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Annual and Interannual Variability of Forest Fires in Tropical South America and their association with the Normalized Difference Vegetation Index (NDVI) during 2000-2010

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Motivation



Map of the Amazon rainforest as [WWF](#)



[Uacari](#)



Yellow-billed Jacamar (*Galbula albirostris*)

Scarlet and white tanager (*Crisiophaps salmon*)



Tropical forest in the Amazon, near [Manaos \(Brasil\)](#).



Yagua elderly from near Iquitos using his blowguns (Pukana).



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Deforestation in the Amazon Basin





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Normalized Difference Vegetation Index (NDVI)

- The Normalized Difference Vegetation Index (NDVI) is calculated by the following expression:

$$NDVI = \frac{(IRC - R)}{(IRC + R)}$$

- Where IRC is the reflectivity in the near infrared and R is the reflectivity in the red .
- The range of values of the spectral reflection is between 0 and 1. Both the reflectivity of the near infrared and the red, are ratios of the reflected radiation on the incoming radiation in each spectral band. Consequently these ranges of values, the NDVI value varies between -1 and 1.



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Research Problem



(Compton Tucker, NASA GSFC)

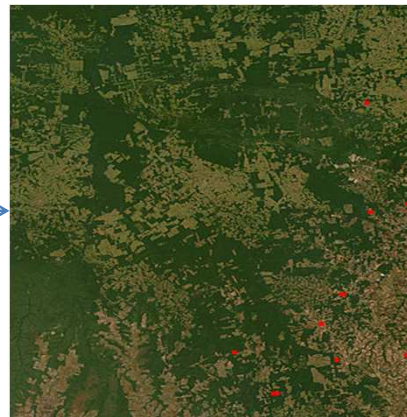
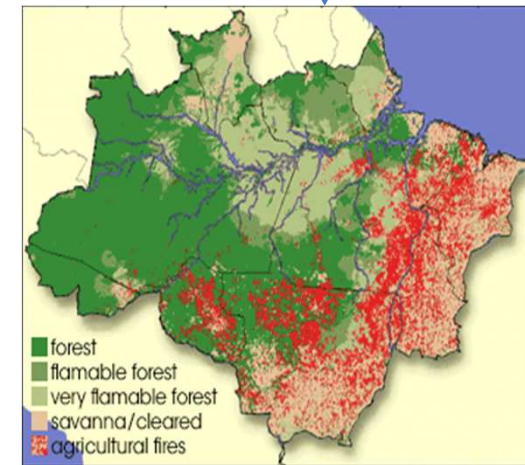


Imagen satelital de la deforestación en el estado de [Mato Grosso](#) (Brasil).



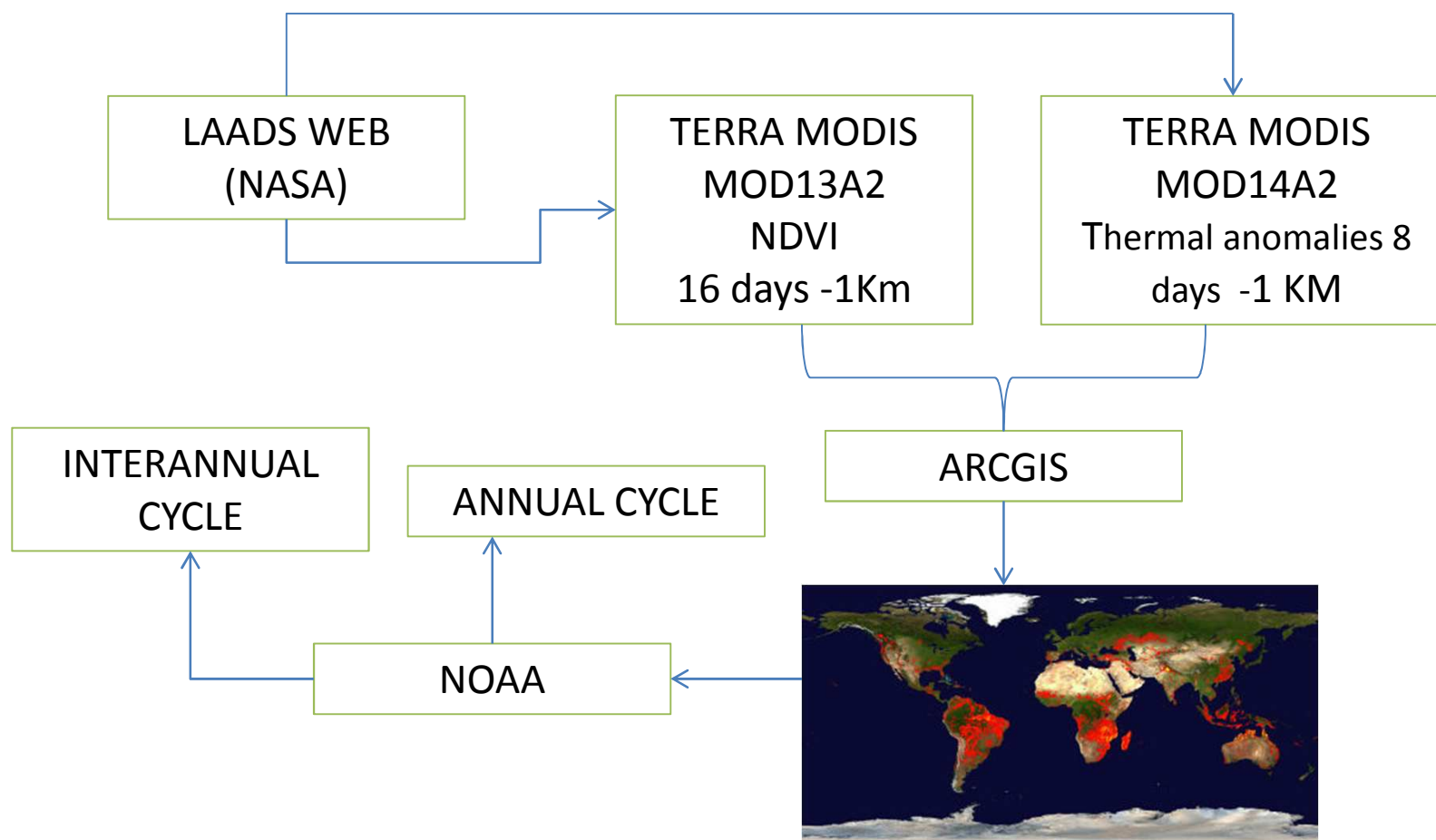
Nepstad *et al.*, 2001



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Methodology





Names, Areas and Location of the Quadrants of the Study Zones

Zone	Area (km ²)	Lower left corner		Top right corner	
		Latitude	Length	Latitude	Length
Central Amazonia (CA)	862283	-67	-7	-57	0
Eastern Amazonia (EA)	385491	-57	-10	-48	2
Southern Amazonia (SA)	663703	-67	-15	-57	-7
Western Amazonia (WA)	386574	-76	-7	-67	0
Llanos Colombo - Venezolanos	875609	0	74	9	63



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Map of the Quadrants in Study Area



Zone	Nº
Central Amazonia (CA)	1
Eastern Amazonia (EA)	2
Southern Amazonia (SA)	3
Western Amazonia (WA)	4
Llanos Colombo - Venezolanos	5



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RESULTS

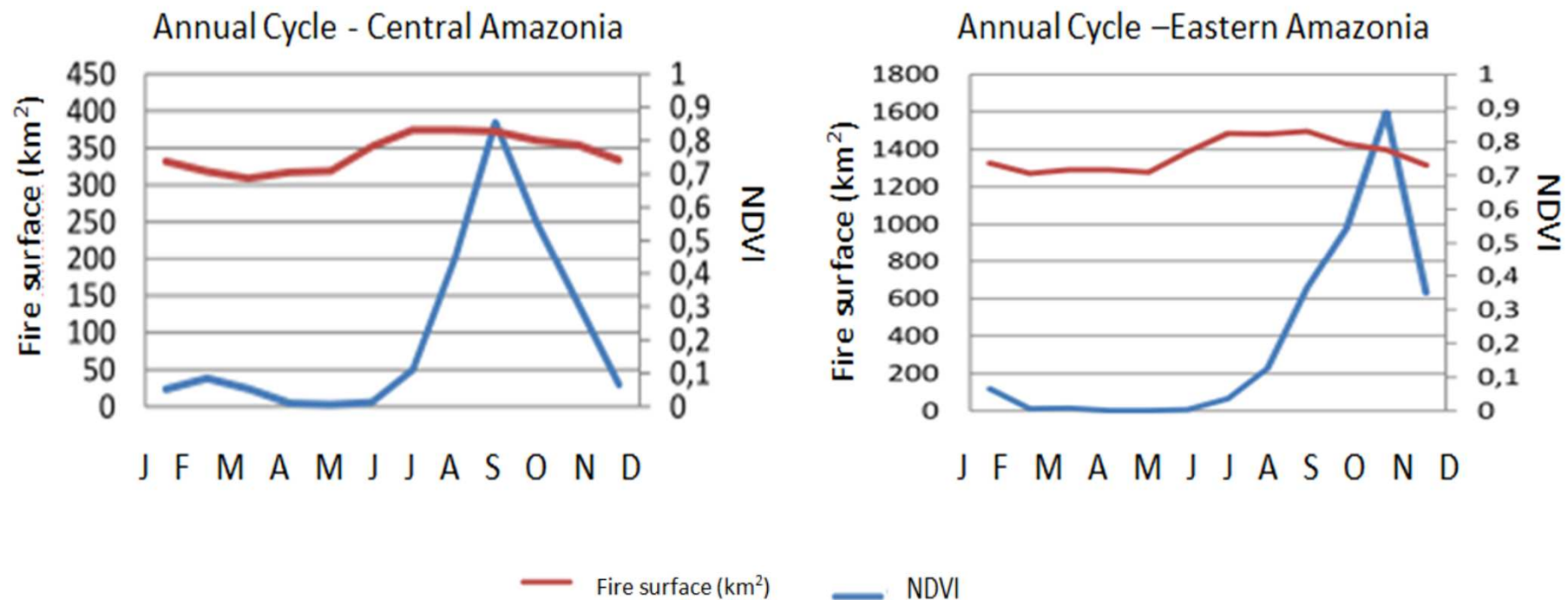


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Annual average cycle of fire and NDVI mean, for Tropical South America during the period 2000-2010.



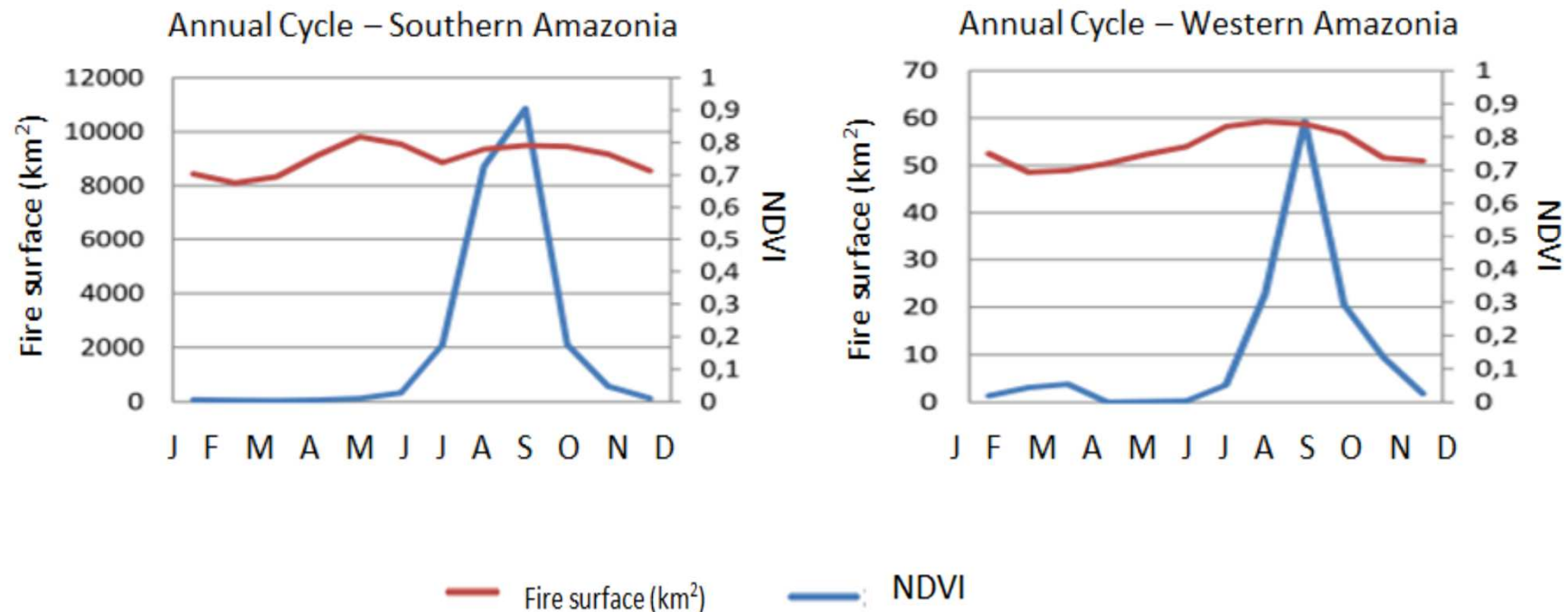


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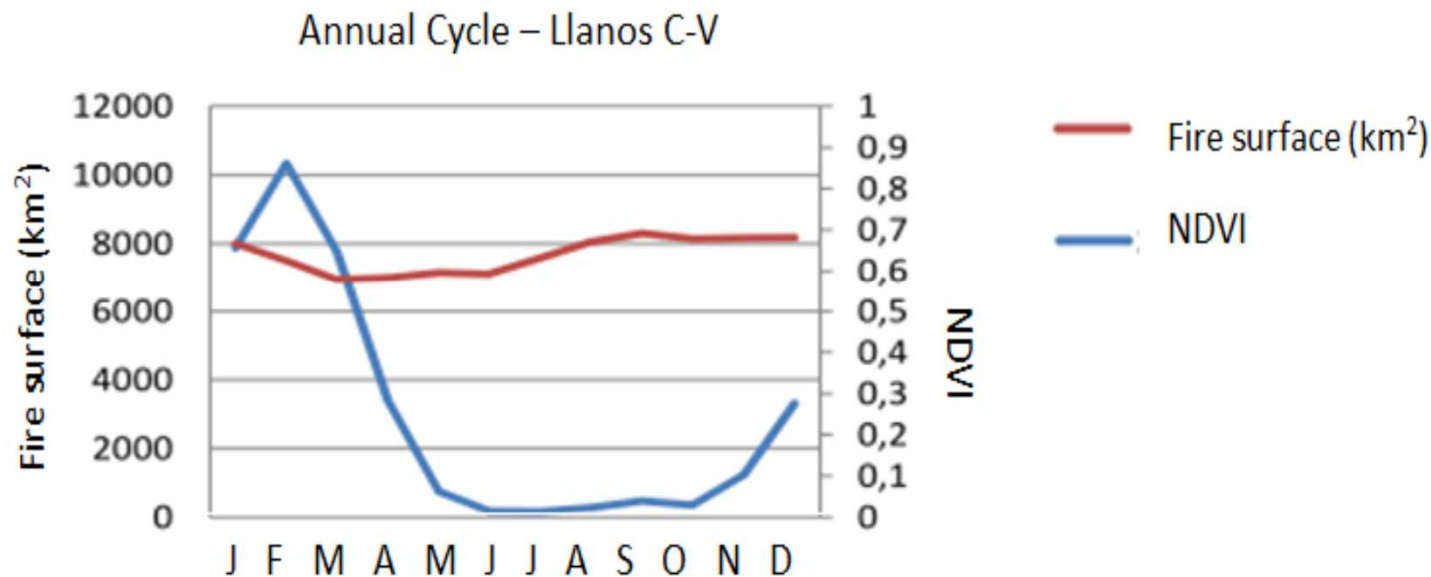




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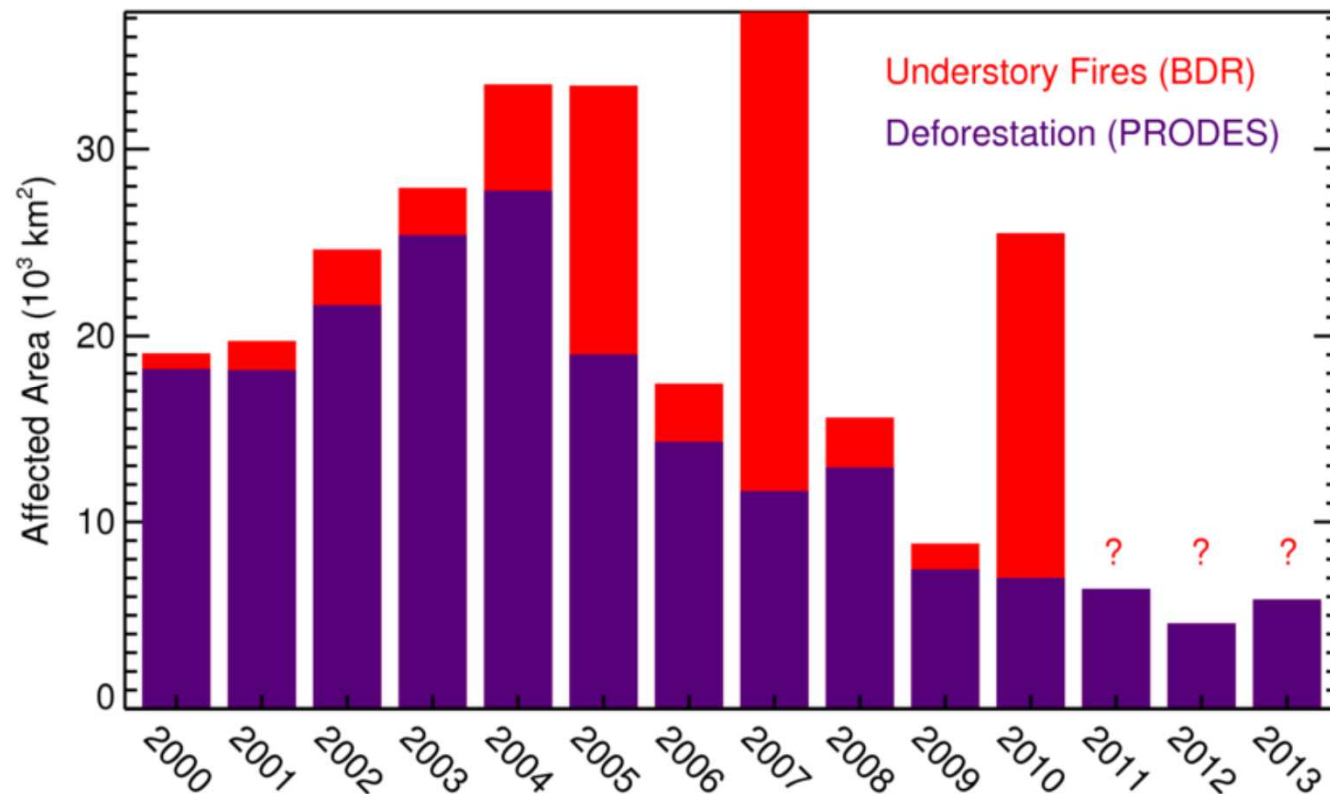




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Annual rates of deforested area and burn-damaged area in Amazonia, as indicated by the PRODES and BDR algorithms.





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BURNED AREAS AVERAGE

Zone	Burned Areas Average		Maximun Relative Period	Max Abs.	Minimun Relative Period	Min Abs.
	Min (km ²)	Max (km ²)				
Central Amazonia (CA)	4	384	Aug - Oct	Sept	Apr - Jun	May
Eastern Amazonia (EA)	1,5	1597	Sept - Nov	Sept	Apr - Jun	May
Southern Amazonia (SA)	42	10885	Aug - Oct	Sept	Feb - Apr	March
Western Amazonia (WA)	0,11	59	Aug - Oct	Sept	Feb - Apr	March
Llanos Colombo-Venezolanos	161	1033	Jan - Mar	Feb	Jun – Aug	Jul



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NDVI AVERAGE

Zone	NDVI Average		Maximun Range Period
	Min	Max	
Central Amazonia (CA)	0,68	0,83	Jul – Aug
Eastern Amazonia (EA)	0,7	0,83	Aug - Sep
Southern Amazonia (SA)	0,67	0,81	May - Jun
Western Amazonia (WA)	0,69	0,84	Aug - Sep
Llanos Colombo - Venezolanos	0,59	0,68	Sep – Nov



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Conclusions

- Of four studied regions of the Amazon basin, **Eastern Amazonia** was most affected by thermal anomalies and forest fires, which spread quickly through the zone.
- During November 2002, was reported the burned area was 2255 km².





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Conclusions



Although **Southern Amazon** have developed coverages of tropical rainforest, in aerial photographs observe a strong impact in this area, by opening agricultural boundaries and wild trees felling.



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Conclusions

- In the Amazon regions studied, forest fires occur with more frequently in the second half of the year with a defined unimodal annual cycle.
- The forest fires largely extending from the east toward the center, reaching its maximum levels in the months, September and November.



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Thank you!



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