

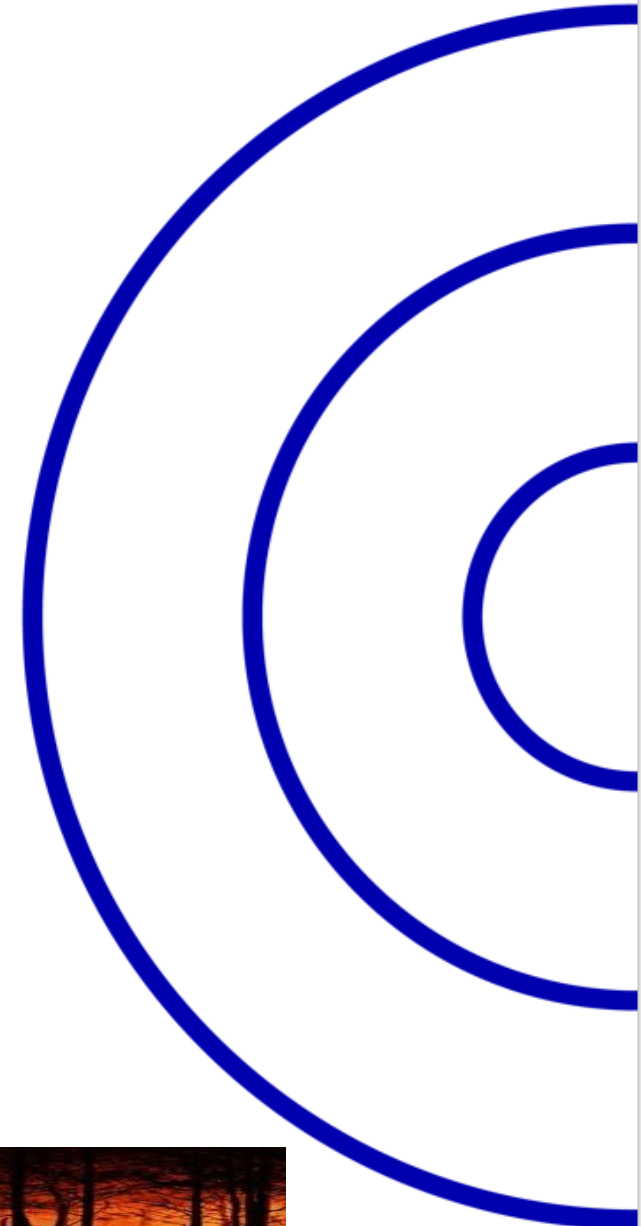
# Indicadores de la vegetación andina amazónica para la prevención de incendios forestales

**Ricardo Zubieta PhD.**



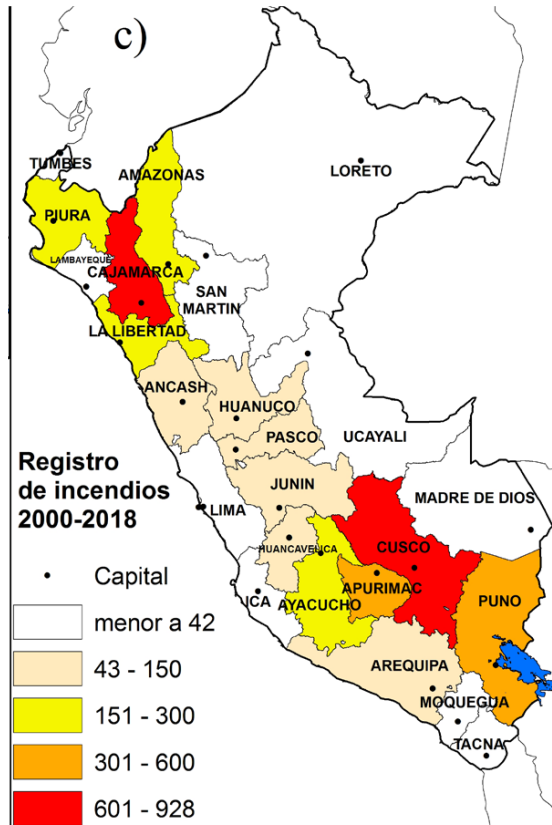
**PERÚ**

Ministerio  
del Ambiente



Un incendio forestal es un fuego no deseado que se propaga sin control que causa pérdidas económicas, Ecológicas y sociales (SERFOR, 2018)

**Cajamarca y Cusco son las regiones más recurrentemente afectadas**



Fuente: Zubieta et al., 2019

## Causas

Uso del fuego para la agricultura



Fuente:  
Álvarez, 2022

Uso del fuego para la renovación de pastizales



Cambio de uso de la tierra

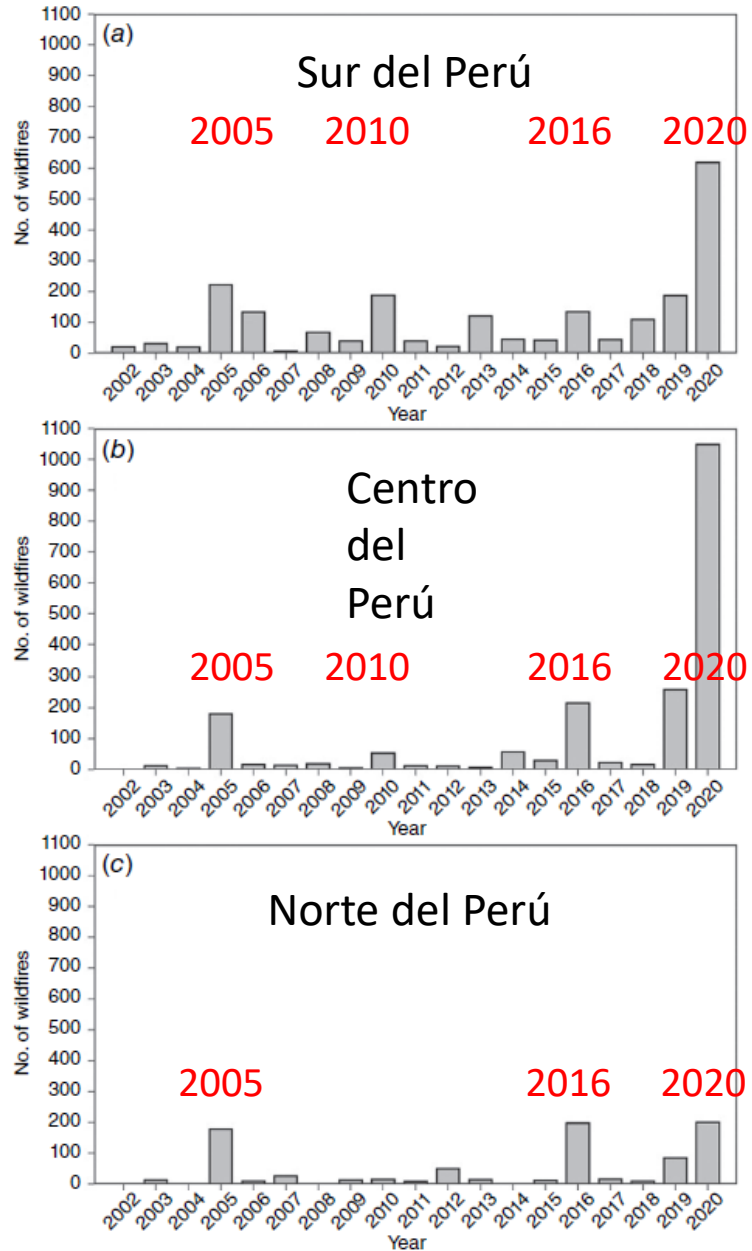


Quemas ilegales en Brasil

<https://www.naturalezaconderechos.org/2020/08/26/quemas-ilegales-en-brasil/>

**Factores: Rol de la población (ignición), el combustible forestal y el Clima**

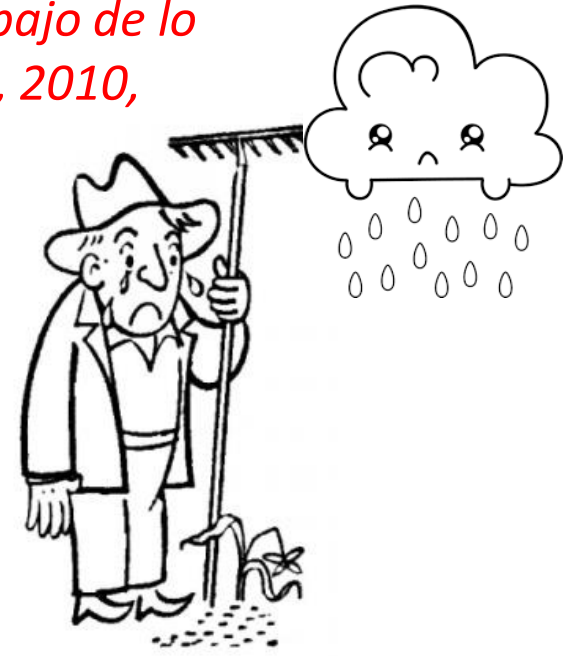
## Aumento sin precedentes en la cantidad de emergencias por incendios en los Andes peruanos durante 2020



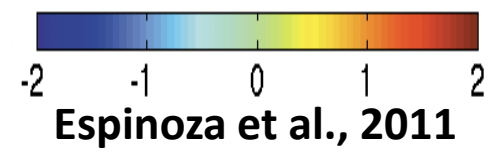
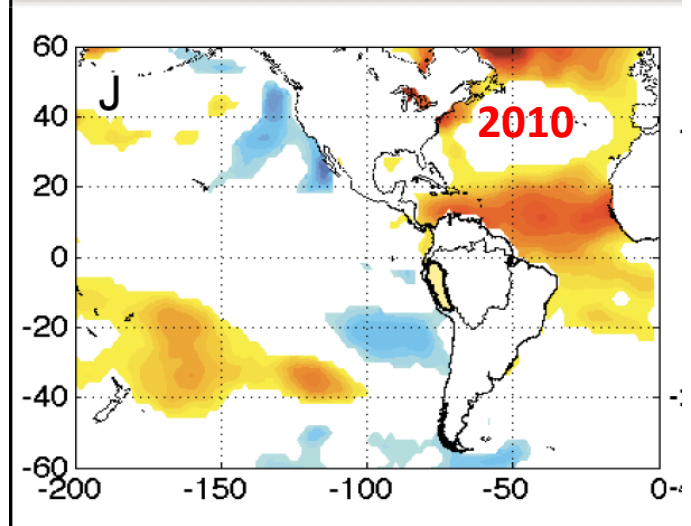
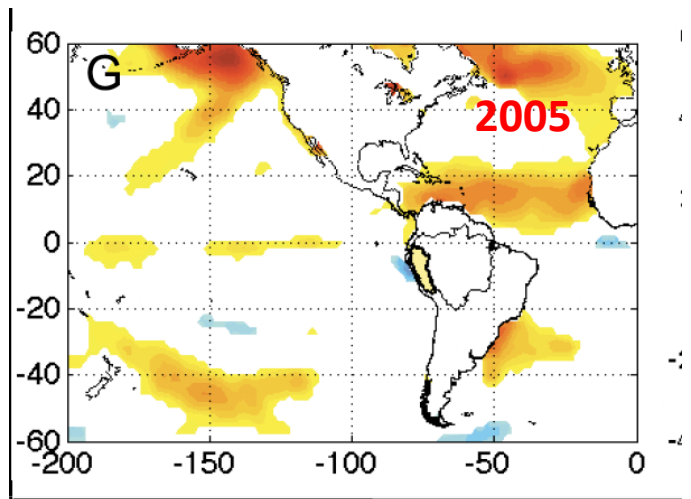
La pandemia Covid 19, también ejerció un rol, mediante la migración de la población desde la ciudad al campo (Alvarez, 2022).

**Hubo otros factores en 2005, 2010?**

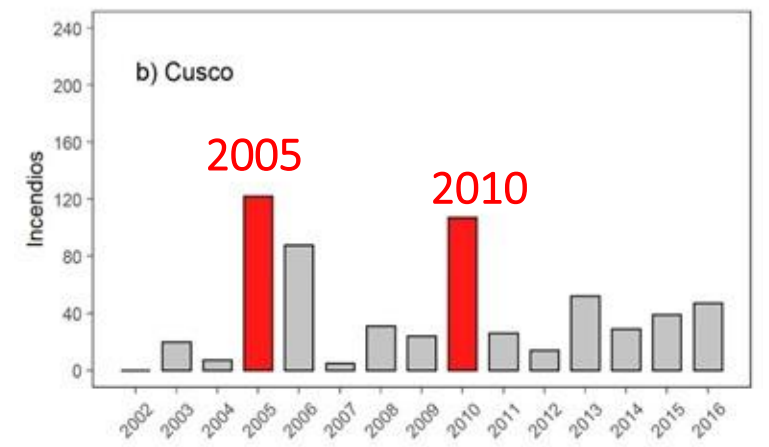
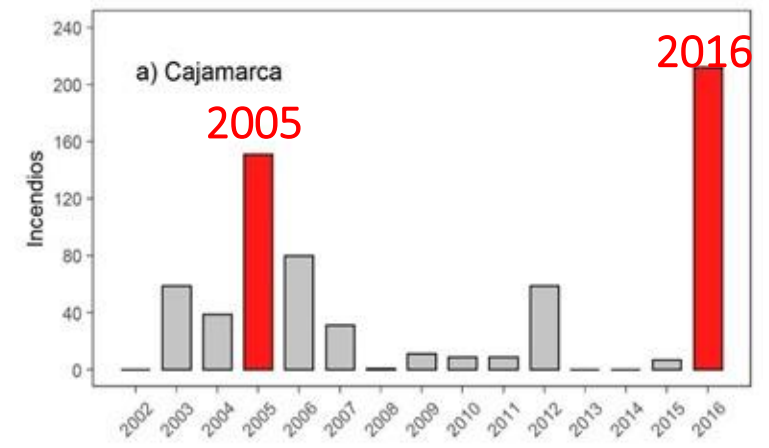
Periodos secos prolongados (Lluvia en niveles por debajo de lo normal). 2005, 2010, 2016.



a) Inhibición en la entrada de humedad a la Amazonía y Andes en 2005 y 2010.



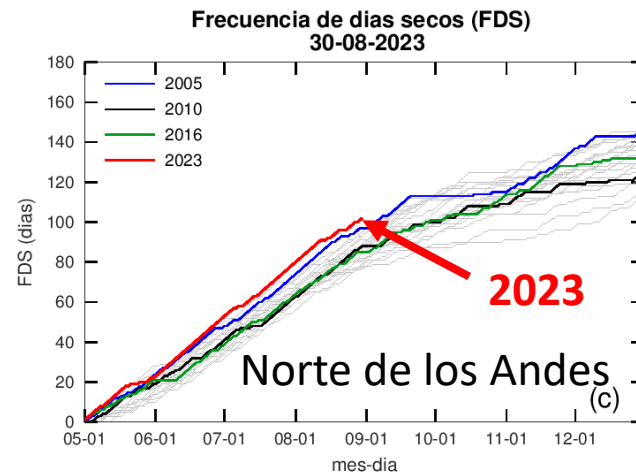
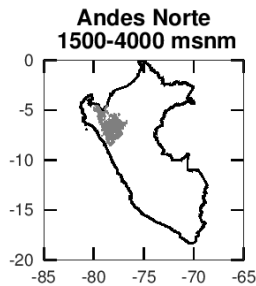
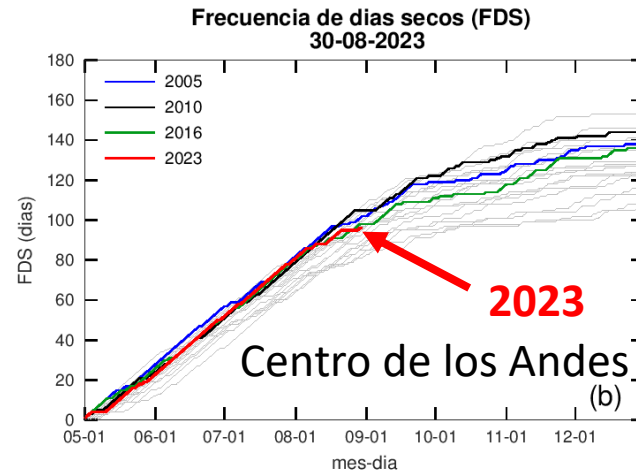
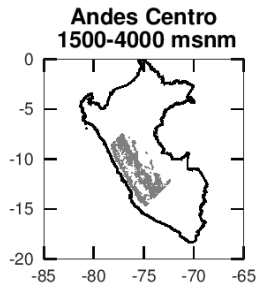
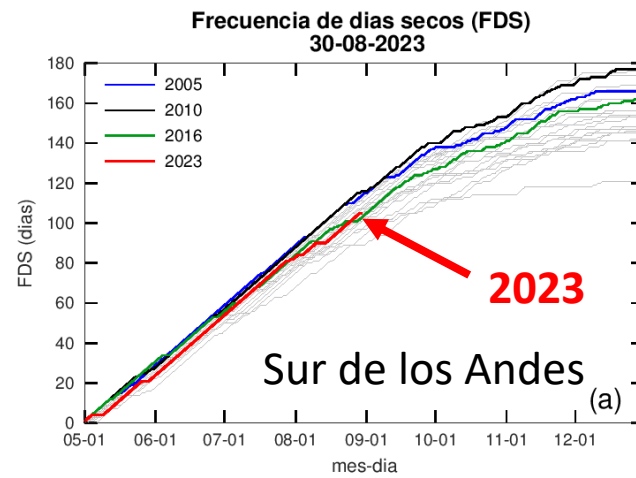
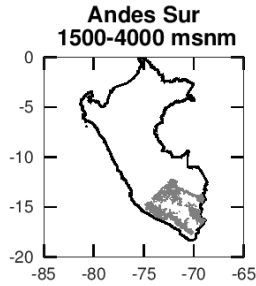
b) La emergencias por incendios forestales se incrementaron en 2005, 2010 y 2016 (hasta 400%)



Fuente: Ccanchi 2021

c) 2005, 2010 y 2016 son también caracterizados por eventos El Niño en el pacífico central

Cantidad de días secos (días en los que No llueve).

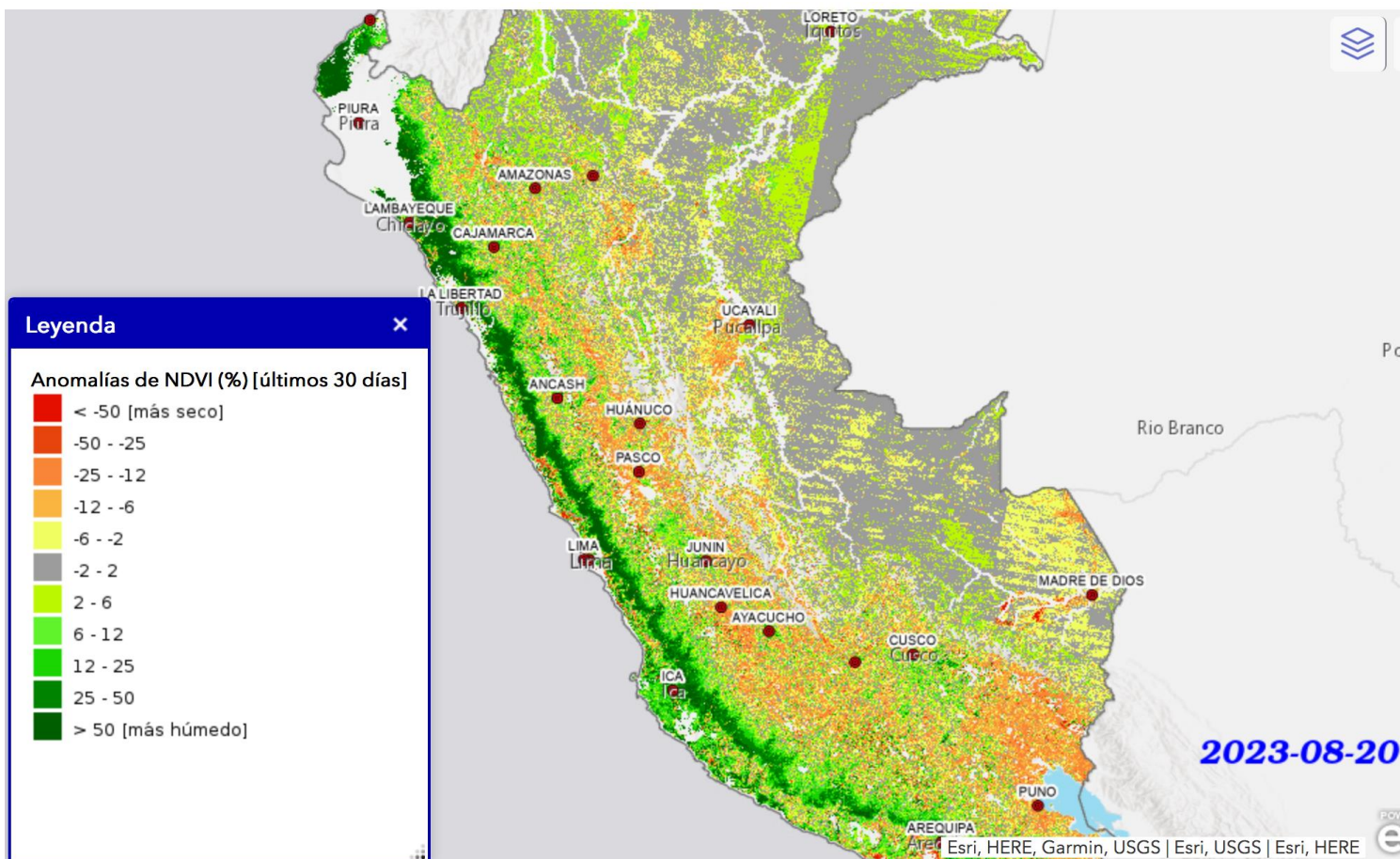


La investigación del IGP indica que a mayor cantidad de días secos es más probable el incremento severo de la ocurrencia de incendios forestales (Zubieta et al., 2021).

El periodo agosto 2023 alcanza niveles similares a lo ocurrido en 2016 (IGP, 2023).

# Impacto de la reducción de lluvia sobre la vegetación en 2023

Anomalías de NDVI (%) agosto 2023



Investigaciones del IGP a partir de datos e información satelital indican que un periodo sin lluvias prolongado conduce a una mayor exposición del combustible forestal durante el periodo de quemas en los Andes y por tal a condiciones para una mayor incidencia de incendios (Zubieta et al., 2023).

Contraste 2023, hay un Incremento del estado fotosintético de la vegetación en la vertiente del Pacífico, y reducción en el centro y sur de los Andes peruanos (IGP, 2023)

# GRACIAS

## *rzubieta@igp.gob.pe*

Evidencias y respaldos científicos recientes IGP (en colaboración con MINAM, SERFOR, UNALM) para servicios IGP y emisión de boletines

**CSIRO PUBLISHING**  
 International Journal of Wildland Fire 2021, 31, 836-849  
<https://doi.org/10.1017/WJF.2020.102>

**Potential conditions for fire occurrence in vegetation in the Peruvian Andes**

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**Abstract.** Fire activity in the Peruvian Andes has increased significantly in recent decades, but climatic parameters associated with drought, which may indirectly contribute to the occurrence of severe forest fires, have not yet been investigated. Because fire prevention tools are scarce, strategies for deterring burning are necessary in order to reduce impacts in regions where forest fires usually result from human activity. This study explores the conditions conducive to forest fires in the Andes of Peru. Daily precipitation and temperature observed data from the PISCO gridded dataset for the 2002–2016 period were used. In addition, MODIS satellite images (MOD09A1 product) were collected to characterize Andean vegetation using spectral indices. Analysis of daily temperature and rainfall indicates that climatic parameters such as cumulative precipitation, dry-day frequency and hot-day frequency are statistically associated with conditions that could contribute to increased forest fire occurrence. Our findings suggest that a decrease in the water content of vegetation, estimated by the Global Vegetation Moisture Index during the dry period and wet period onset, can be used to identify potential conditions for forest fire occurrence. This study suggests that forest managers should consider implementing prevention strategies that include continuous monitoring of climate and vegetation parameters.

**WILDLAND FIRE** RESEARCH PAPER  
**THE ROLE OF DROUGHT CONDITIONS ON THE RECENT INCREASE IN WILDFIRE OCCURRENCE IN THE HIGH ANDEAN REGIONS OF PERU**  
 Ricardo Zubieta<sup>1,2</sup>, Yerson Canchi<sup>3,4</sup>, Alejandra Martínez<sup>5</sup>, Miguel Saavedra<sup>6</sup>,  
 Edmundo Norambuena<sup>6</sup>, Sigrid Alvarez<sup>6</sup> and Merry Blay<sup>6</sup>

**ABSTRACT**  
 Wildfire occurrence has increased sharply in the last two decades in the Peruvian Andes. There is, however, little research on wildfires and their impacts. This study explores the conditions conducive to wildfire during 2002. MODIS images were collected to estimate the development of vegetation. In addition, ground-based monthly and monthly-based daily precipitation data were collected. Daily precipitation together with evapotranspiration and a meteorological index (CI) with monthly precipitation was used to estimate the Standard Precipitation Index (SPI). We used the Global Vegetation Moisture Index (GVMI), which is a useful indicator of vegetation dynamics based on vegetation indices. Our results do not indicate a direct link between rainfall irregularity (dewet CI) values and development of vegetation. Although the SPI drought index using seasonal rainfall reduction reach normal conditions during 2016–2020, analysis of the dry frequency (EDF) suggest that the dry period played an important role between September and November 2020, providing conditions similar to the drought of 2002, 2010 and 2016. EDF for determination average values from April to November. We corroborate the usefulness of EDF for monitoring the potential increase in wildfire conditions. A controlled burn policy could offer a more useful way to reduce the impacts of wildfire.




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Performance of heat spots obtained from satellite datasets to represent burned areas in Andean ecosystems of Cusco, Peru

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Fuente: <https://www.igp.gob.pe/incendios-forestales/>

<https://ide.igp.gob.pe/geovisor/ndvi/>