

Slash and burn agriculture causes widespread wildfires in the Amazonian rainforest

Sentinel-3 SLSTR RBT acquired on 11 August 2019 from 13:14:13 to 14:55:13 UTC
Sentinel-3 SLSTR RBT acquired on 12 August 2019 from 12:51:02 to 14:32:02 UTC
Sentinel-3 SLSTR RBT acquired on 14 August 2019 from 13:36:40 to 14:19:11 UTC
Sentinel-3 SLSTR RBT acquired on 16 August 2019 from 13:23:49 to 14:25:17 UTC
Sentinel-5P TROPOMI CO acquired on 17 August 2019 from 16:26:03 to 18:11:03 UTC
Sentinel-3 SLSTR RBT acquired on 18 August 2019 from 12:34:27 to 14:15:26 UTC
Sentinel-5P TROPOMI HCHO acquired on 18 August 2019 from 17:41:04 to 17:51:03 UTC
Sentinel-3 SLSTR RBT acquired on 20 August 2019 from 13:20:04 to 14:24:32 UTC
Sentinel-3 SLSTR RBT acquired on 21 August 2019 from 12:53:53 to 14:34:52 UTC

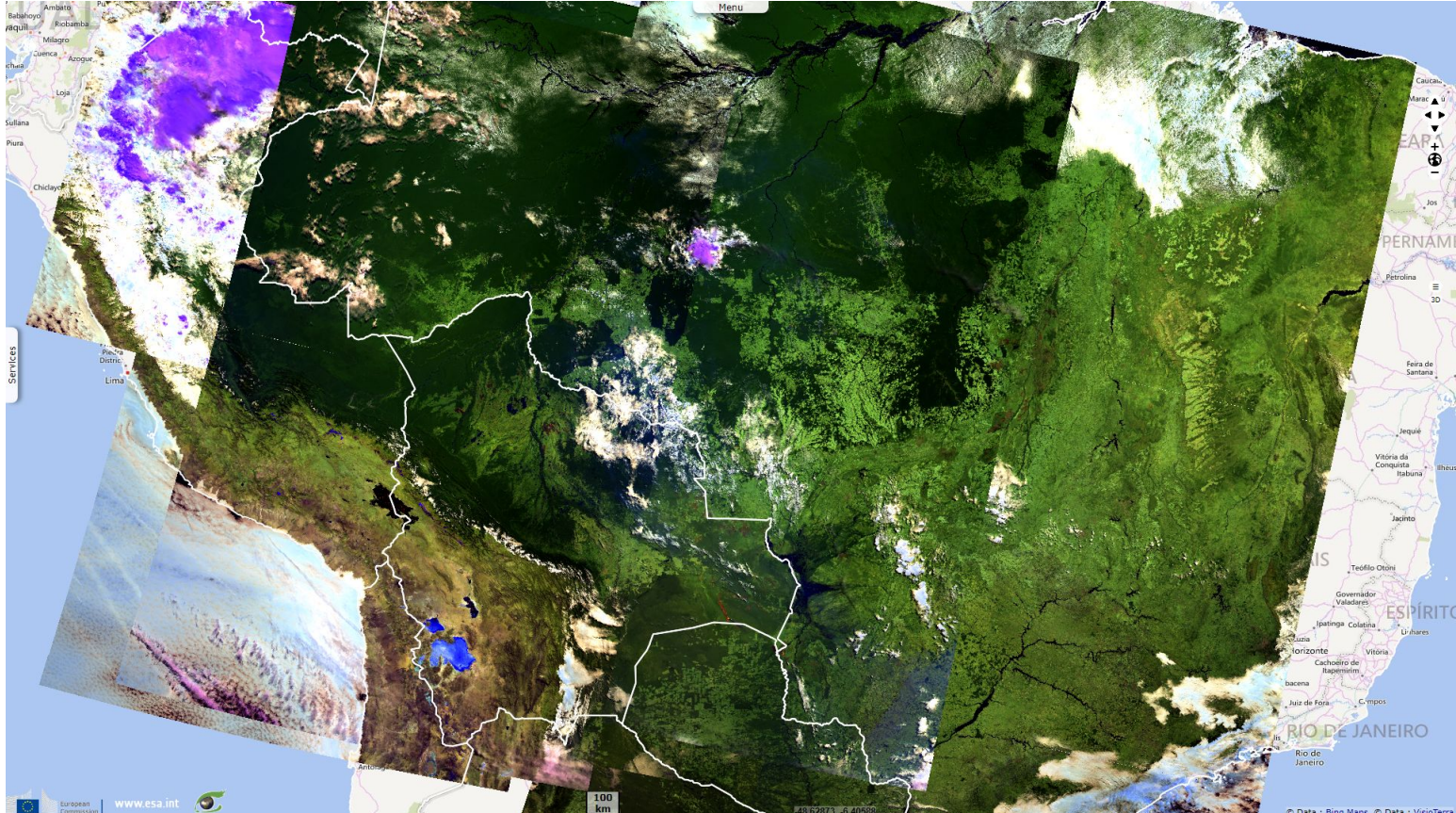
Author(s): Sentinel Vision team, VisioTerra, France - svp@visioterra.fr

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Fig. 1 - S3 SLSTR (18, 20 & 21.08.2019) - S6,S5,S2 colour composite - Part of the Amazon rainforest the most concerned by wildfires.

[2D view](#)

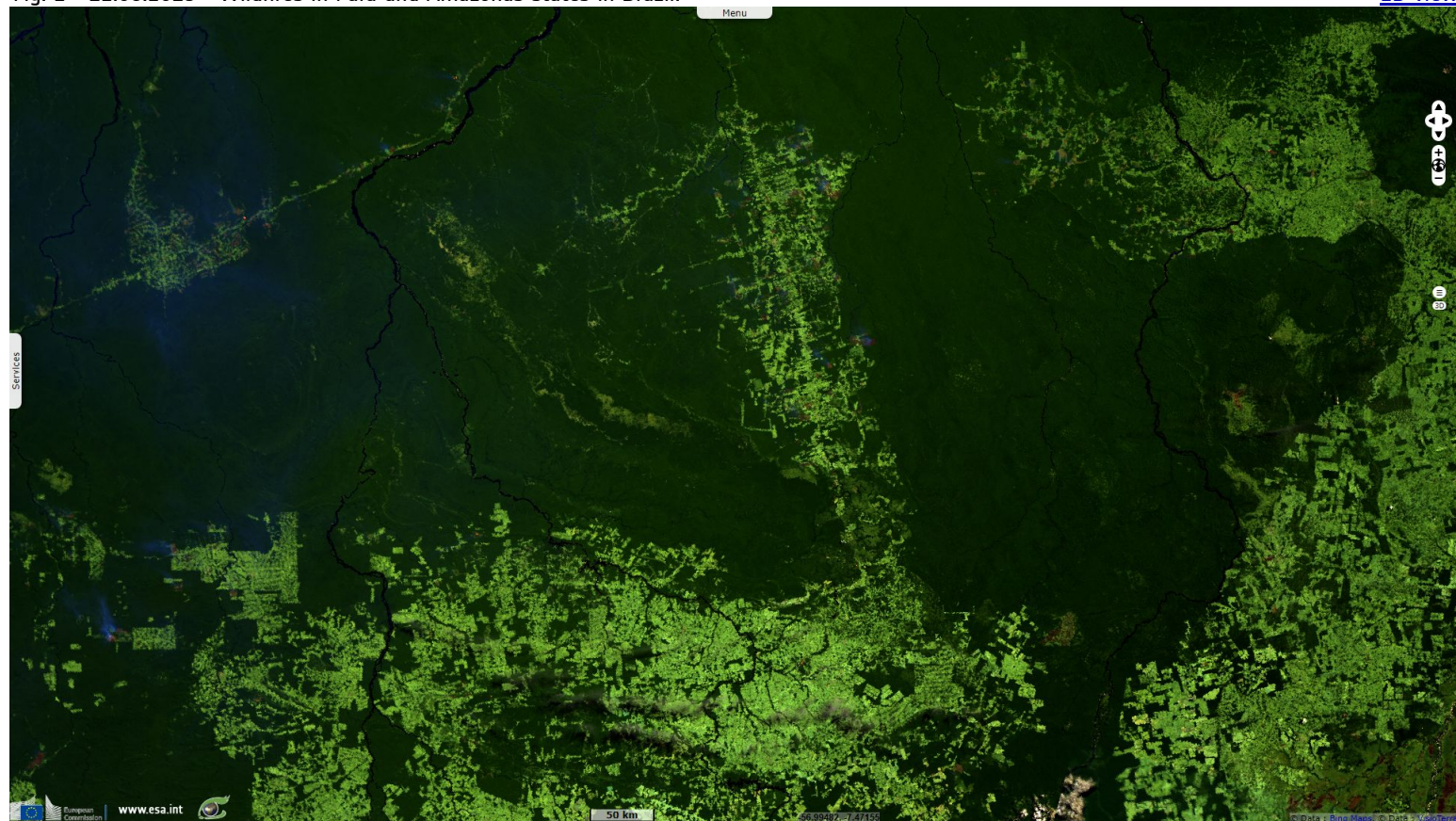


According to the [WWF survey](#): "the combination of human activities – such as deforestation and logging – and climate change, increases the drying effect of dead trees that fuels forests fires. In the absence of effective measures, global warming and deforestation could convert from 30 up to 60 per cent of the Amazon rain forest into a type of dry savanna, according to research carried out under the auspices of Brazil's National Space Research Institute (INPE)."

"We are running a serious risk of losing a large piece of the Amazonian tropical forest," said senior INPE scientist Carlos Nobre. "If warming exceeds a few degrees Celsius, the process of 'savannisation' may well become irreversible." Currently, the Amazonian forests act as an important sink for carbon dioxide (CO₂), a gas emitted mainly from the burning of fossil fuels coal, oil and natural gas, and the major driver of global climate change. However, up to about 20 per cent of CO₂ emissions stem from deforestation. If its destruction continues, the Amazon rainforest could become a net source of CO₂, WWF says."

Fig. 2 - 12.08.2019 - Wildfires in Para and Amazonas states in Brazil.

[2D view](#)



Regarding this subject, Carlos A. Nobre [wrote](#) the article [Land-use and climate change risks in the Amazon and the need of a novel sustainable development paradigm](#) on April 4, 2016: "For half a century, the process of economic integration of the Amazon has been based on intensive use of renewable and nonrenewable natural resources, which has brought significant basin-wide environmental alterations. The rural development in the Amazonia pushed the agricultural frontier swiftly, resulting in widespread land-cover change, but agriculture in the Amazon has been of low productivity and unsustainable. The loss of biodiversity and continued deforestation will lead to high risks of irreversible change of its tropical forests. It has been established by modeling studies that the Amazon may have two 'tipping points', namely, temperature increase of 4°C or deforestation exceeding 40% of the forest area. If transgressed, large-scale 'savannization' of mostly southern and eastern Amazon may take place. The region has warmed about 1°C over the last 60 years, and total deforestation is reaching 20% of the forested area."

Fig. 3 - 20.08.2019 - Multiple limited-scale wildfires happened mostly at the border of recently deforested areas.

[2D view](#)

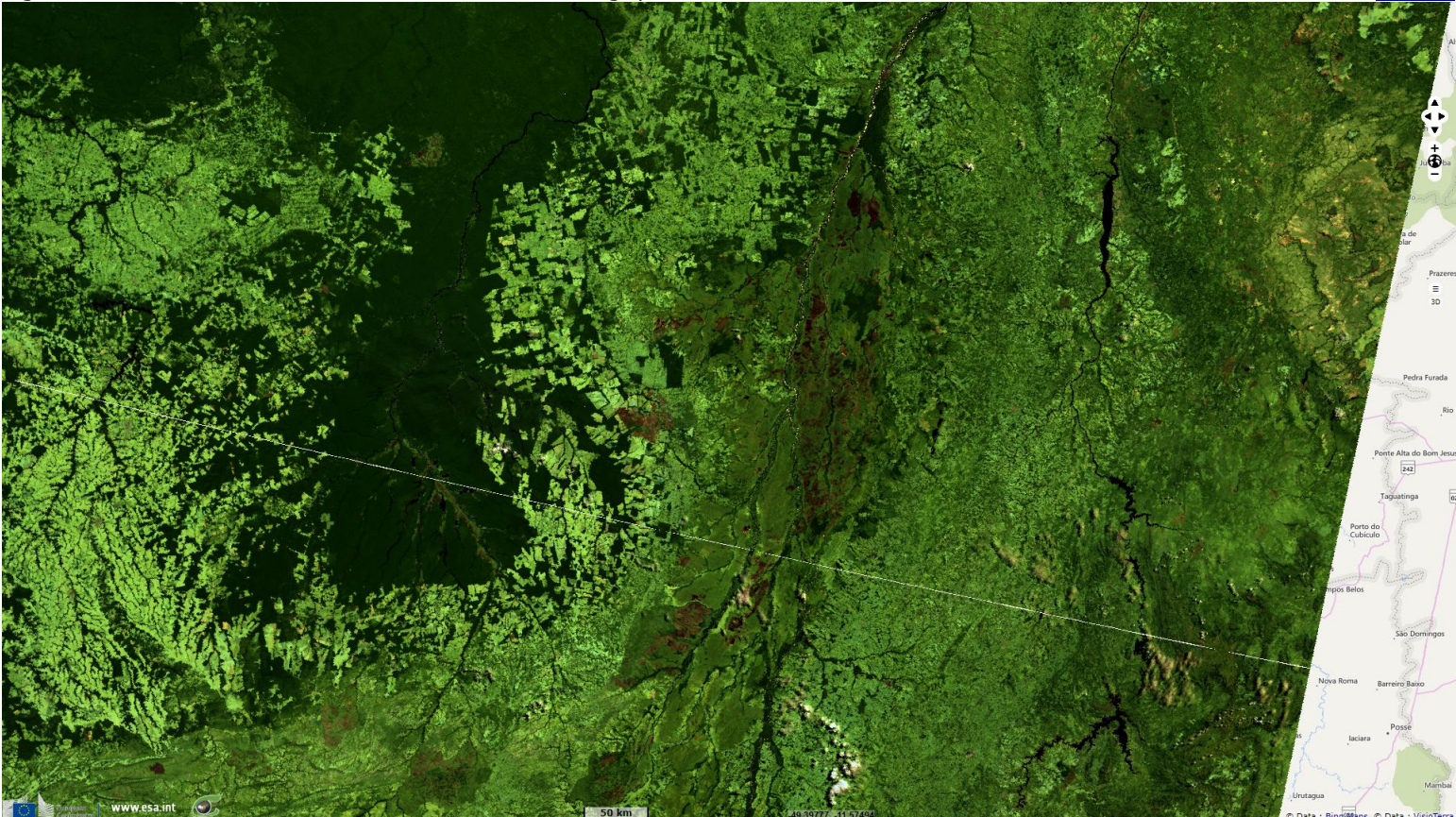


"The recent significant reductions in deforestation – 80% reduction in the Brazilian Amazon in the last decade—opens up opportunities for a novel sustainable development paradigm for the future of the Amazon. We argue for a new development paradigm—away from only attempting to reconcile maximizing conservation versus intensification of traditional agriculture and expansion of hydropower capacity—in which we research, develop, and scale a high-tech innovation approach that sees the Amazon as a global public good of biological assets that can enable the creation of

innovative high-value products, services, and platforms through combining advanced digital, biological, and material technologies of the Fourth Industrial Revolution in progress."

Fig. 4 - 11.08.2019 - Mato Grosso and Tocantins have been largely deforested in the last decade.

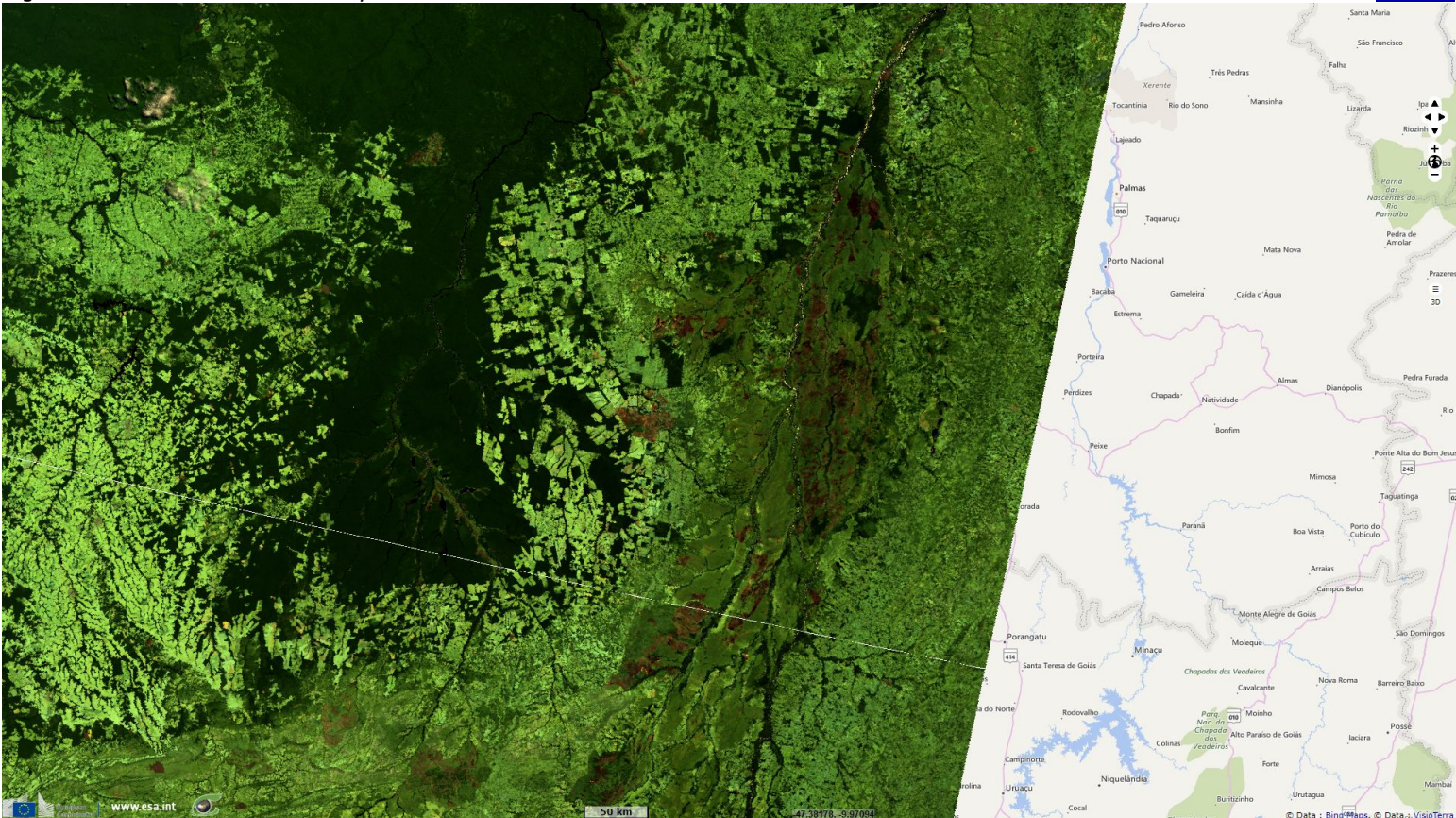
[2D view](#)



"A number of complex problems threaten our geopolitical, environmental, social, and economic stability: the links between global food and energy markets; the unsustainable depletion of natural resources and biodiversity stocks; the increasing water insecurity around the world; and, above all, the urgent need both to decarbonize the energy systems of the world to avoid catastrophic climate change and to adapt to unavoidable climate change underway. The scale and reach of the risks associated with climate change, together with their potentially irreversible nature, make this probably the greatest market failure and the starkest example of a 'tragedy of the commons' the world has ever seen. To put this comparison in perspective, the net benefit to the world economy of a 50% reduction of tropical forest deforestation and degradation has been estimated at US \$3.7 trillion."

Fig. 5 - 16.08.2019 - Wildfires mostly start near converted areas close to roads or rivers.

[2D view](#)

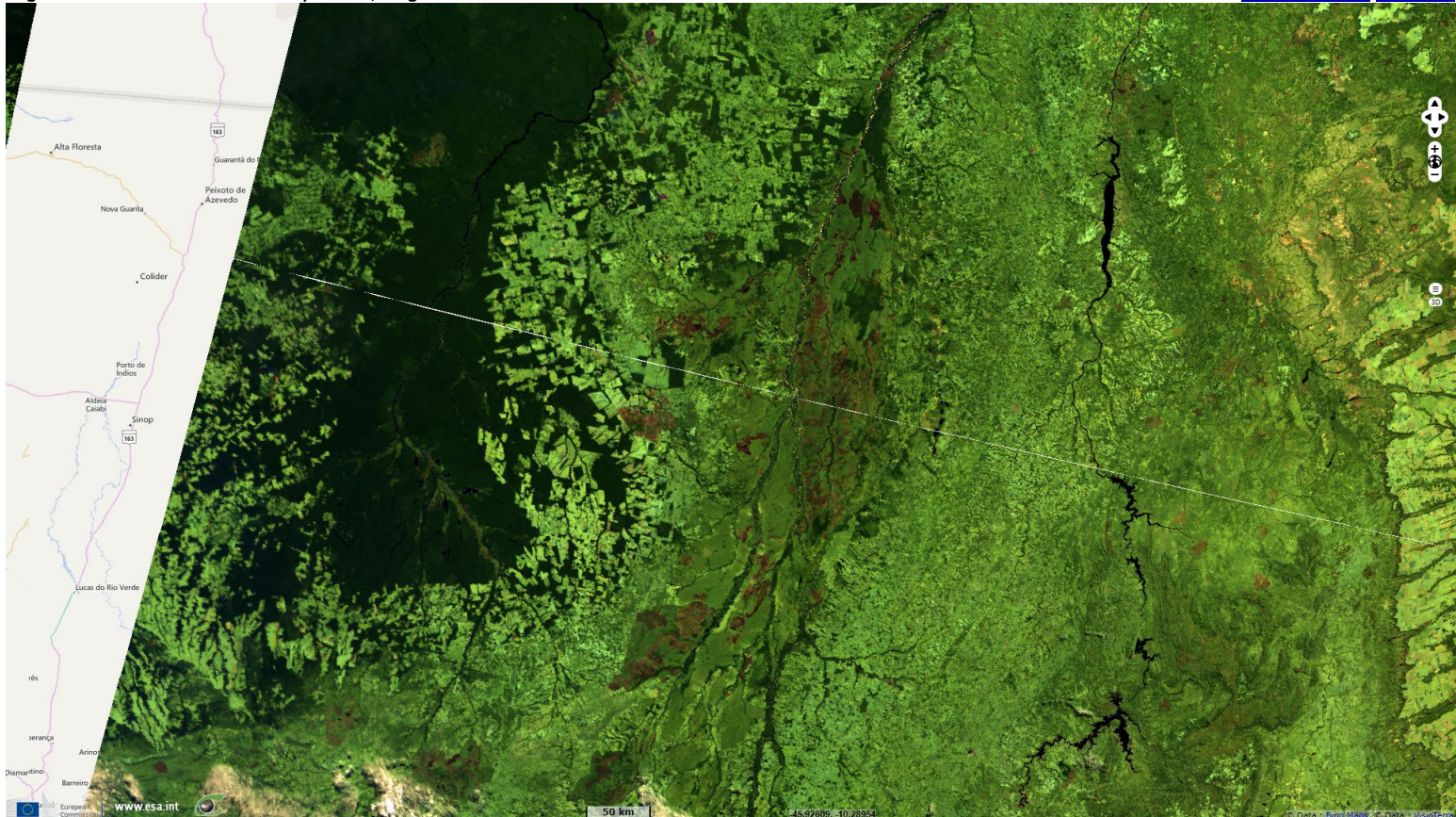


"Of particular importance is the continued deforestation in the Amazon, which could lead to the irreversible change of its tropical forests and the major loss of its biodiversity. The Amazon ecosystems harbor about 10 to 15% of land biodiversity; its abundant rainfall of about 2.2m per year

makes the region an important heat source for the atmosphere, generating an estimated $210\,000\text{ m}^3\text{ s}^{-1}$ to $220\,000\text{ m}^3\text{ s}^{-1}$ of river discharge, which is $\sim 15\%$ of the freshwater input into the oceans; it stores an estimated 150 billion to 200 billion tons of carbon; and it presents a mosaic of ethnological and linguistic diversity."

Fig. 6 - 21.08.2019 - A few days later, large areas have burnt.

[2D animation](#) [2D view](#)



"A number of large-scale drivers of environmental change are operating simultaneously and interacting nonlinearly in the Amazon, namely, land-use change and climate changes due to global warming and to deforestation, which may, in turn, induce higher frequency of extreme climate events and of vegetation fires, adding to increased tropical forests' exposure and vulnerability. Our scientific understanding has increased about the risks associated with these drivers of change acting synergistically. By and large, environmental change in the region is a response to the global economy. Global market demand growth for animal and vegetable protein, new transportation and energy infrastructure projects, and weak institutions can be cited as some of key drivers in this process."

Fig. 7 - 11.08.2019 - Some of the worst hit areas are near the East-Bolivian frontier, more so on the Bolivian side.

[2D view](#)

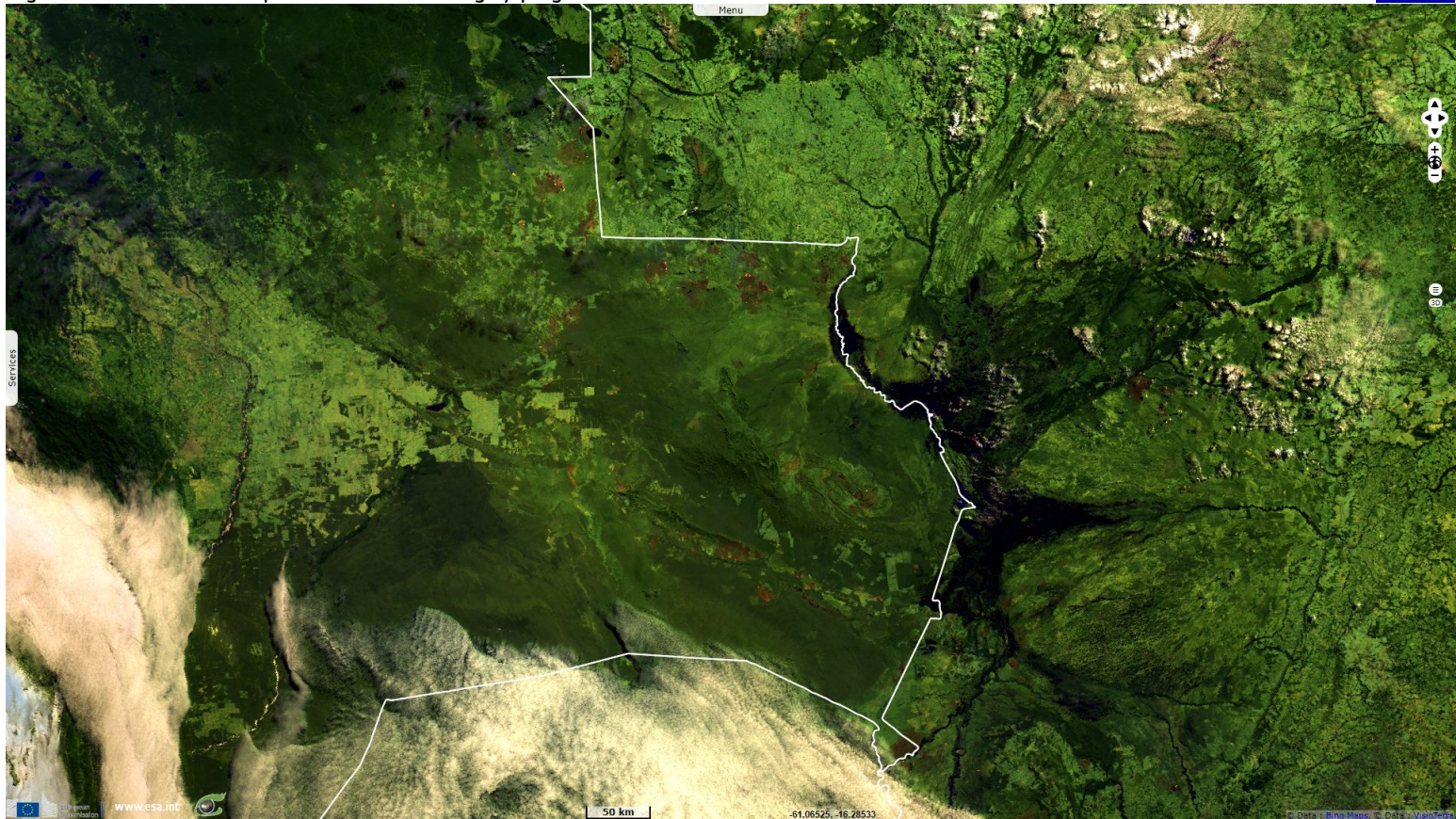


"The prevailing model for rural development in the Amazon over the last half century—replacing forests with agriculture, cattle ranching, and large-scale hydropower generation—has long been outdated for a number of environmental, economic, and social reasons. For instance, for Brazil, the

gross agricultural product of the Amazon represents 14.5% of Brazil's agriculture sector gross domestic product (GDP), using a deforested area of about 750 000 km². In contrast, São Paulo state accounts for 11.3% of the agriculture sector GDP, using an area of approximately 193 000 km². The conclusion is inescapable: Over 50 years of a deforestation-based development model have not resulted in wealth creation or better quality of life for those living in the Amazon—the *Amazônidas*."

Fig. 8 - 14.08.2019 - Multiples wildfires have largely progressed in the meantime.

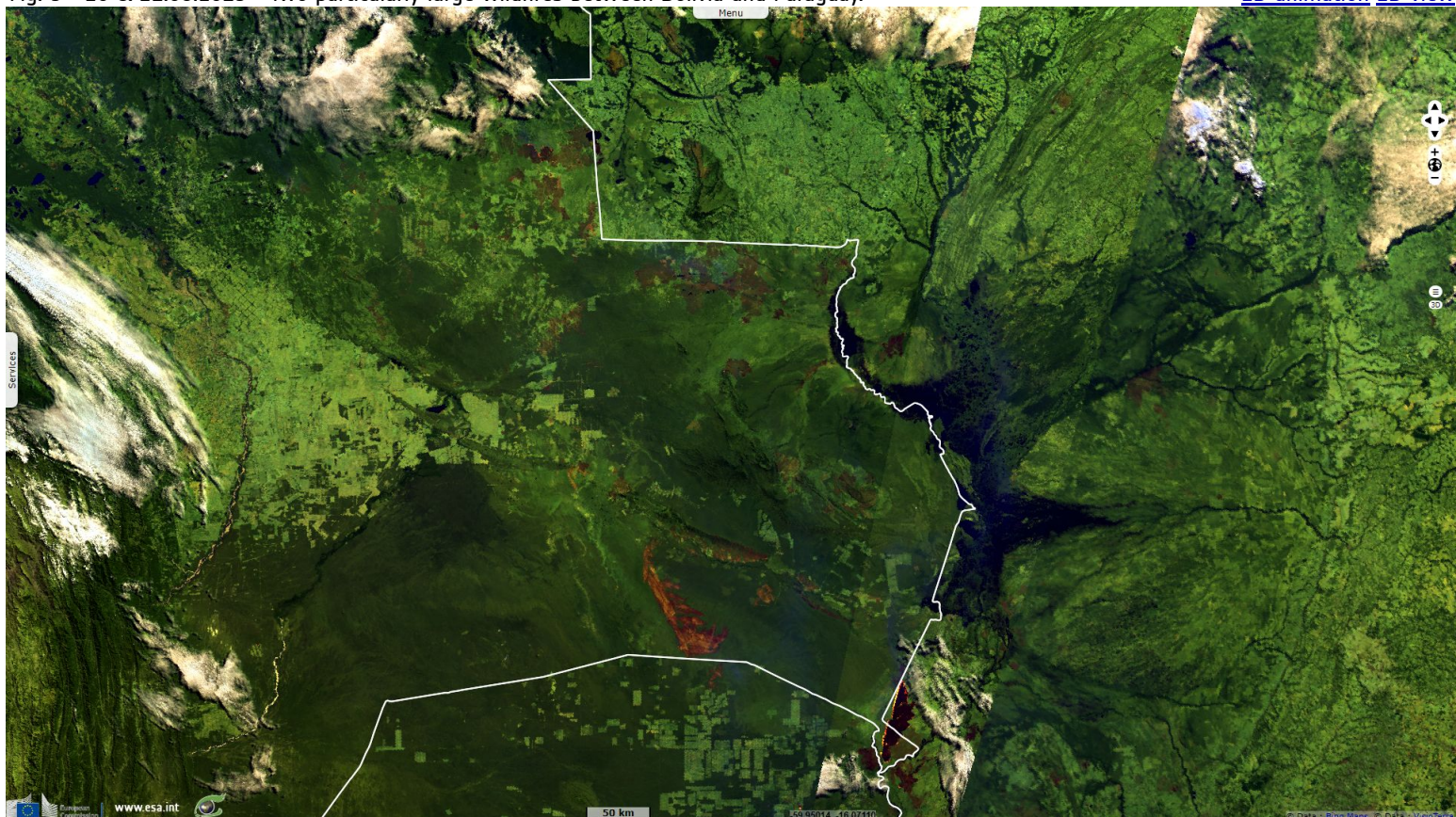
[2D view](#)



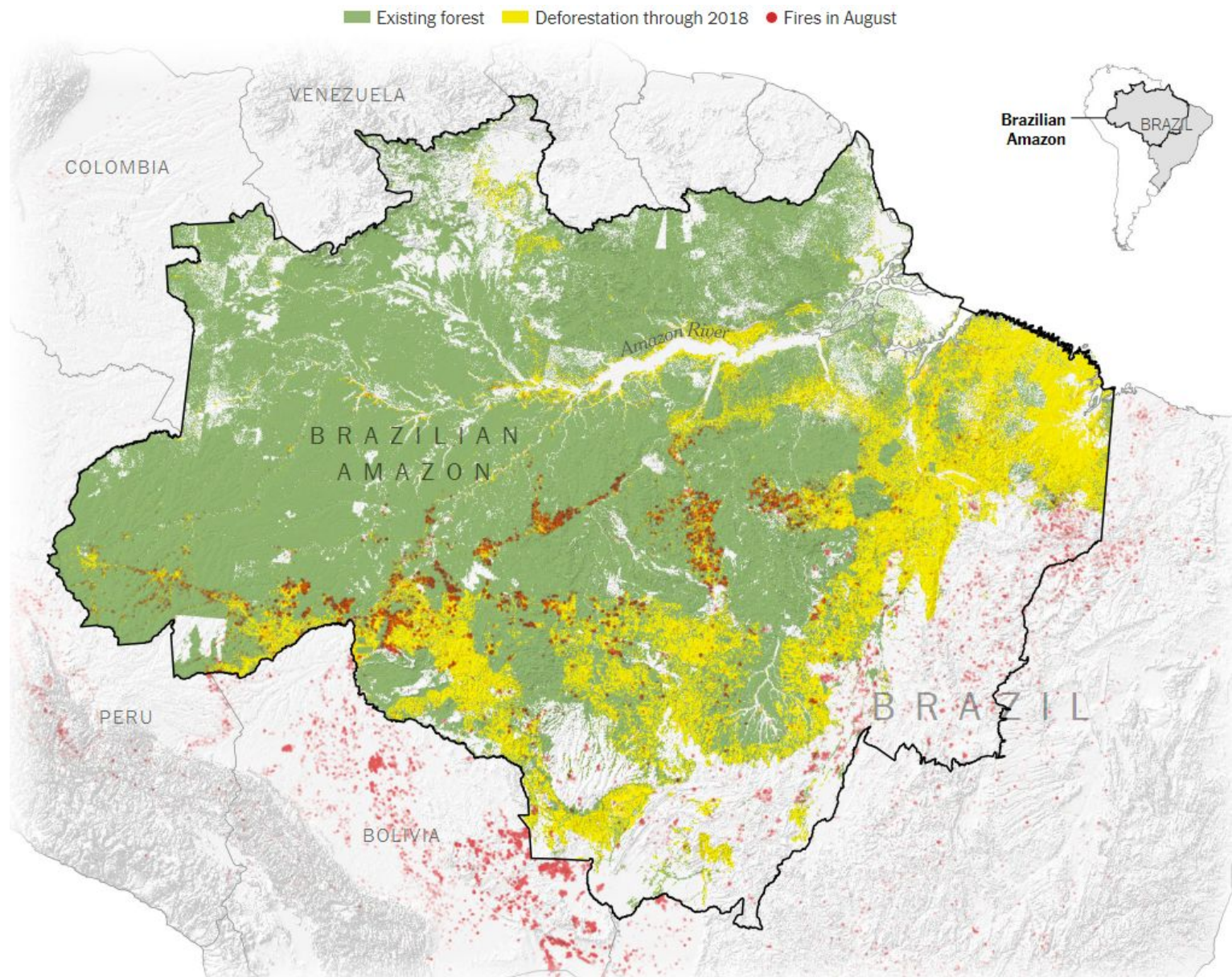
"Moreover, in terms of development policy pathways for the Amazon, two modes have historically dominated: (i) a valuable nature conservation approach with large swathes of territory legally protected from any economic and human activity outside indigenous peoples and (ii) an approach that has focused on conversion or degradation of forests for the production of either protein commodities or tropical timber at the forest frontier and the build-out of massive hydropower generation capacity—which, together, have been historically responsible for massive deforestation of the Amazon and generated other significant negative externalities. We argue therefore that there is a 'Third Way' within reach that sees the Amazon as a global public good of biological assets and biomimetic designs that can enable the creation of innovative high-value products, services, and platforms for current and for entirely new markets."

Fig. 9 - 20 & 21.08.2019 - Two particularly large wildfires between Bolivia and Paraguay.

[2D animation](#) [2D view](#)



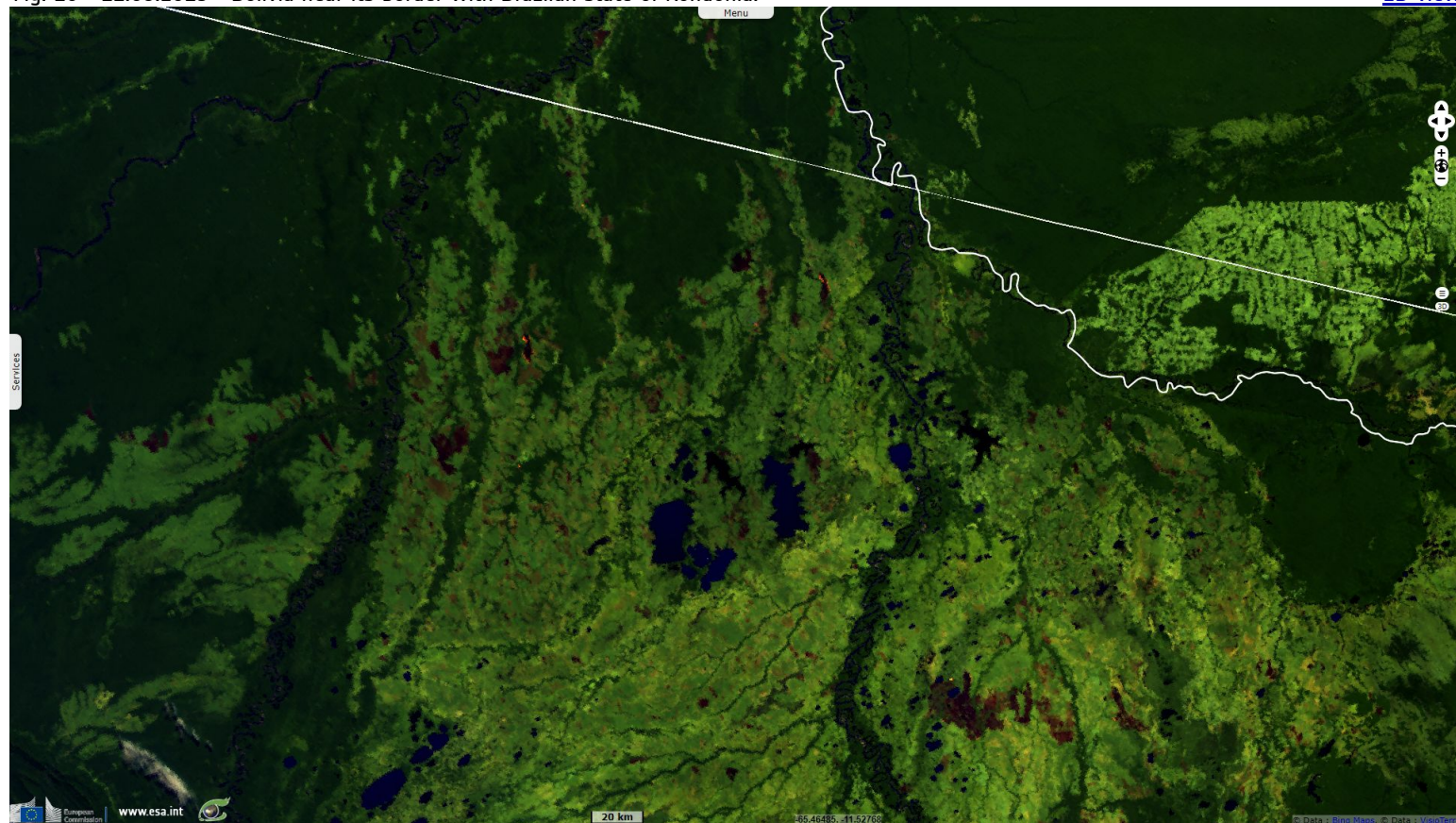
"It is urgent to halt deforestation, keeping in mind that almost 1 million square kilometers of the Amazon tropical forests have already been deforested and another equal portion finds itself in the process of degradation. The rate of deforestation has declined in the last several years; this decline is conspicuous in the Brazilian Amazon, where deforestation rates have been cut down by almost 80% since 2005 at the same time that the agricultural output in the region has been increasing significantly. It is therefore becoming clear that economic growth is decoupled from deforestation as demonstrated by ample facts, such as the case of the reduction of deforestation rates observed between 2005 and 2014, which are opposed to the growth of the values of agricultural gross value added (GVA) in North Brazil, which almost tripled during this period. Since 2005, deforestation rates in Brazilian Amazon have decreased from almost 30 000 km² per year to a rate of around 6 000 km² per year, on average, from 2011 to 2015, indicating the difficulties of zero deforestation targets."



[Sources: Brazil's National Institute for Space Research; NASA](#)

Fig. 10 - 11.08.2019 - Bolivia near its border with Brazilian state of Rondonia.

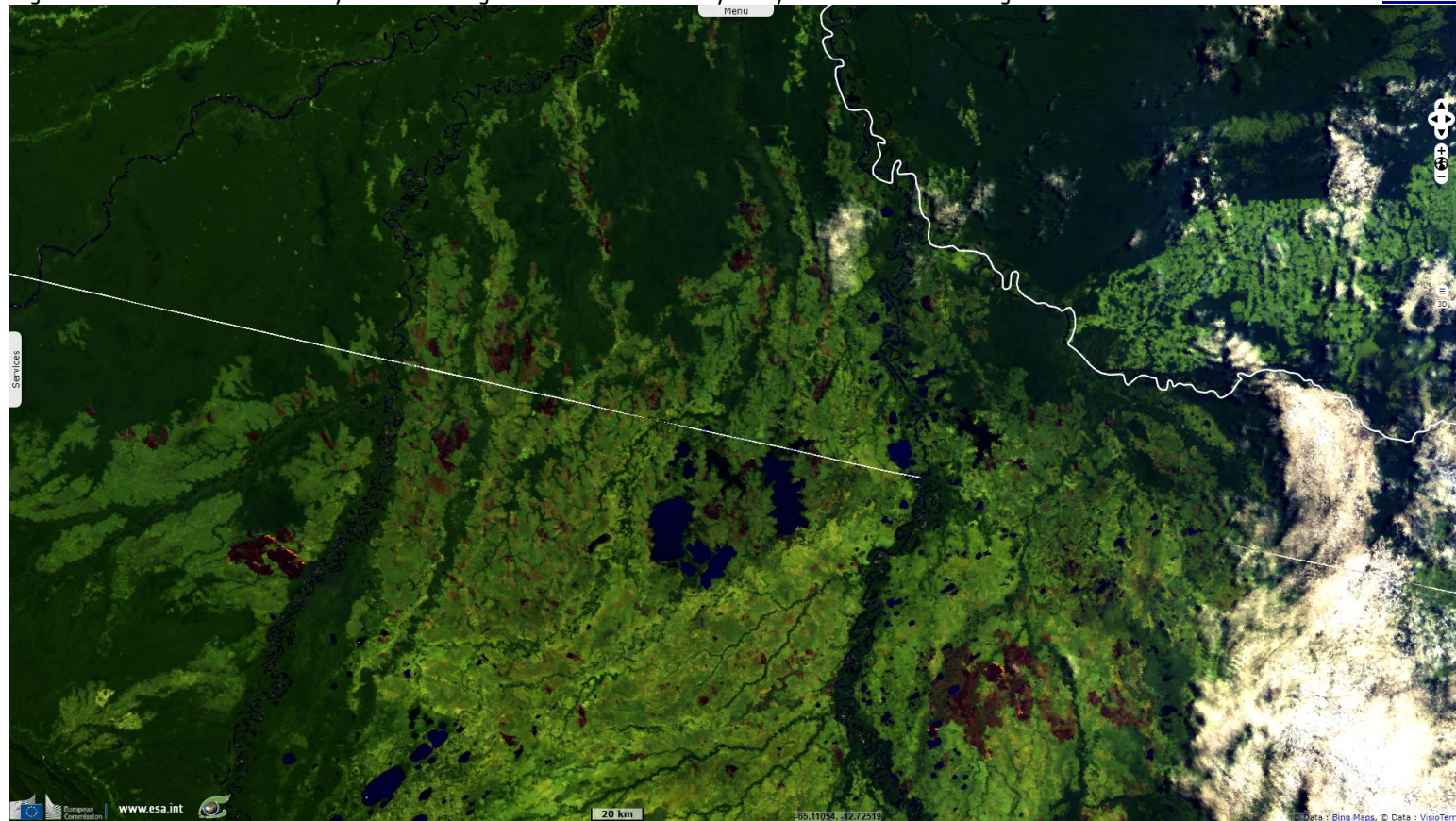
[2D view](#)



"This sharp decline of deforestation was enabled by several factors, including purpose-built satellite monitoring capabilities, effective law enforcement and compliance, industry value chain initiatives like the soy moratorium, restrictions on access to credit for farms located in deforested areas, and expansion of protected areas and indigenous territory encompassing 47% of the entire Brazilian Amazon region. Long-term-demand growth for agricultural commodities in the emerging markets, weak institutions, and large energy infrastructure projects may potentially contribute as underlying and proximate drivers to the return of high deforestation rates in the absence of alternative development pathways."

Fig. 11 - 18.08.2019 - This heavily deforested region has been affected by many wildfires small and big.

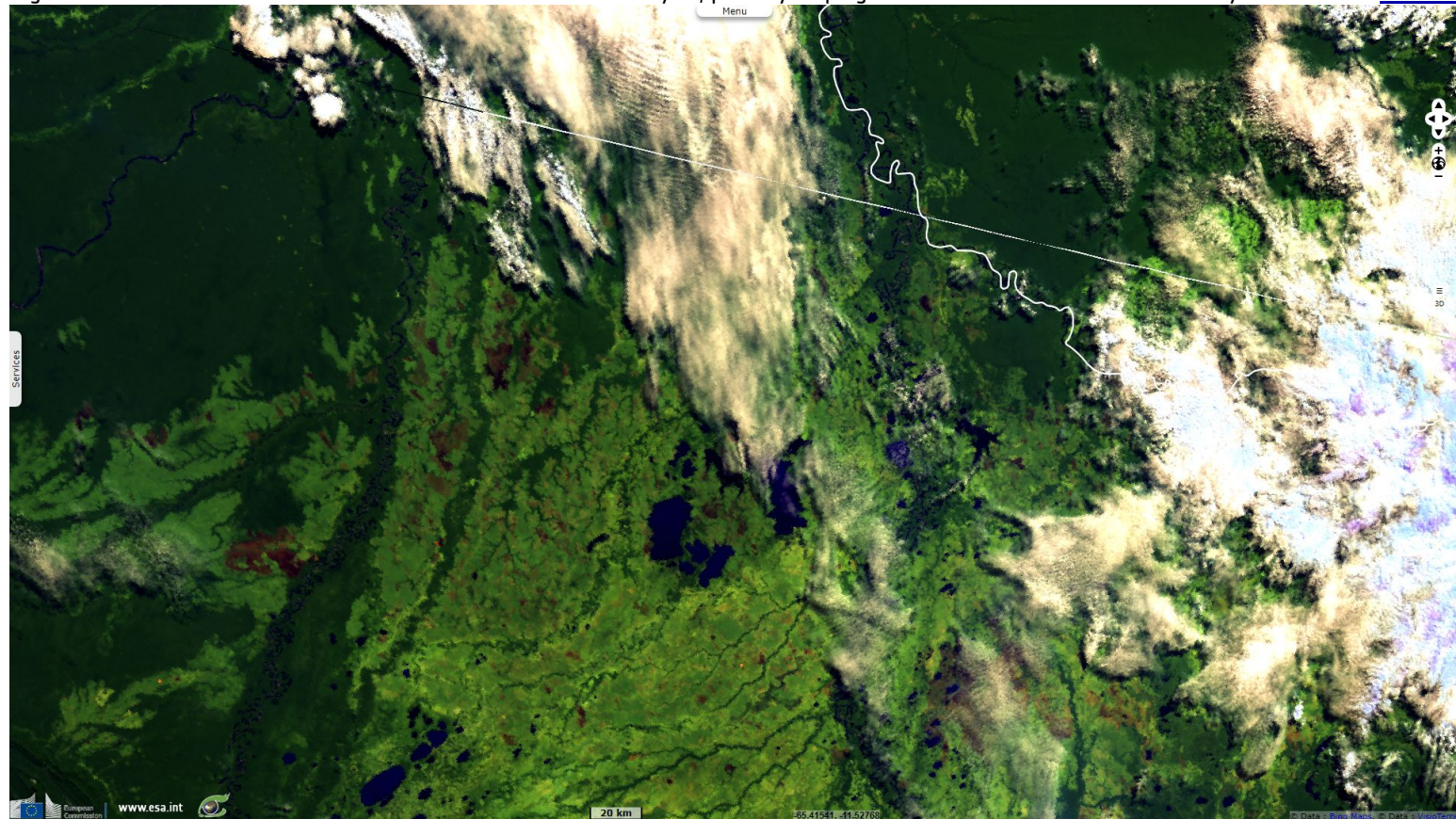
[2D view](#)



K.K. Rebecca Lai [comments](#) in the New-York Times article [What Satellite Imagery Tells Us About the Amazon Rain Forest Fires](#): *"'Fires are not a natural phenomenon in these forests', said Mark Cochrane, an expert on wildfire and ecology at the University of Maryland. 'All of the fires in this region are caused by people.' Mr. Cochrane noted that while a large majority of the fires were on land that had already been cleared, many others were detected burning with particular intensity. He said these were likely deforestation fires, not just fires for clearing previously deforested land. 'When you slash an area, pile it up, let it dry and then burn it, it burns very intensely, and that's also what puts off a lot of that smoke', said Mr. Cochrane."*

Fig. 12 - 21.08.2019 - Rainforest wildfires are more numerous this year, possibly as progressive loss of tree cover increases dryness.

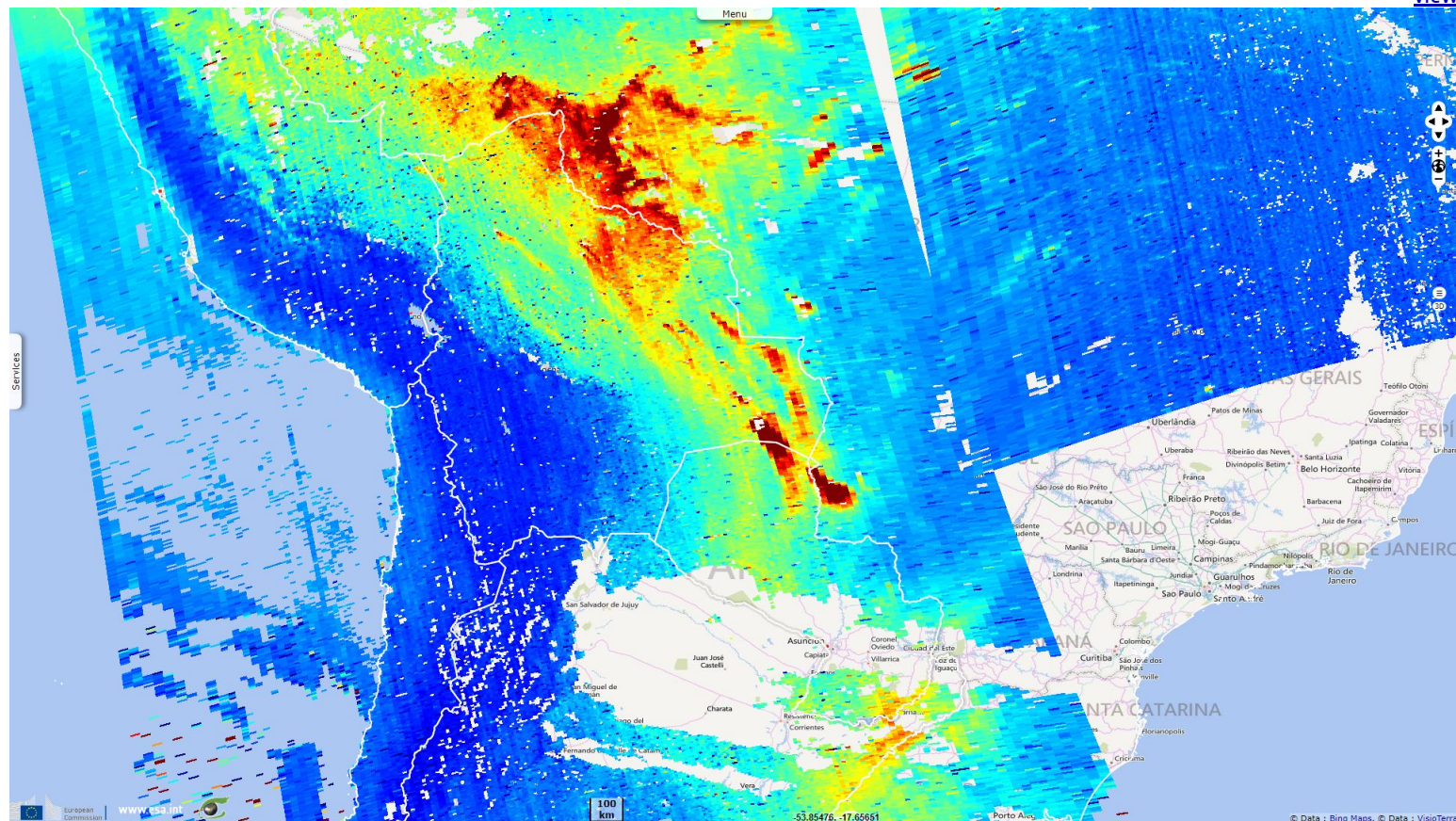
[2D view](#)



Randy Showstack [wrote](#) the article published in Earth and space science news [Ousted Head of Science Agency Criticizes Brazil's Denial of Deforestation Data](#): "There has been a rise in deforestation in recent years, after a long period of decline. INPE's satellite data show that deforestation in the Amazon in June 2019 was 920.21 square kilometers. This is an 88% increase from 2018, when fewer than 500 square kilometers were deforested. The July 2019 increase in deforestation appears to be even more dramatic—reportedly 278% higher than July 2018, according to information widely reported by media in Brazil and elsewhere and attributed by the media reports to INPE data."

Fig. 13 - S5P (17.08.2019) - CO total column with colour map - Amazon wildfires release large quantity of carbon monoxide toward south-east.

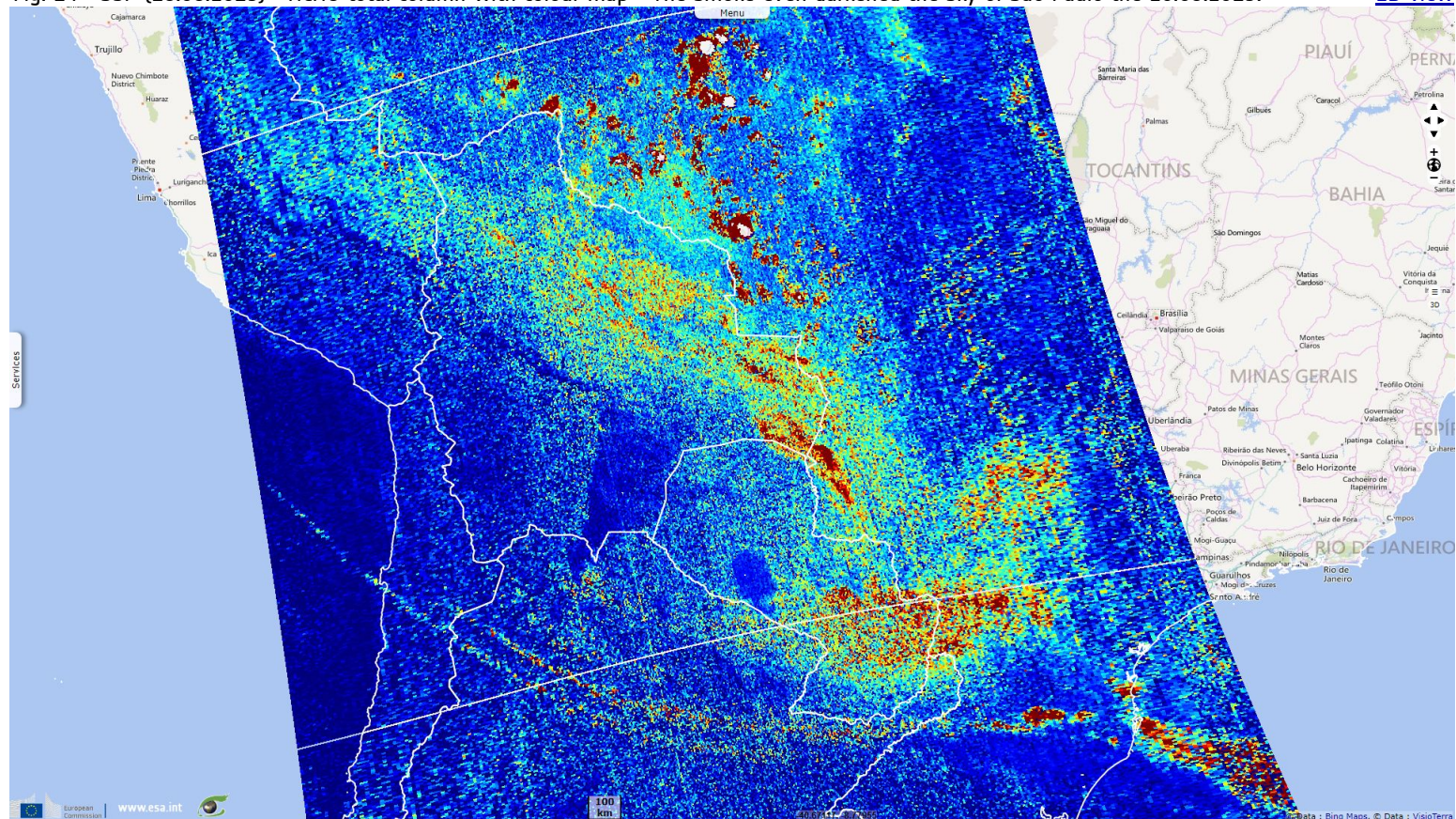
[2D view](#)



"Ricardo Galvão, the recently ousted leader of Brazil's agency that monitors deforestation in the Amazon basin, said that the Brazilian president's attacks on scientific data that show sharp spikes in deforestation have 'backfired on the government.' 'The whole world puts its attention on the Amazon now', said Galvão, who was director of Brazil's INPE until he was removed from his post on 2 August. 'Jair Bolsonaro, Brazil's populist right-wing president who has worked to loosen environmental protections since taking office in January, falsely charged in July that INPE's data on increased deforestation are lies. He also claimed without proof that INPE 'seems to be in the service of some NGO', or non governmental organization."

Fig. 14 - S5P (18.08.2019) - HCHO total column with colour map - The smoke even darkened the sky of Sao Paulo the 20.08.2019.

[2D view](#)



Manuela Andreoni also [reminds](#) in the New-York Times [Brazil Angriyly Rejects Millions in Amazon Aid Pledged at G7](#): "Mr. Bolsonaro has been widely criticized by environmentalists for calls to open up protected parts of the Amazon rainforest for logging, farming, mining and other development, which many say has caused further exploitation of the region. The illegally set fires and resulting deforestation, critics say, are being driven by his policies."

*The views expressed herein can in no way be taken to reflect the official opinion of the European Space Agency or the European Union.
Contains modified Copernicus Sentinel data 2019, processed by VisioTerra.*

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