NASA SPACE APPS 2026 · SEOUL

Abang on Earth

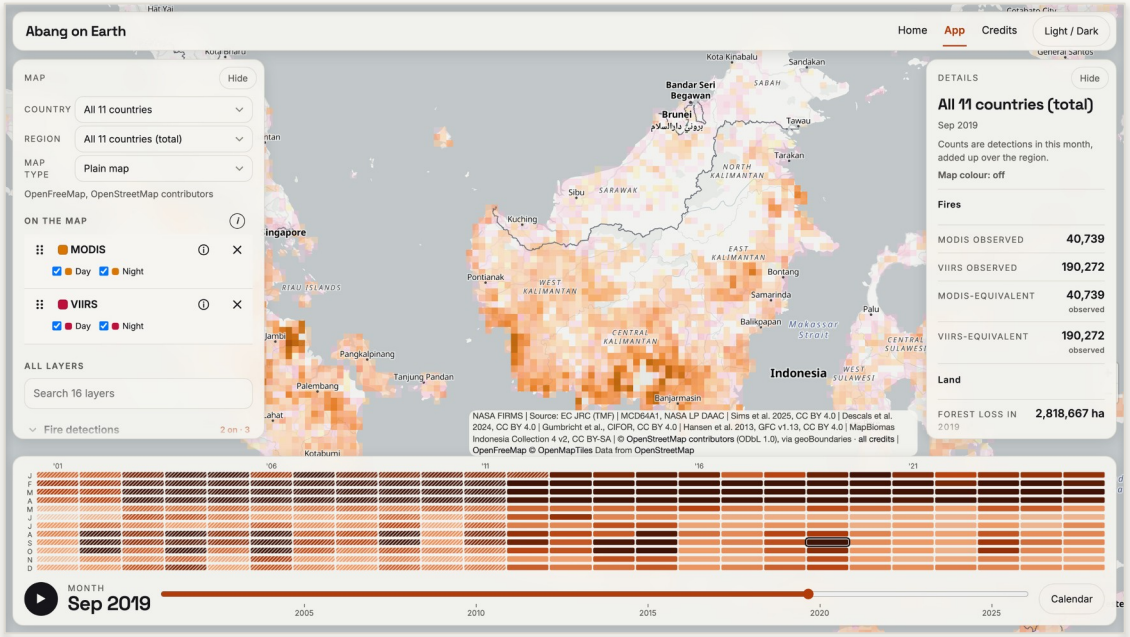
> **See the fires of the past the way we see the fires of today.**

A web app that harmonizes MODIS and VIIRS into one burning activity calendar, 2001–2025, for any country or province in Southeast Asia.

Harmonization of MODIS and VIIRS Hot Spots

Team Abang Abang · Joshua Julian Damanik

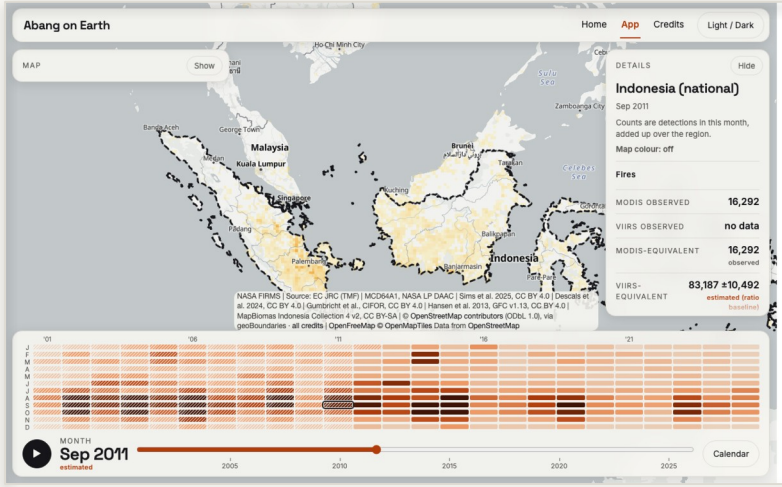
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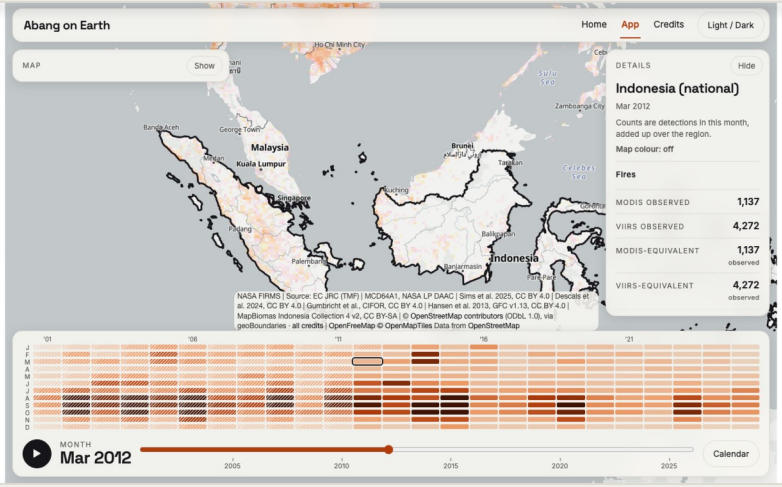
The live map, Borneo, Sep 2019.

25 years	11	608,298
2001–2025, month by month	countries, 287 regions, day and night	model fire points, 2002–2012 (experimental)

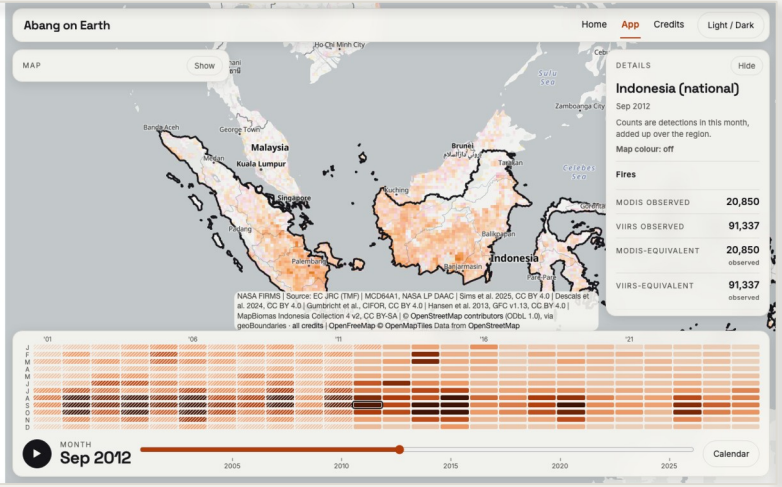
The fire record breaks in 2012, so trends across 2012 look wrong.



Sep 2011: MODIS only. Indonesia: MODIS 16,292, VIIRS no data.

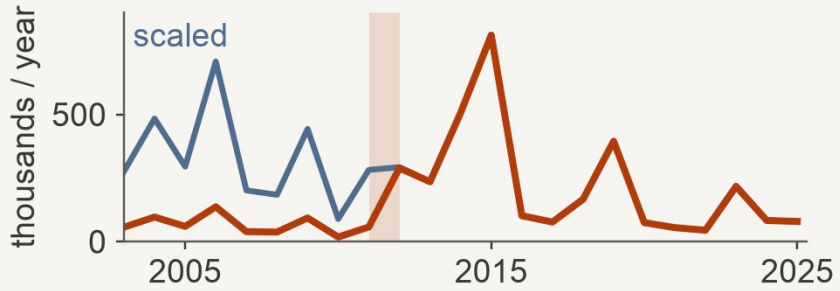


Mar 2012: VIIRS appears. MODIS 1,137, VIIRS 4,272.



Sep 2012: the map fills. MODIS 20,850, VIIRS 91,337.

Frames from the live map, months as labelled. Press Play: abang.earth/#facts (fact 1, “Open on the map”).



Blue: scaled. Red: joined (5.04× at 2012).

MODIS has 1 km pixels (since 2000), **VIIRS** 375 m (since 2012). A small fire can be missed in 1 km and found in 375 m: about 5 VIIRS detections per MODIS detection in Indonesia.

Joined as they are, the count jumps 5.04 times at 2012; scaled, 1.04 times. Years before 2012 are seen only through the coarser sensor.

Other methods convert detections or counts, after the weak signal is lost. We learn from the raw radiance of real MODIS–VIIRS pairs.

One calendar across 2012: we align two satellites, train a model, and show the result on a public map.

1 Align 1,017 pairs → **2 Train** 438,678 parameters → **3 Run** 46,125 scenes → **4 Show** abang.earth

1 A public map with a burning activity calendar

25 years 11 countries, 287 regions

Day and night. The count record goes from a 5.0× jump to 1.04× (about 6 % off on left-out years for Indonesia's yearly total, about 13 % for a single month).

2 Satellite alignment

1,017 pairs of night scenes chosen

971 gave training tiles. MODIS and VIIRS saw the same place less than 30 minutes apart; both are on one 375 m grid.

3 A convolutional model

438,678 parameters

Turns raw MODIS night radiance into VIIRS-like radiance at 375 m. To our knowledge, and within our documented search, the first learned model of this kind.

4 Harmonized VIIRS (experimental)

608,298 fire points, July 2002 to January 2012

Before VIIRS existed. From 45,784 MODIS night scenes (46,125 were run; 341 are validation scenes that are not drawn).

Open: code and weights Apache-2.0; 18-page technical report (links on slide 7).

How it works: the model learns from real aligned pairs, and its output is shown next to MODIS.

MODIS night
4 and 11 µm
raw radiance, 1 km pixels copied onto a 375 m grid

→

Small U-Net
438,678 params
masked convolutions; sees pixel size and view angle

→

VIIRS-like
per 375 m cell
training target: real aligned VIIRS radiance

No fire detections as input or target; fire products only mask cells and help choose scenes.

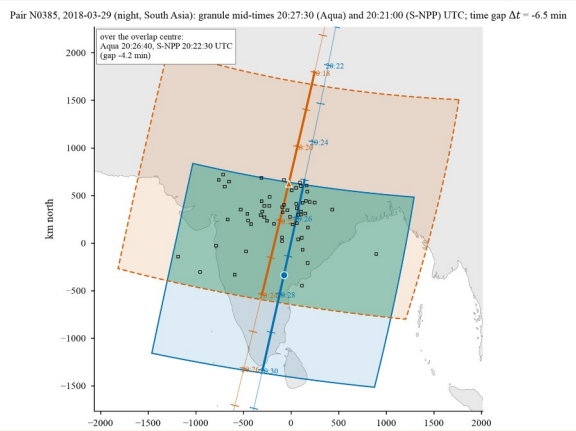


Fig. 1. A real pair, 29 Mar 2018: footprints, overlap, tiles.

7,462
candidate pairs, ≤ 30 min

1,017
pairs chosen

32,914
36 km tiles kept

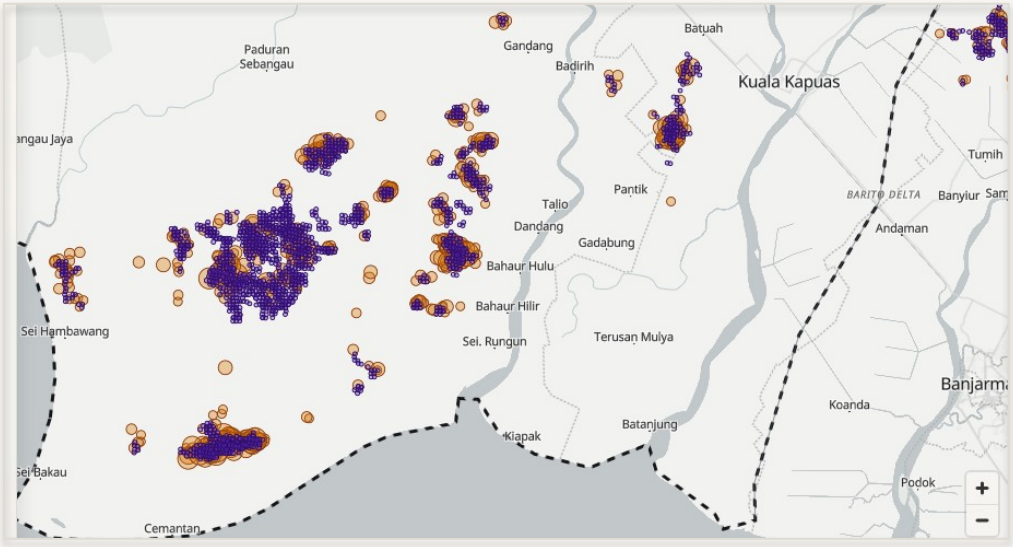


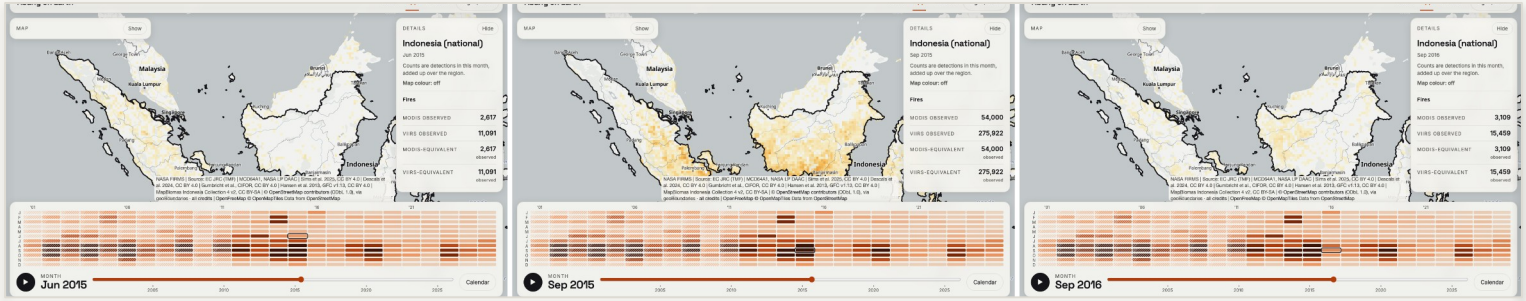
Fig. 2. Central Kalimantan, Oct 2004, night: Harmonized VIIRS (purple, experimental) and MODIS (orange). Live map.

Three regions of Indonesia, Sep 2019: MODIS at night shows about 7–13 % of the fire detections of real VIIRS. Harmonized VIIRS reaches 36–84 %, from MODIS data alone. Some scenes of this month were used in training.

Experimental. One example outside the training data (Kalimantan 2015): the model's total fire heat is close to real VIIRS (ratio 1.00). Other measures are in the technical report.

Researchers, journalists, students and enthusiasts can analyze fire history and its link with land use.

A For general researchers, journalists, students and enthusiasts, who can analyze the history of fire detection and its relation with land use.



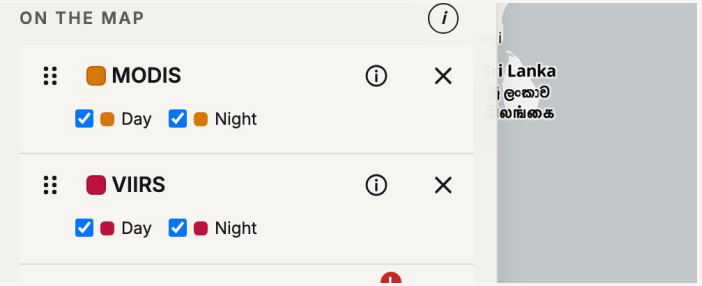
Jun 2015: quiet. MODIS 2,617.

Sep 2015 (El Niño): MODIS 54,000.

Sep 2016: quiet again. MODIS 3,109.

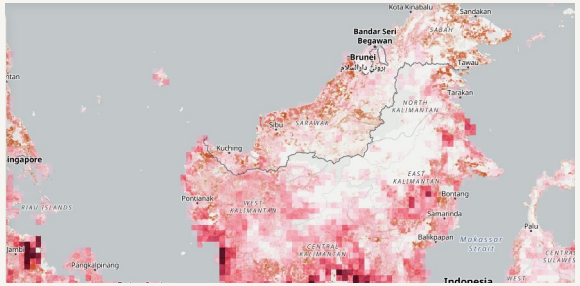
Burning activity calendar, Indonesia. Live map frames. Open: abang.earth/#facts (fact 2).

MODIS and VIIRS, day and night



Day and Night boxes on every fire layer; Harmonized VIIRS for night passes.

Fire next to land layers



Forest loss, oil palm and peatland on the same month.

2.16×

Indonesia has about 2.2 times the detections in El Niño years (95,205 per year) than in neutral years (44,110); 2015 alone: 149,770.

Unusual conditions. Association, not proof of cause.

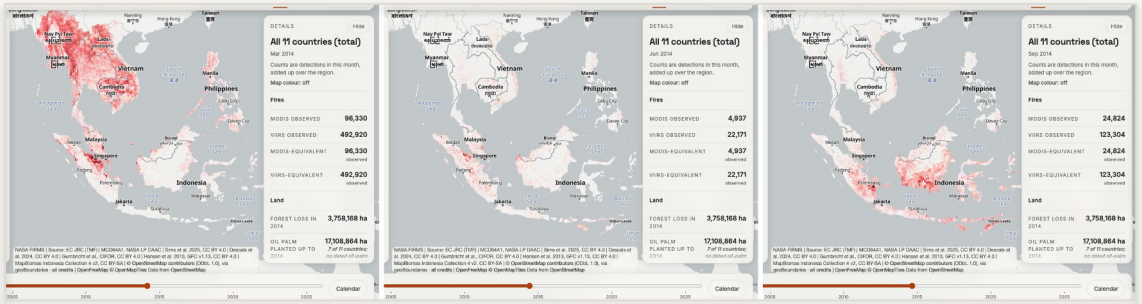
36 % vs 28 %

Where forest burned before it was cleared, oil palm followed more often (Sumatra and Kalimantan, 2002–2011).

Association, not cause.

Agencies and policy makers can study where and when fire burns, and what the land became.

B For forest and fire agencies, who can analyze the fire pattern for strategy to reduce fire damage.



Mar 2014: mainland burns.

Jun 2014: quiet.

Sep 2014: Indonesia burns.

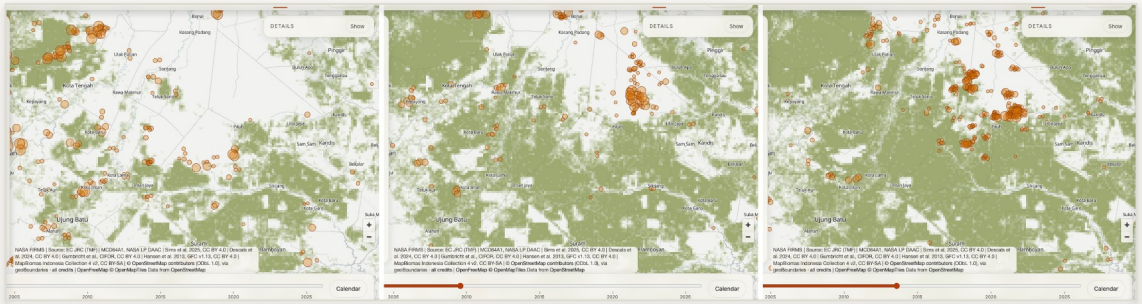
Frames from the live map. Open on the map: abang.earth/#facts (fact 3).

Counts by country and province; click a region for its monthly and yearly numbers, with the estimate's range.

Critical periods Aug–Oct in Indonesia (65 % of a year's fire), Feb–Apr in Myanmar, Laos and Vietnam (75 %); 5.9 months apart.

Early warning emergency responders, scientists and land managers can examine historical patterns, unusual conditions and critical periods of an area.

C For policy makers, who can study how fire relates to land clearing and land-use change, to make better policy for conserving forest and regulating land use.



Aug 2003

Aug 2009

Aug 2013

Frames from the live map. Open on the map: abang.earth/#facts (fact 4).

Timeline fire on one timeline with forest loss, oil palm (Descals), MapBiomas plantations and mining, and peatland.

36 % vs 28 % where forest burned before it was cleared, oil palm followed more often. Association, not cause.

Remote sensing researchers can reuse our method for better models and other pairs of sensors.

D For remote sensing researchers, who can reuse the method of aligning two satellites and learning from raw radiance for better models and for other pairs of sensors.

Alignment recipe: pairs of scenes ≤ 30 minutes apart, on one 375 m grid.

Learning from raw radiance: where the weak signal of small fires still exists.

Open: code, trained weights and technical report.

Next: compare with real VIIRS in more regions and years; add day scenes and Terra.

See the fires of the past the way we see the fires of today.

abang.earth

Code: github.com/damanikjosh/modis-viirs-night-radiance

Report: abang.earth/paper/technical-report.pdf

Use of Super Intelligence (SI)

SI tools helped with drafting, code, data work and reviews. People made the decisions. No SI-generated images.

Data and licences

NASA FIRMS, LAADS DAAC and GIBS (NASA open data); MapBiomas, Hansen/UMD, Descals. Code Apache-2.0. Full list: abang.earth/credits

References

Schroeder et al. 2014 (VIIRS fire); Giglio et al. 2016 (MODIS fire); Wolfe et al. 2013 (VIIRS footprint).