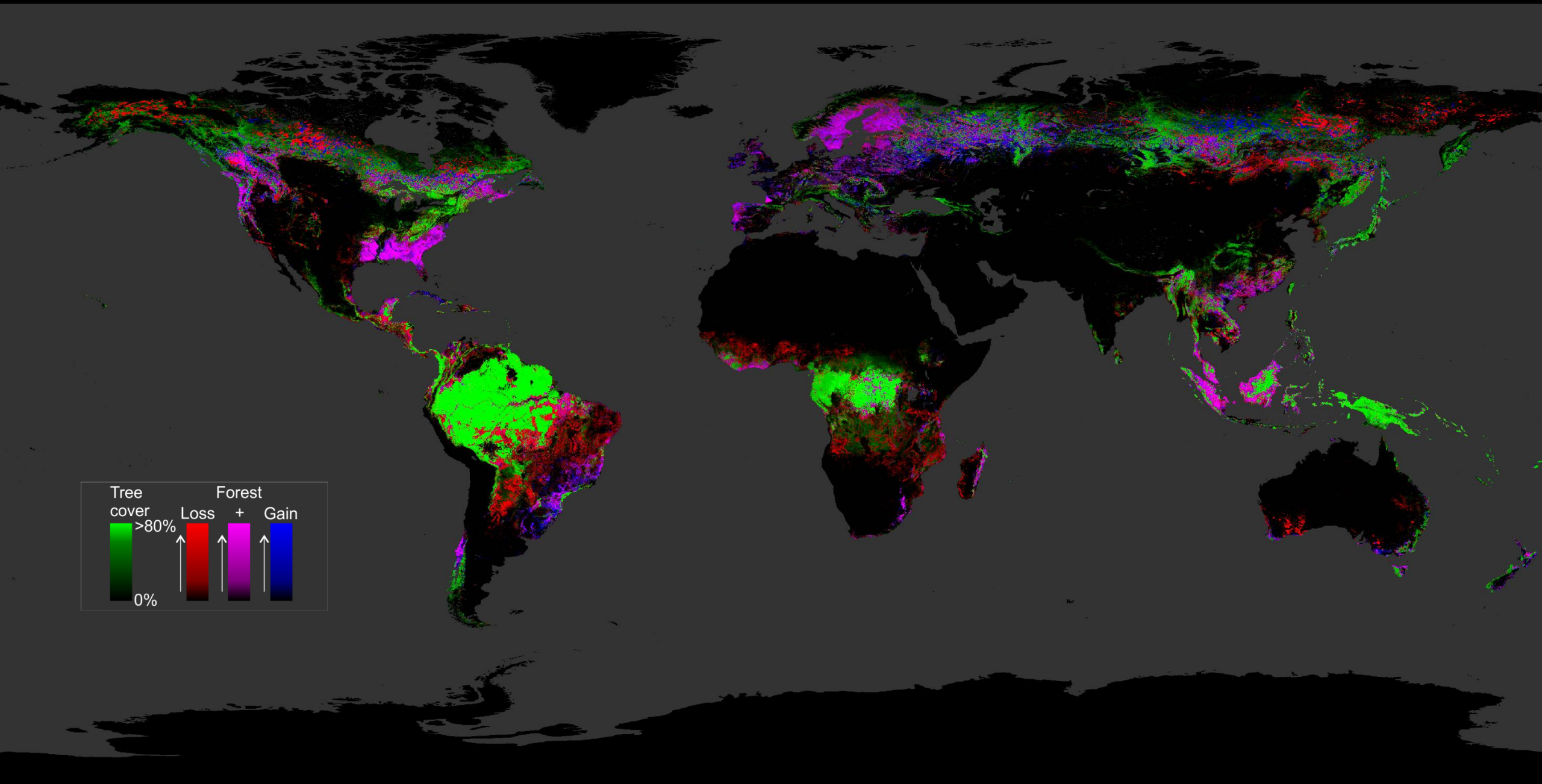
GLAD near-real time forest alerts

M. Hansen, A. Pickens, P. Potapov, A. Tyukavina

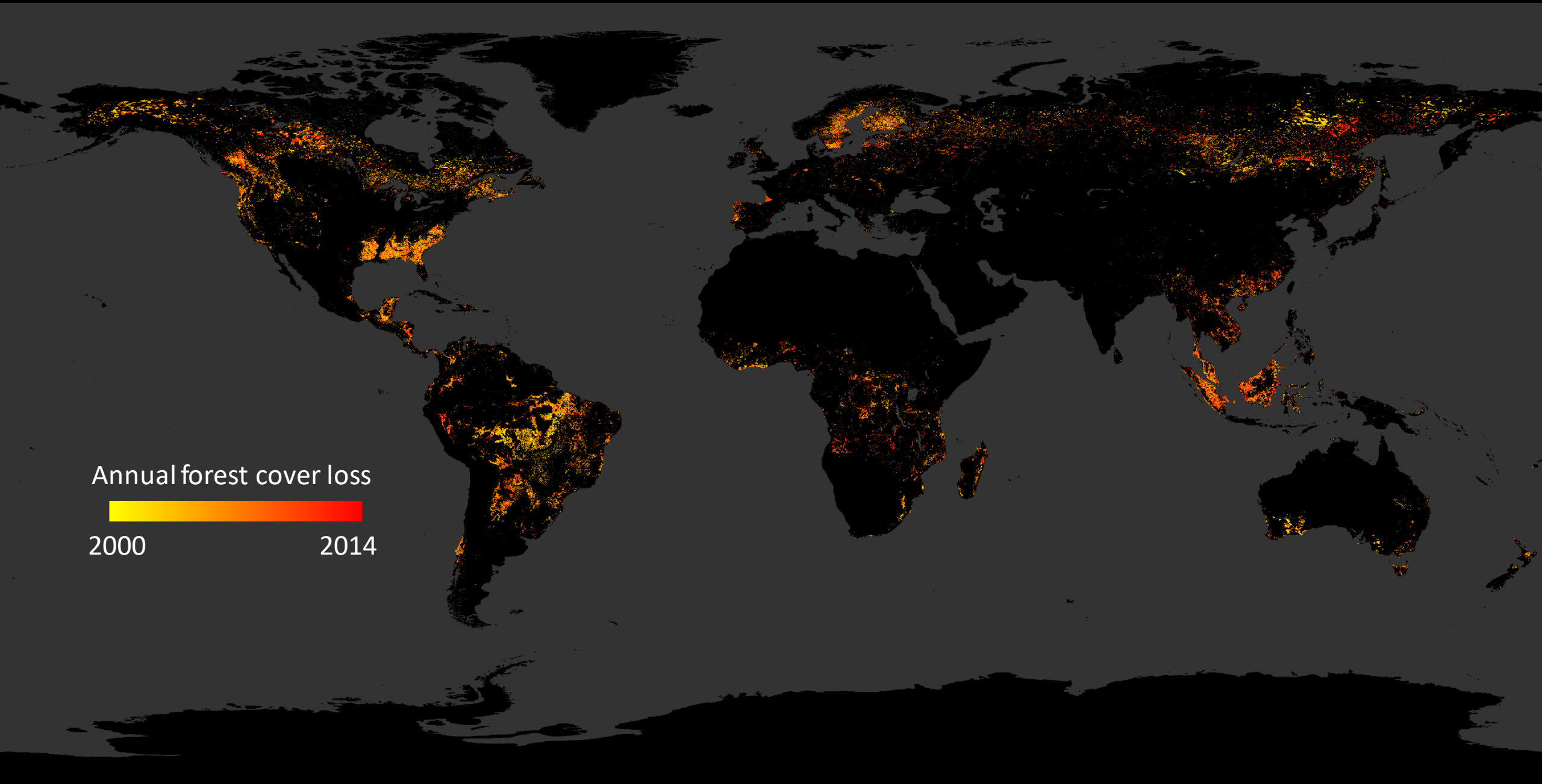
GLAD
GLOBAL LAND ANALYSIS & DISCOVERY

UNIVERSITY OF MARYLAND

Global tree cover loss and gain



Global annual forest cover loss



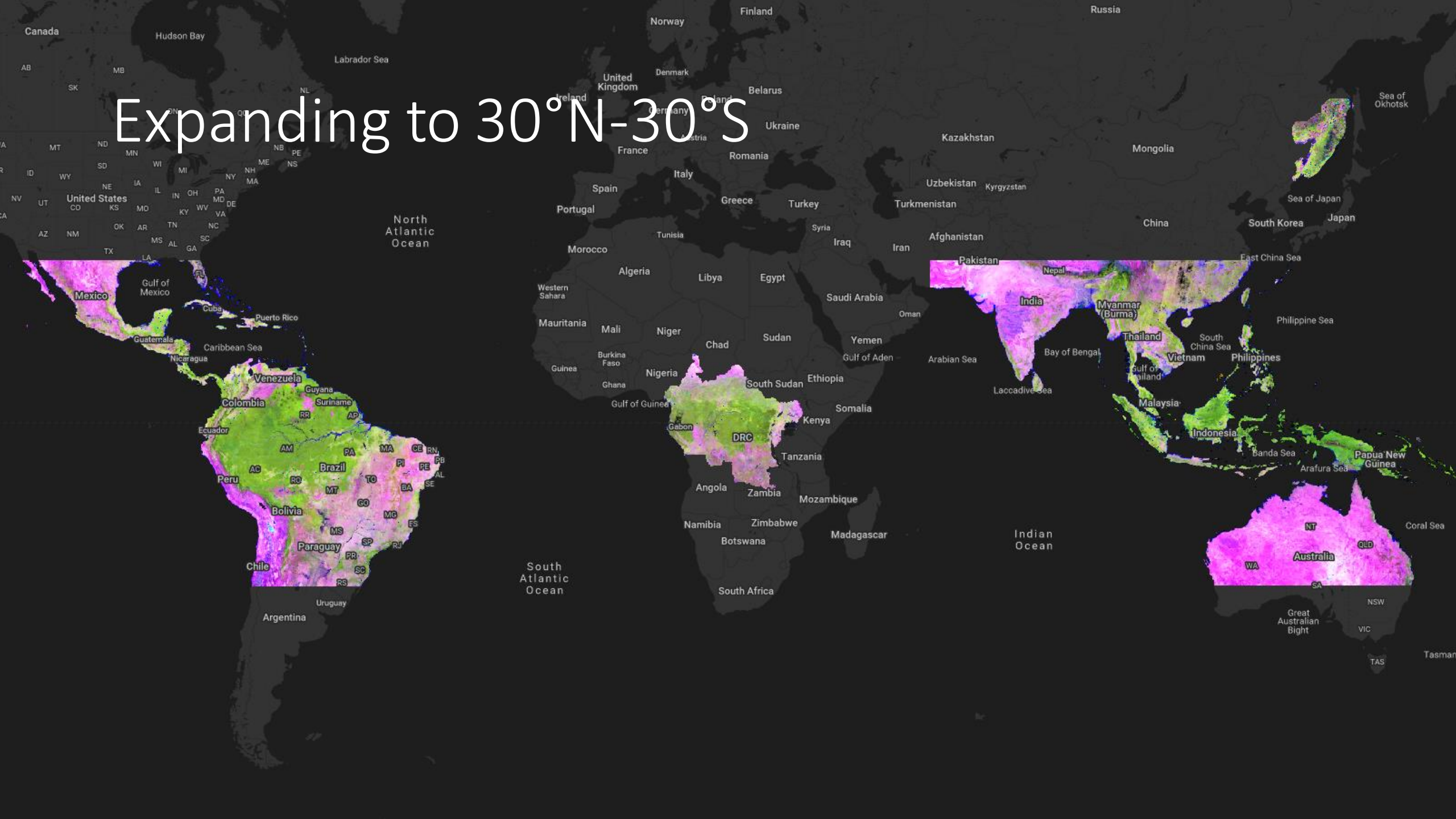
30m forest disturbance alerts

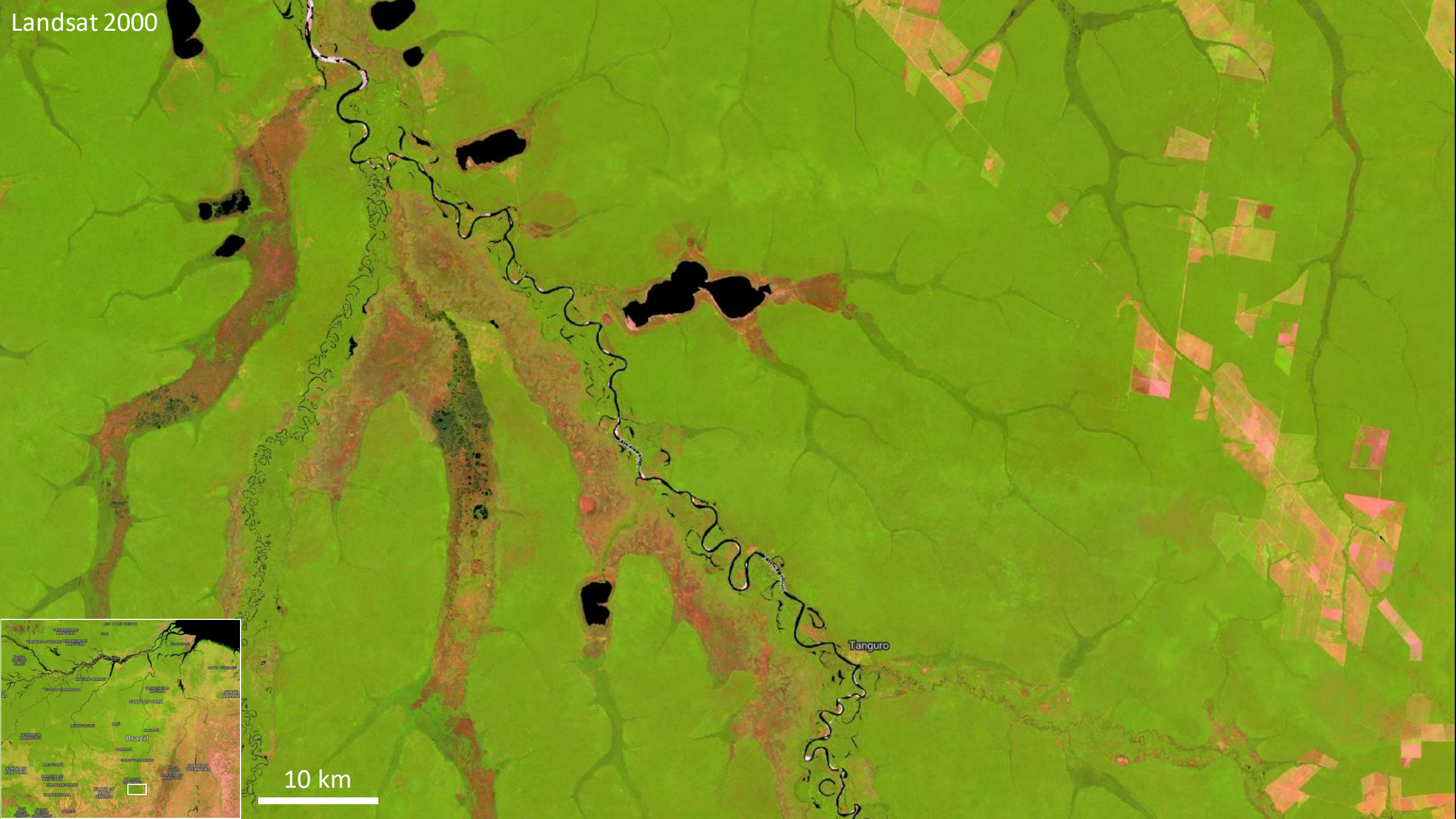
- Near-real time updates on landscapes experiencing forest disturbance
- Derived from all new Landsat 7 and 8 scenes, giving a nominal 8 day revisit
- Updated daily
- Operational for 40+ countries and expanding to all 30°N-30°S
- Serves as an indicator product with low commission error, not as an area estimator
- A complementary product to the annual global map

01/16/2014

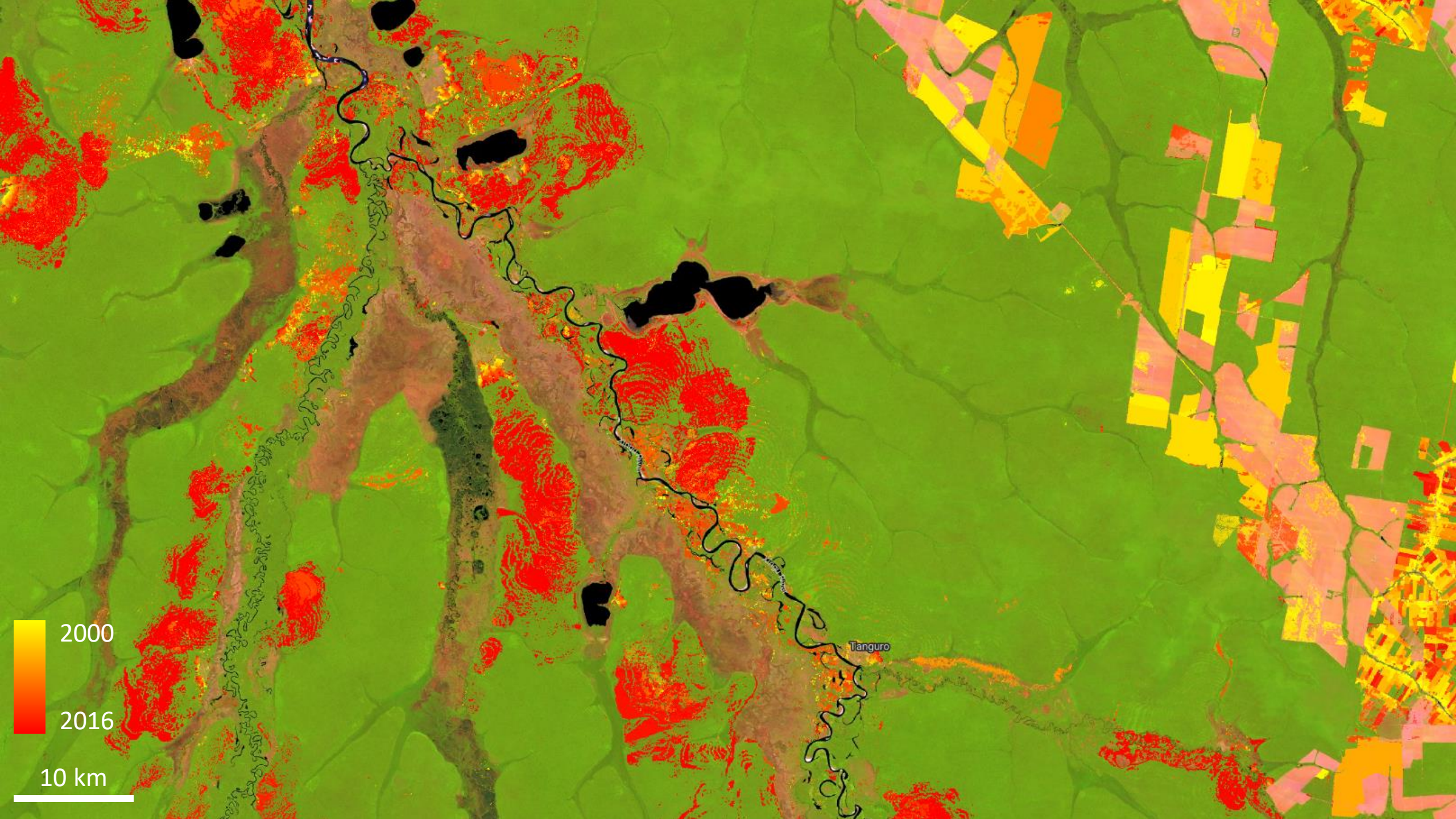
Near real time forest disturbance alerts

Expanding to 30°N-30°S




Landsat 2000
Tanguro
10 km
Brazil


Landsat 2016
Tanguro
10 km


2000
2016
10 km
Tanguro


Alerts as of 7 May 2018
Multiple Detections
Single Detection
2000
2016
10 km
Tanguro


Last observation as of 7 May 2018
Tanguro
10 km


Last observation and alerts as of 7 May 2018
Tanguro
Multiple Detections
Single Detection
10 km

Detection and time-series check

Cloud masking and normalization

Forest loss detection algorithm

Loss

Single detection

Detected loss in at least **1** out of the next **4** observations (within 180 days)

Yes

Multiple detection

No

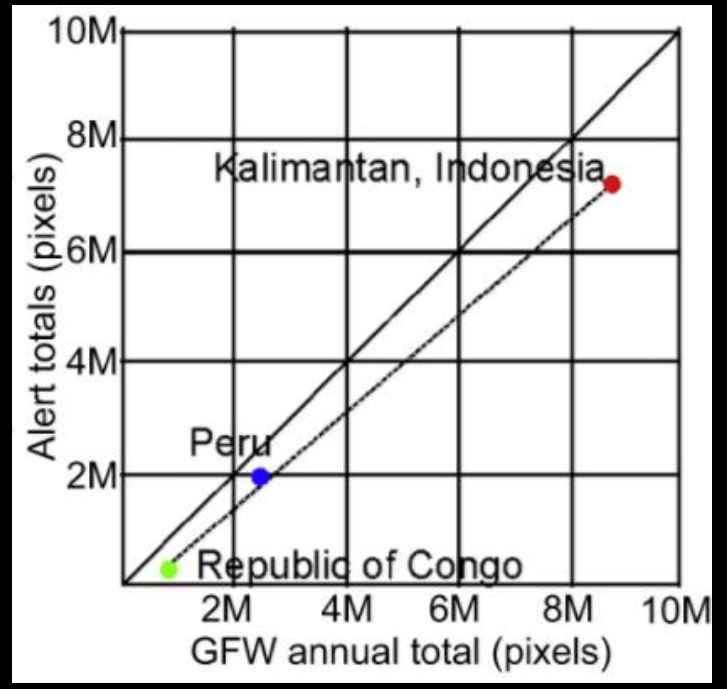
No change

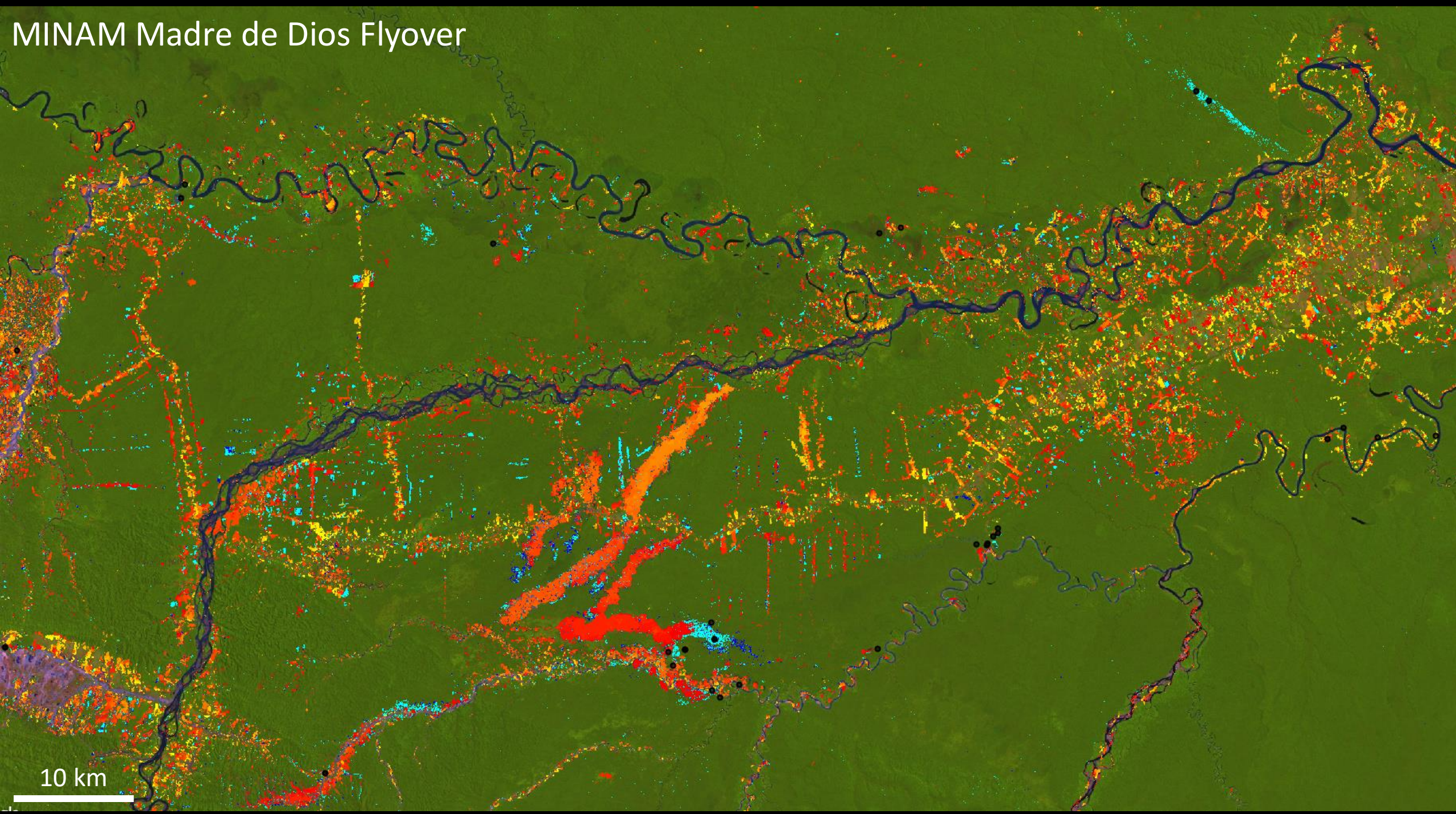
No Loss

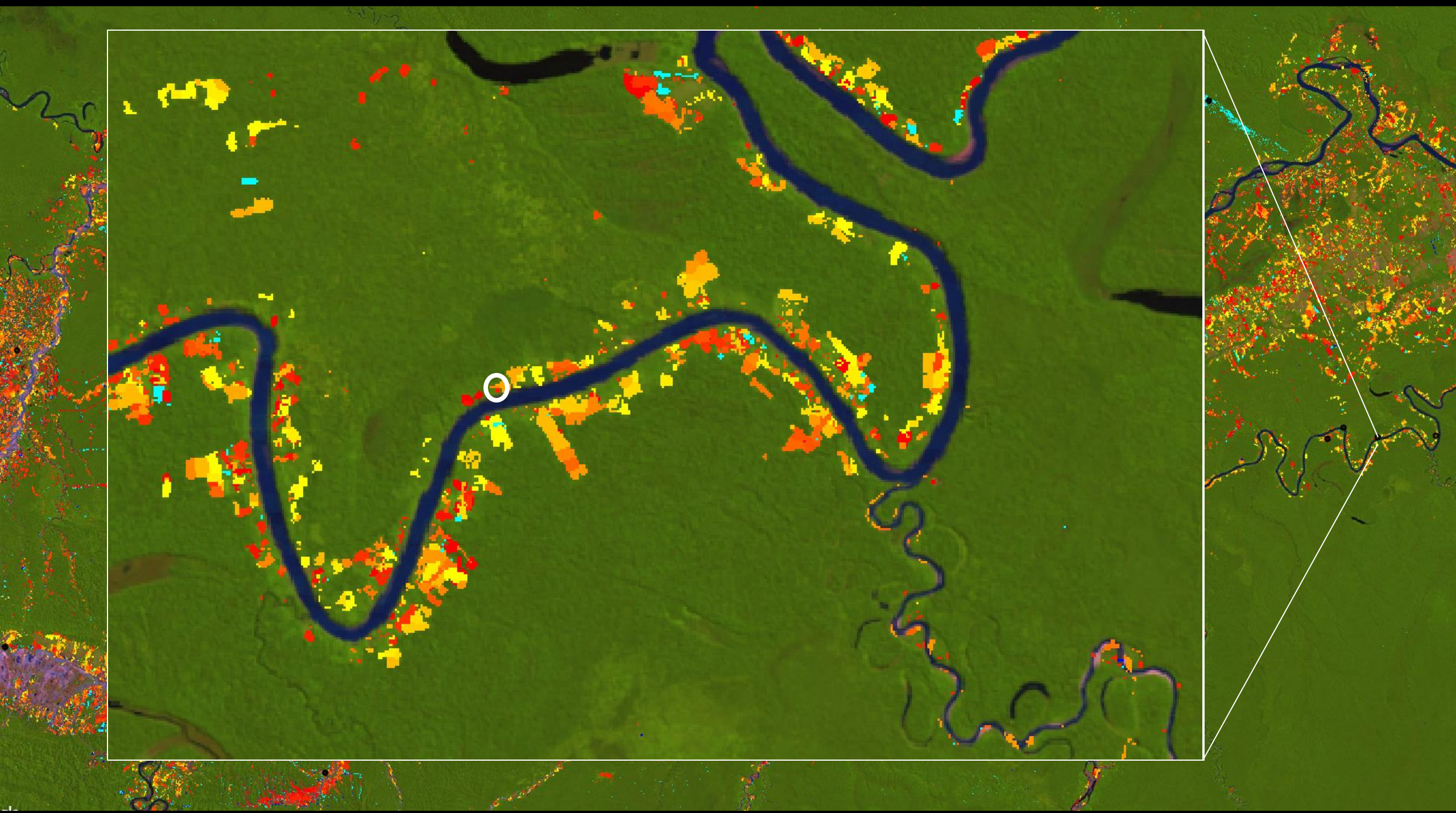
Peru Validation Results

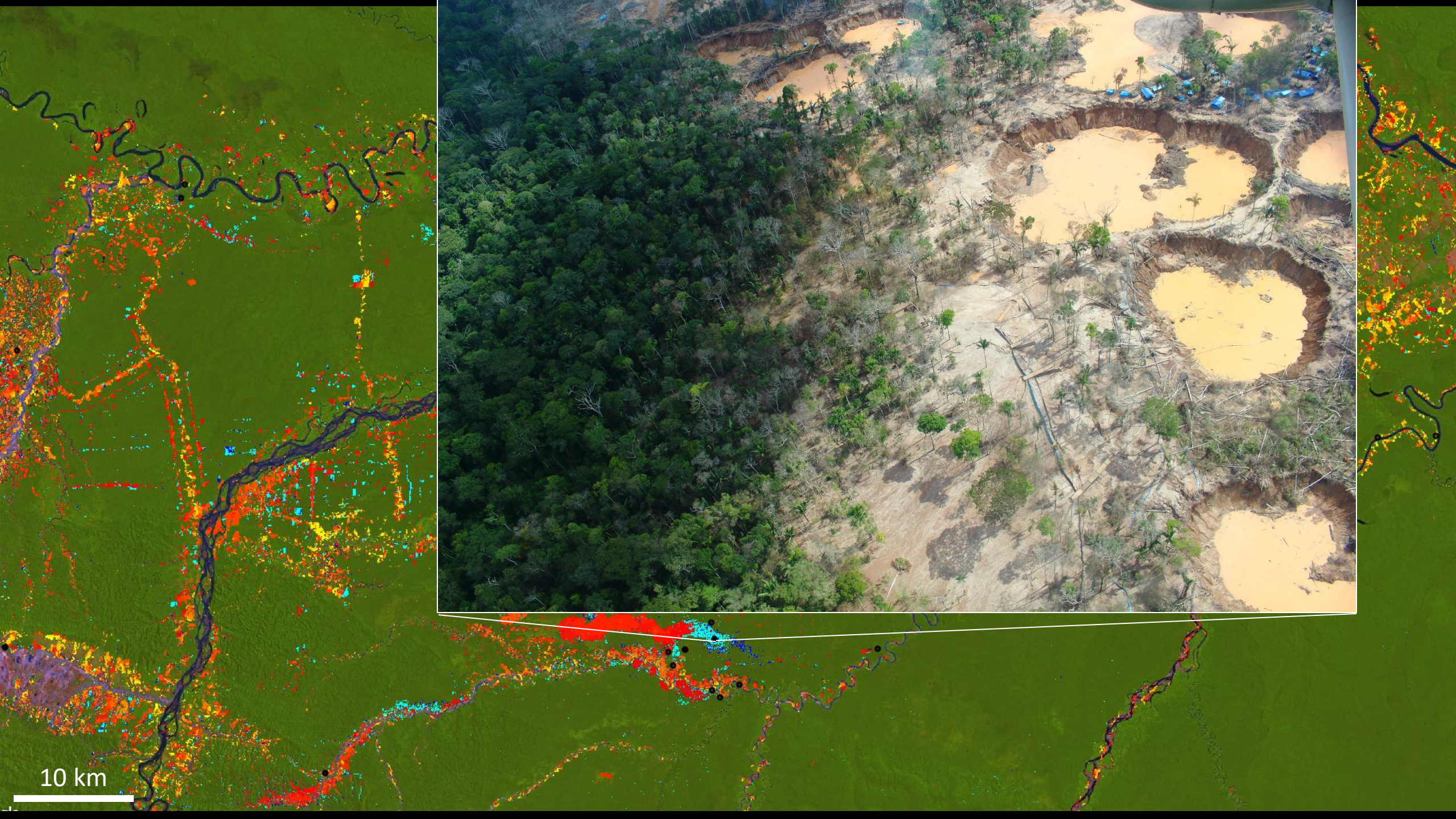
- Stratified random sample targeting areas most likely to be misidentified
- 1300 samples
- A conservative product across regions

		All forests	Primary	Secondary
User's accuracy	All samples (including boundary pixels)	**86.5 ± 2.0**	86.1 ± 2.6	87.0 ± 3.0
	Without boundary pixels and single detection alerts	**99.0 ± 0.7**	99.1 ± 0.9	98.9 ± 1.2
Producer's accuracy	All samples (including boundary pixels)	**67.0 ± 7.4**	77.6 ± 16.2	56.4 ± 7.0
	Without boundary pixels and single detection alerts	**69.7 ± 9.0**	84.9 ± 22.0	54.5 ± 7.9

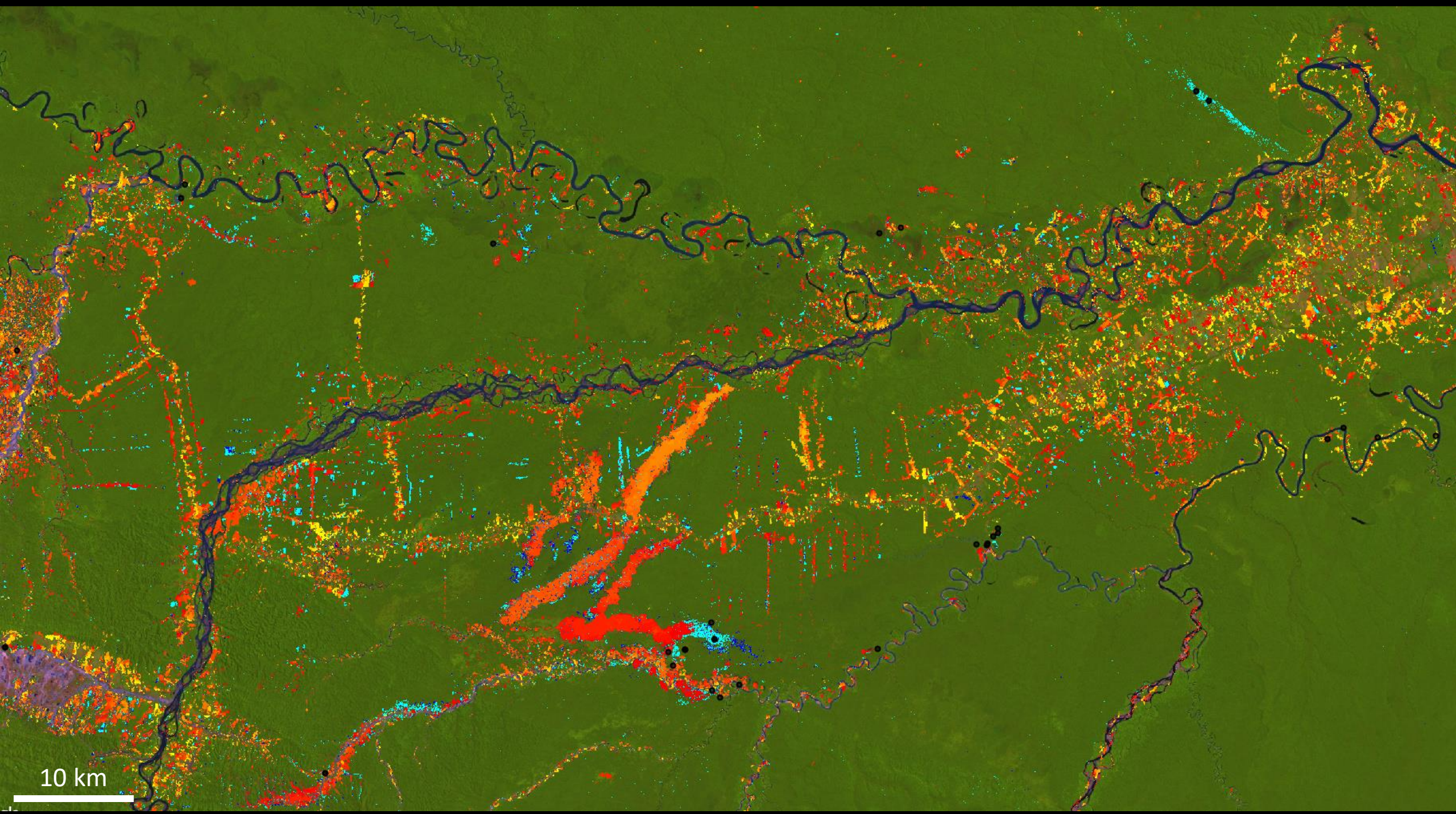



MINAM Madre de Dios Flyover
10 km




10 km


10 km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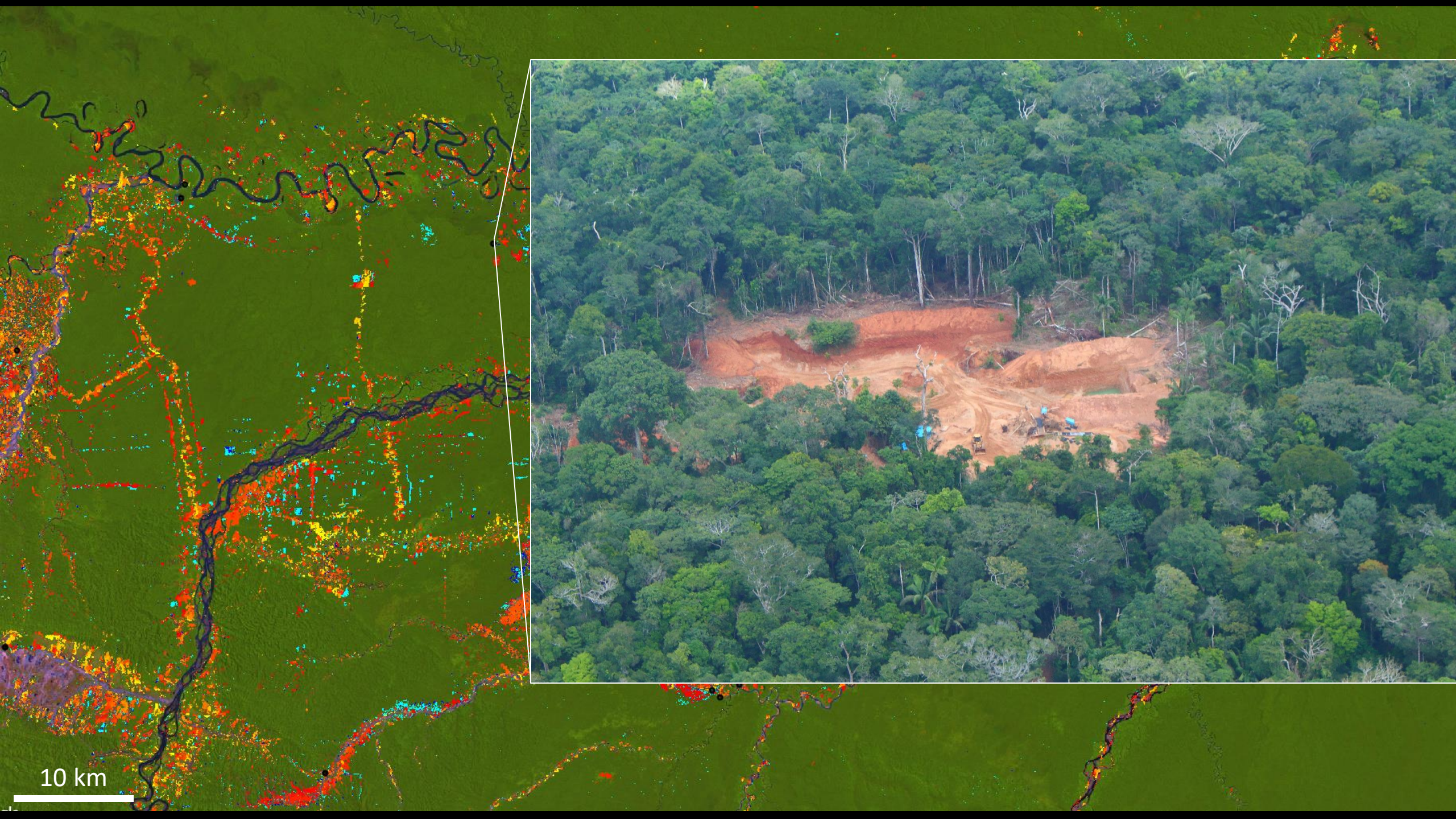
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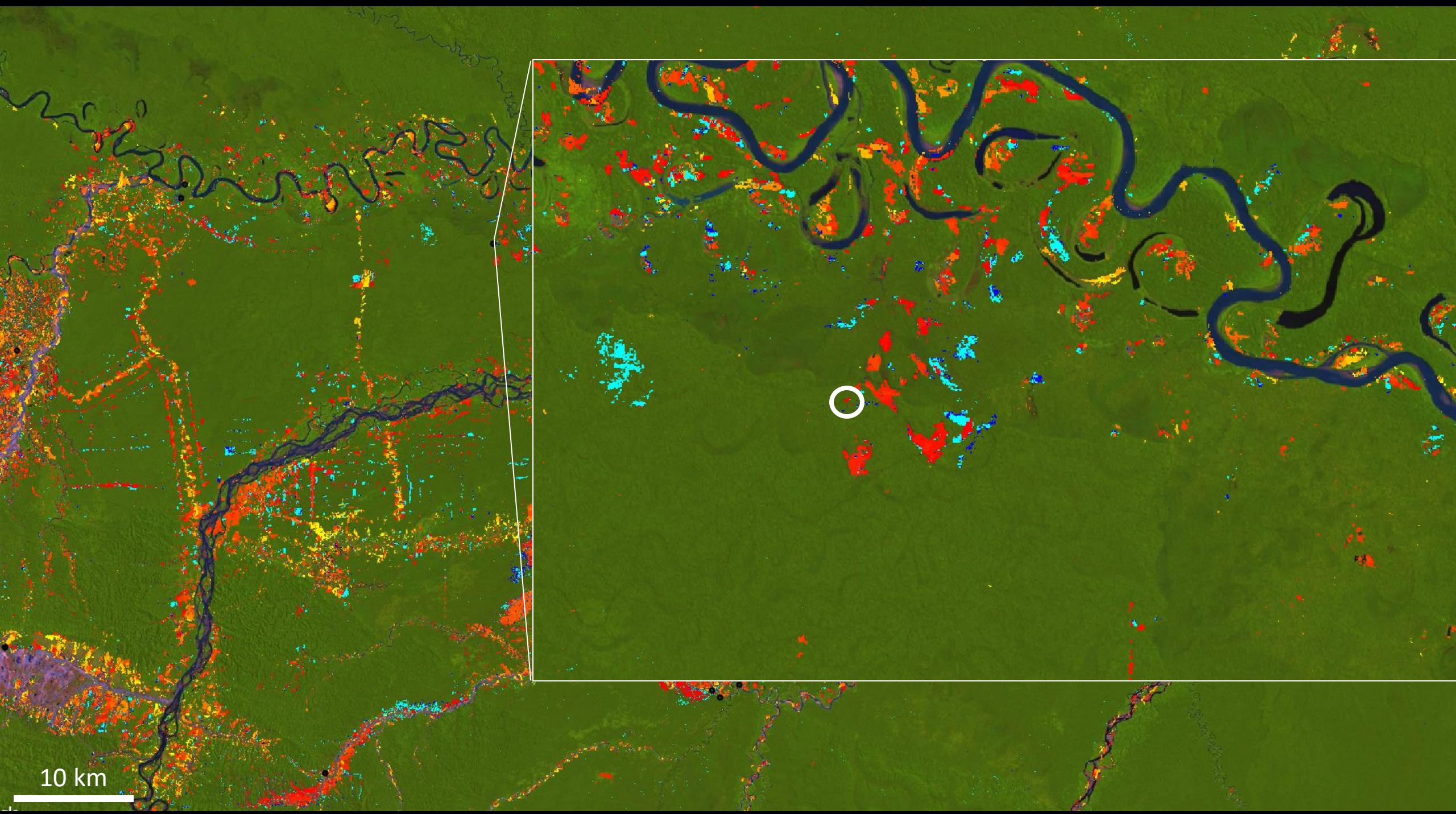
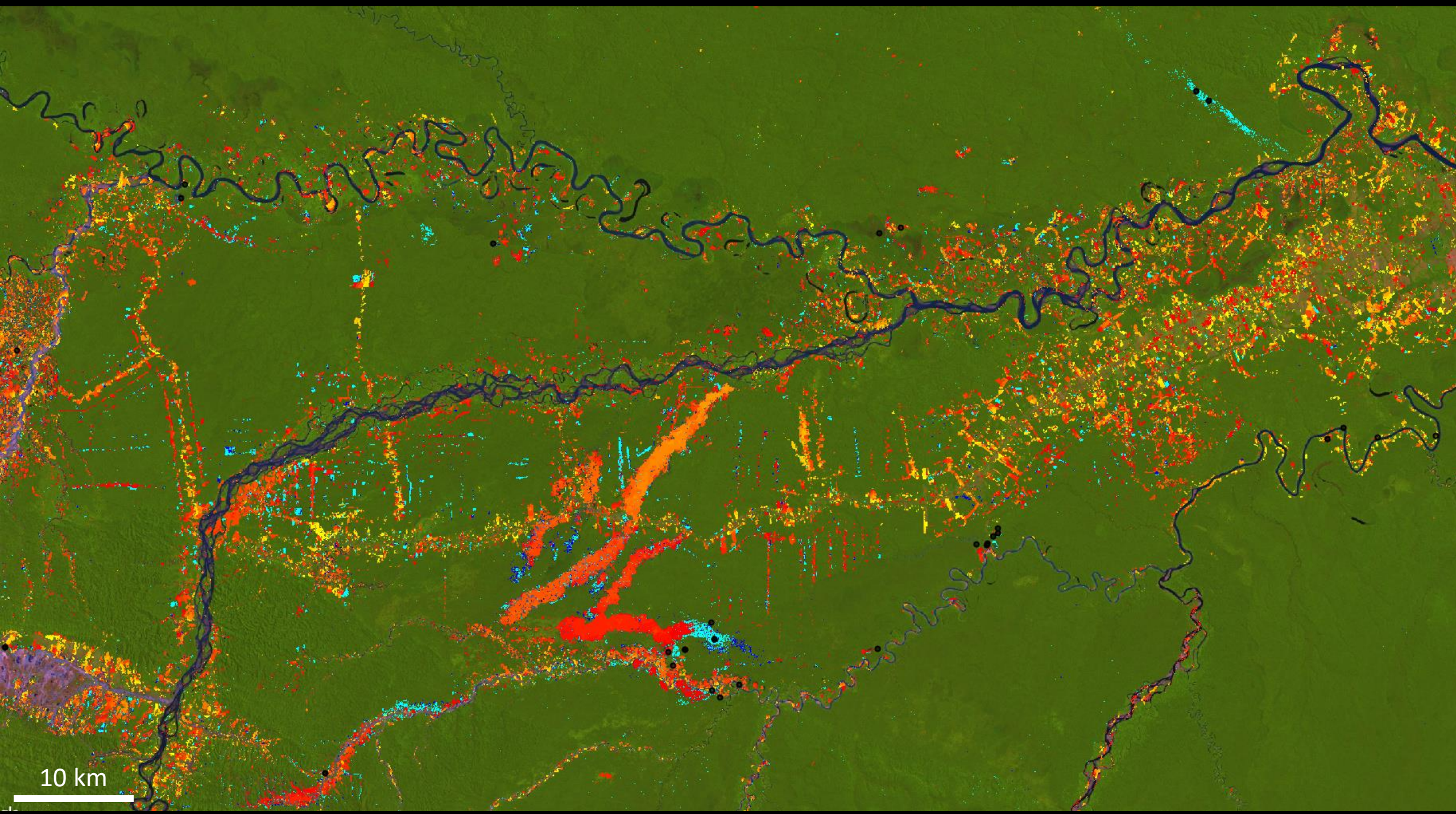
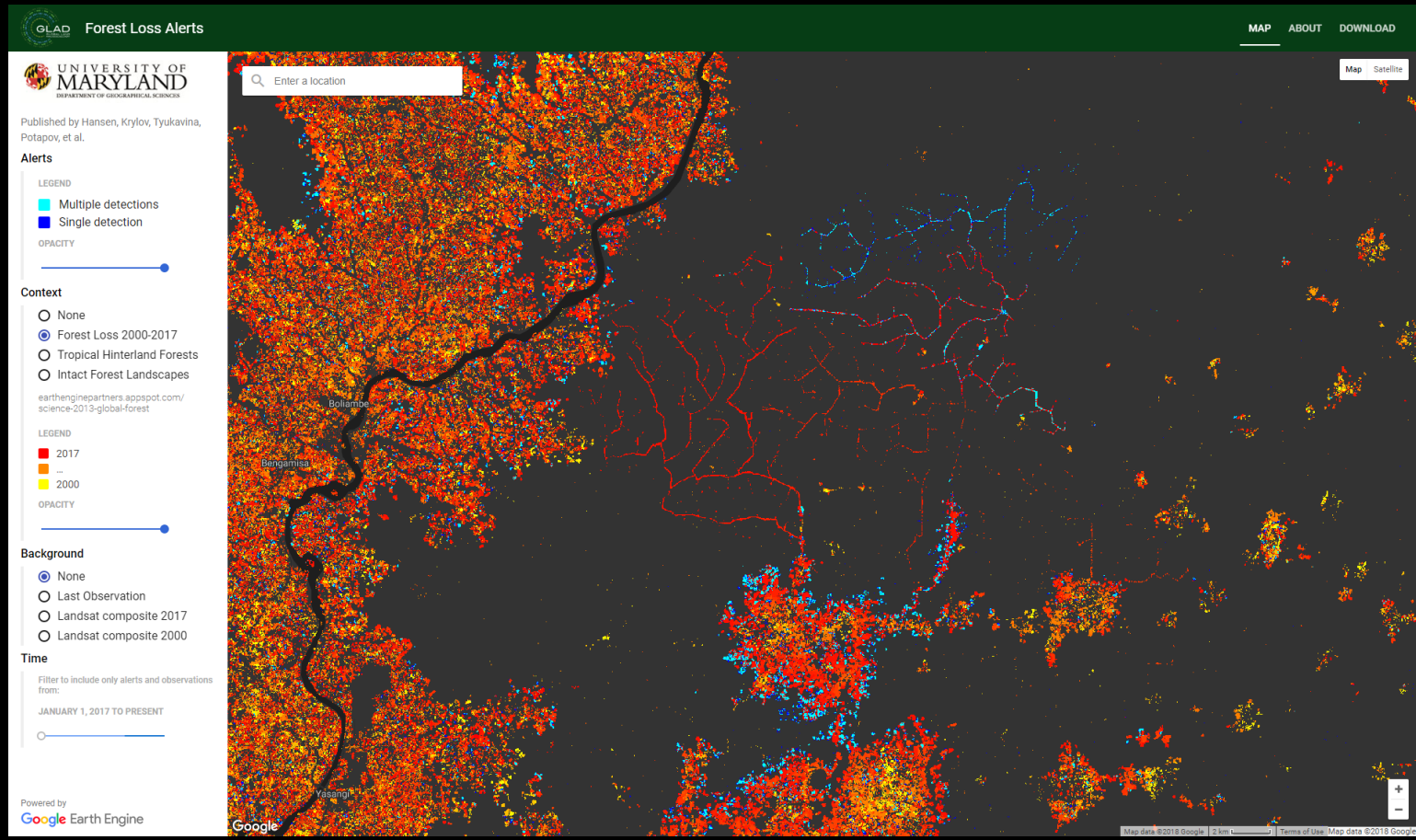

10 km


10 km

Data access

- GLAD forest alert website
  - *glad-forest-alert.appspot.com*
  - Visualization of alerts and auxiliary data
  - Tiled data download
- Global Forest Watch
  - *globalforestwatch.org*
- Google Earthengine assets
  - *projects/glad/alert/UpdResult*



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Alerts

LEGEND

- Multiple detections
- Single detection

OPACITY

Context

- None
- Forest Loss 2000-2017
- Tropical Hinterland Forests
- Intact Forest Landscapes

Background

- None
- Last Observation
- Landsat composite 2017
- Landsat composite 2000

earthenginepartners.appspot.com/science-2013-global-forest

LANDSAT BANDS: SWIR1-NIR-RED

OPACITY

Time

Filter to include only alerts and observations from:

JANUARY 1, 2017 TO PRESENT

Powered by Google Earth Engine

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www.intactforests.org

LEGEND

- IFL 2016
- IFL degradation 2013-2016
- IFL degradation 2000-2013

OPACITY

Background

- None
- Last Observation
- Landsat composite 2017
- Landsat composite 2000

earthenginepartners.appspot.com/science-2013-global-forest

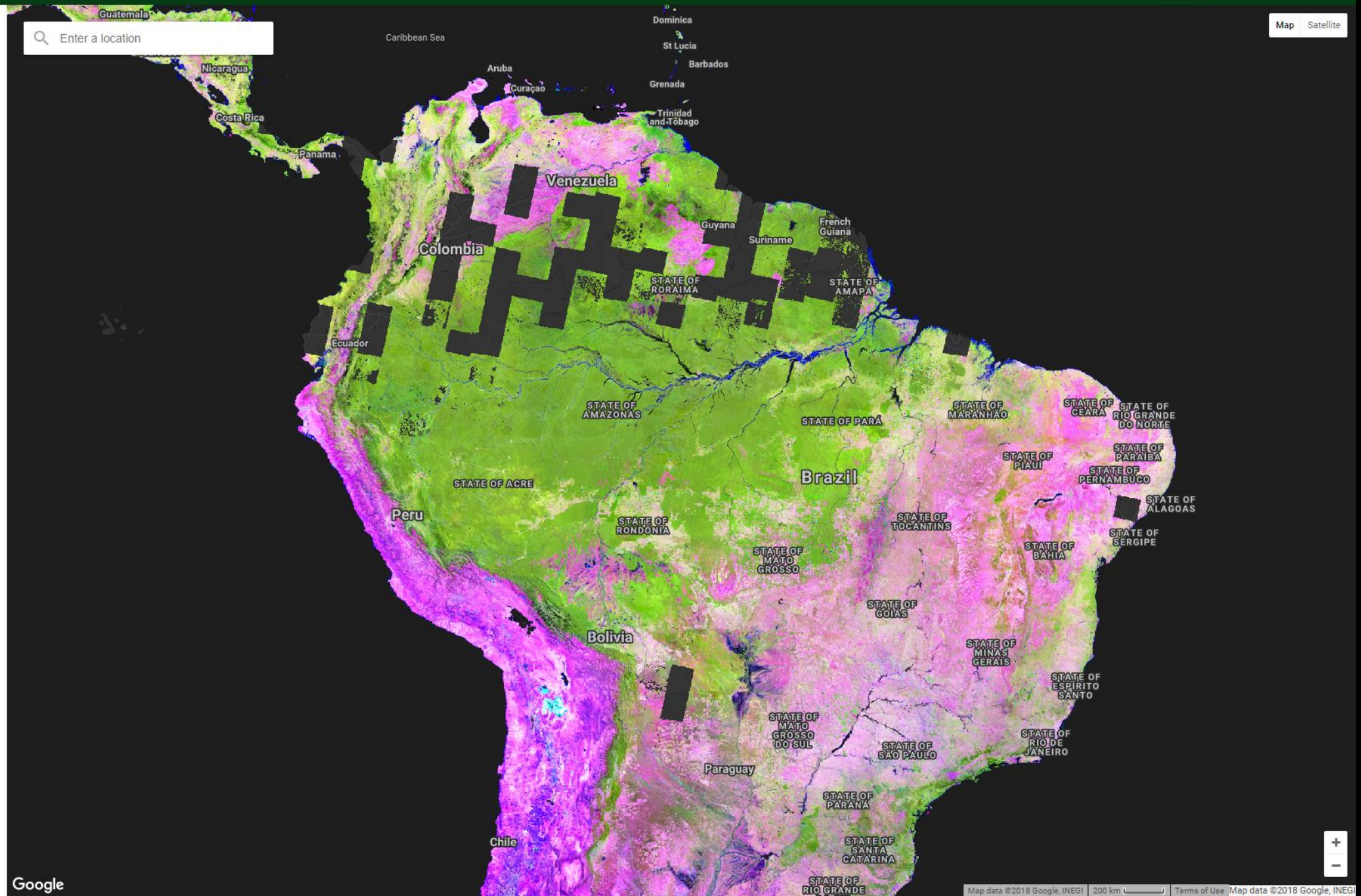
LANDSAT BANDS:
SWIR1-NIR-RED

OPACITY

Time

Filter to include only alerts and

Powered by Google Earth Engine



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LANDSAT BANDS:
SWIR1-NIR-RED

OPACITY

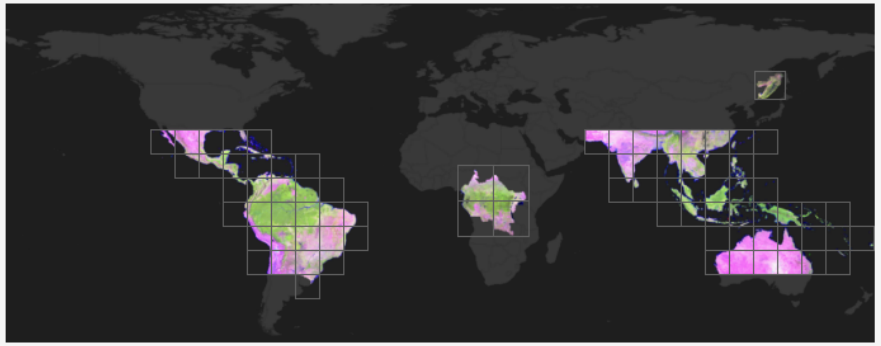
Time

Filter to include only alerts and observations from:

JUNE 5, 2018 TO PRESENT

Powered by Google Earth Engine

Data Download



To download image data for an individual tile, click on a tile on the map above and then click on the URLs below.

Granule with top-left corner at : 080W, 00N

GLADalert_07_01_alert18_080W_10S_070W_00N.tif
GLADalert_07_01_alertDate18_080W_10S_070W_00N.tif
GLADalert_07_01_alert17_080W_10S_070W_00N.tif
GLADalert_07_01_alertDate17_080W_10S_070W_00N.tif
GLADalert_07_01_last_080W_10S_070W_00N.tif
GLADalert_07_01_obsDate_080W_10S_070W_00N.tif

Files are named with the date it was created, the name of the image layer, and the extent of the tile as *MM_DD_layername_xmin_ymin_xmax_ymax*.

Dataset Details

This near-real time forest loss dataset is divided into tiles regionally, consisting of six files per tile. All files and have a spatial resolution of 0.00025° per pixel, or approximately 28 meters per pixel at the equator. South America tiles have dimensions of 12°x12°. Central Africa tiles have dimensions of 14°x14°. South East Asia tiles have dimensions of 10°x10°. Far eastern Russia is a single image with dimensions of 12°x11°.

Forest Loss Alert for 2018 (`alert18`)
Forest loss in 2018, defined as loss of 50% of a pixel's canopy cover. Encoded as no loss (0), probable loss (2), confirmed loss (3) in unsigned 8-bit values. Probable loss is defined as a single observation to date flagged as loss. If there are repeat loss observations within 4 observations or 180 days it becomes confirmed loss, otherwise it reverts back to no loss.

Day of year of forest loss alert in 2018 (`alertDate18`)
Day of year of the first observation flagged as loss within 2018 encoded in unsigned 16-bit values.

Forest Loss Alert for 2017 (`alert17`)
Forest loss in 2017, defined as loss of 50% of a pixel's canopy cover. Encoded as no loss (0), probable loss (2), confirmed loss (3) in unsigned 8-bit values. Probable loss is defined as a single observation to date flagged as

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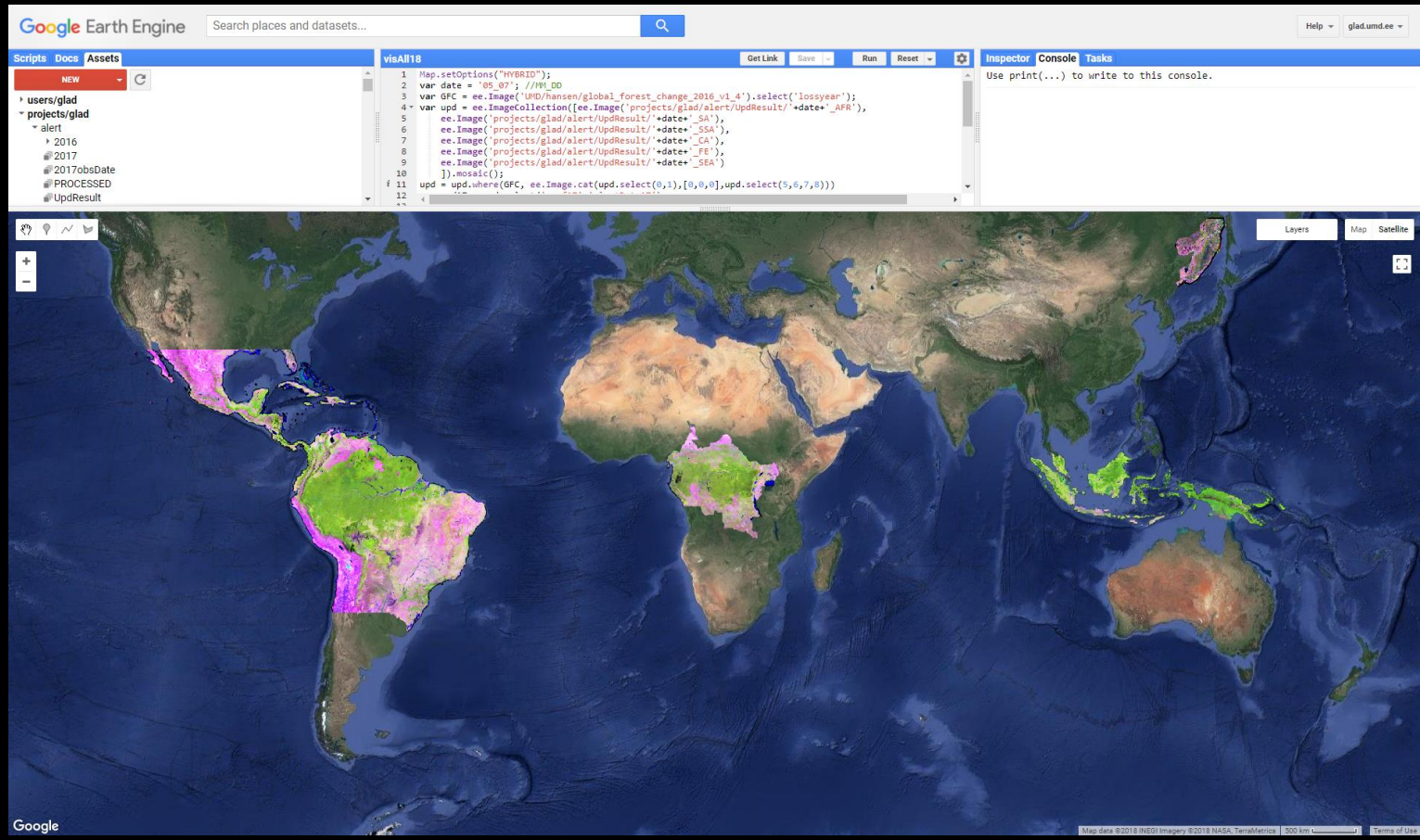
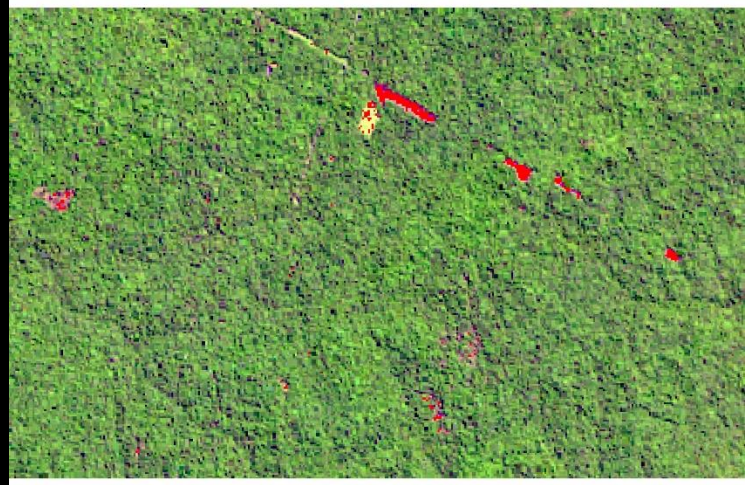
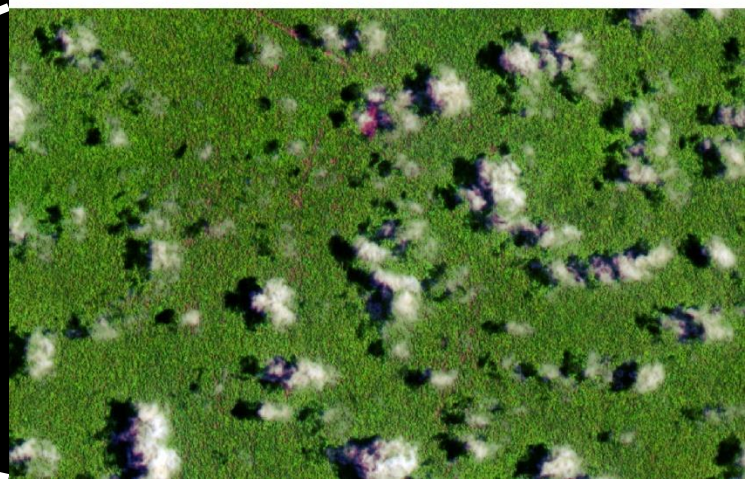


Sentinel data

- Integrating Sentinel 2A/B data, providing a 3-5 day revisit interval
- All models, from quality assessment to forest loss, will be tuned to AEA landscapes and initially extrapolated to the pan-Amazon scale and later pan-tropically
- Sentinel 1 data will be added after establishing Sentinel 2A/B operational system

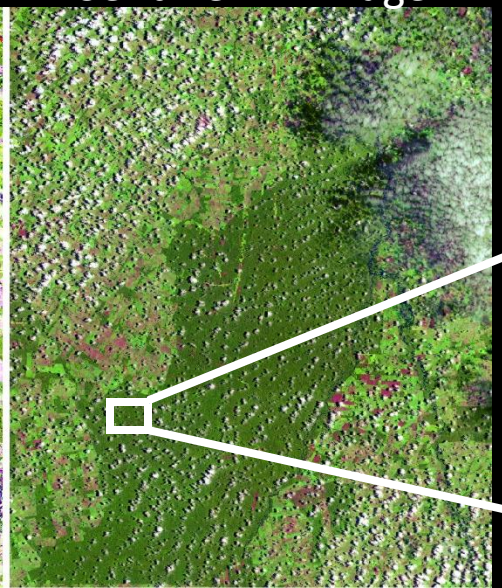




Landsat latest look

Red=2018 alert

Sentinel 2A image



Conclusion

- Global daily alerts are planned
- Prioritizing significance via integrating primary forest maps, protected area boundaries and other contextual information underway
- Quantitative measures, including accuracies, but also impact, are needed


Thanks