Characterization of extreme precipitation and temperature events during El Niño Southern Oscillation in the Colombian Andes

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INTRODUCTION

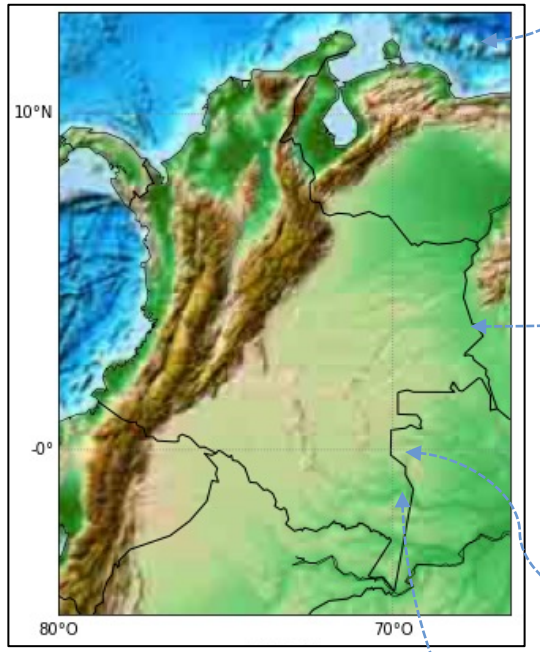


Figure 1. Study region

Andes mountain is a region terrain complex topography

Why is it important to study extreme precipitation and temperature in the Andes?

67% population live in this region and it is the economic activity center of the country.

It's more vulnerable to multiple risks associated to extreme precipitation and temperature events.

Extreme events are influenced by phenomena at different spatial and temporal scales such as El Niño Southern Oscillation – ENSO.

It is necessary to understand the relationship between ENSO and extreme events to improve and perform adaptation, mitigation, and prevention policies.

METHODOLOGY

1

Data

TRMM 3B42 daily 7 0.25°x 0.25°
1998-2019

ERA5 0.25°x 0.25° T2m
1979-2019

3

Comparison

Difference between Niña - Neutral, Niño - Neutral and Niña - Niño

2

Characterization

Precipitation

- Percentile 95 and 99 precipitation for values non zero.
- Clasification events (Niño, Niña and Neutral years)
- Composite analysis.

Temperature

- Percentile 90 temperatura.
- Clasification events (Niño, Niña and Neutral years)
- Composite analysis.

RESULTS

Precipitation percentile 95th

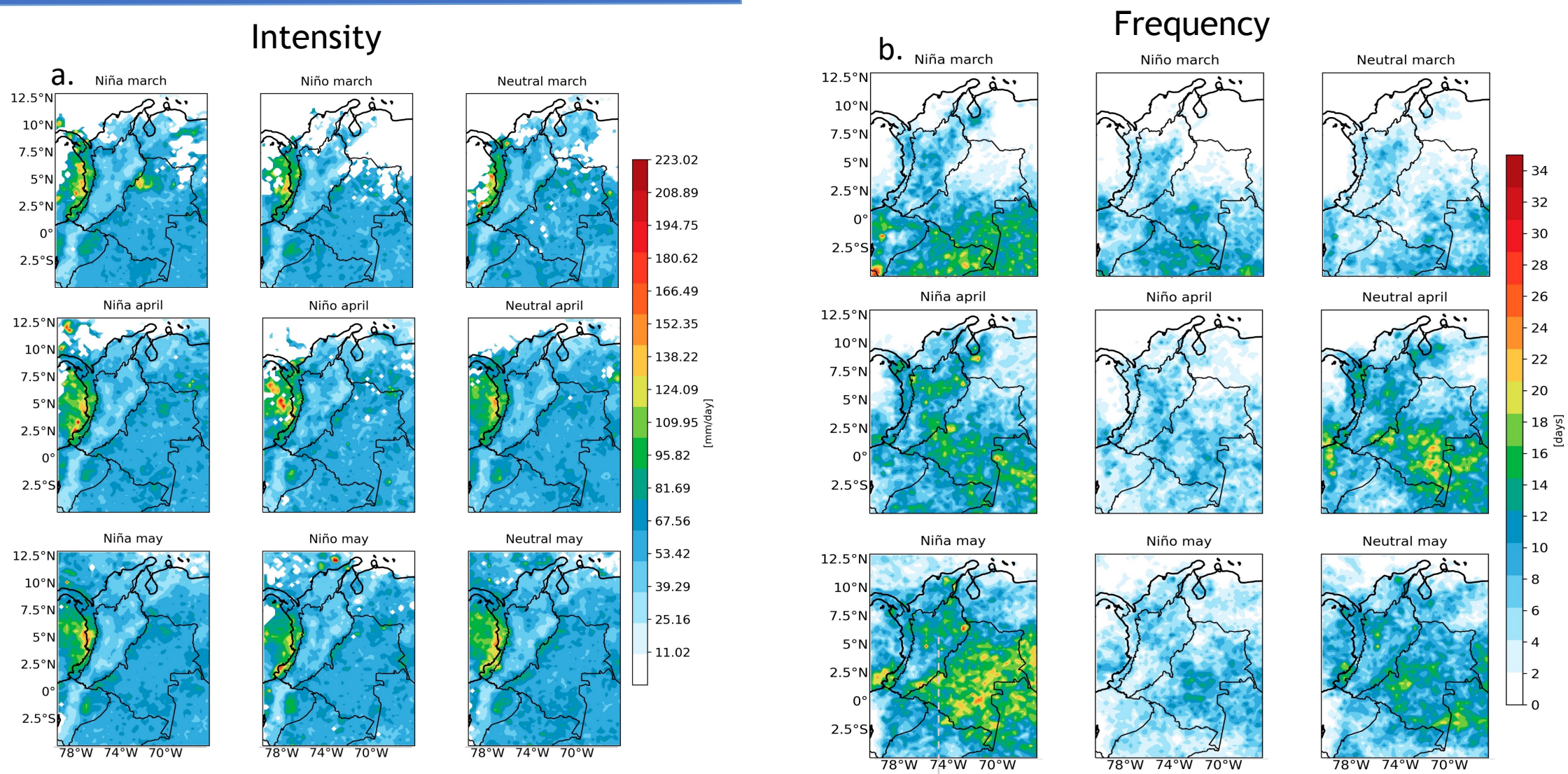


Figure 2 a y b precipitation percentil 95th in march, April and May.

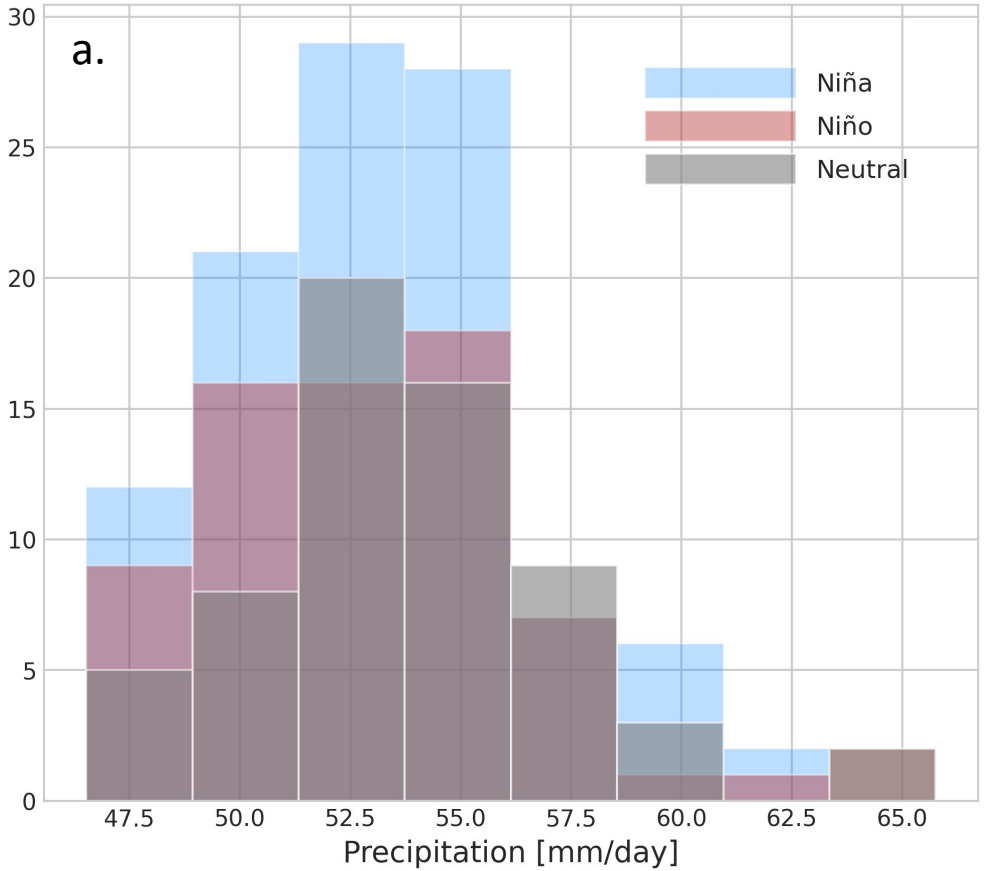
a) The events are more intense in the Andes in this season.

b) Events are more frequent during La Niña in the Andes.

RESULTS

Precipitation percentile 95th

Intensity



Frequency

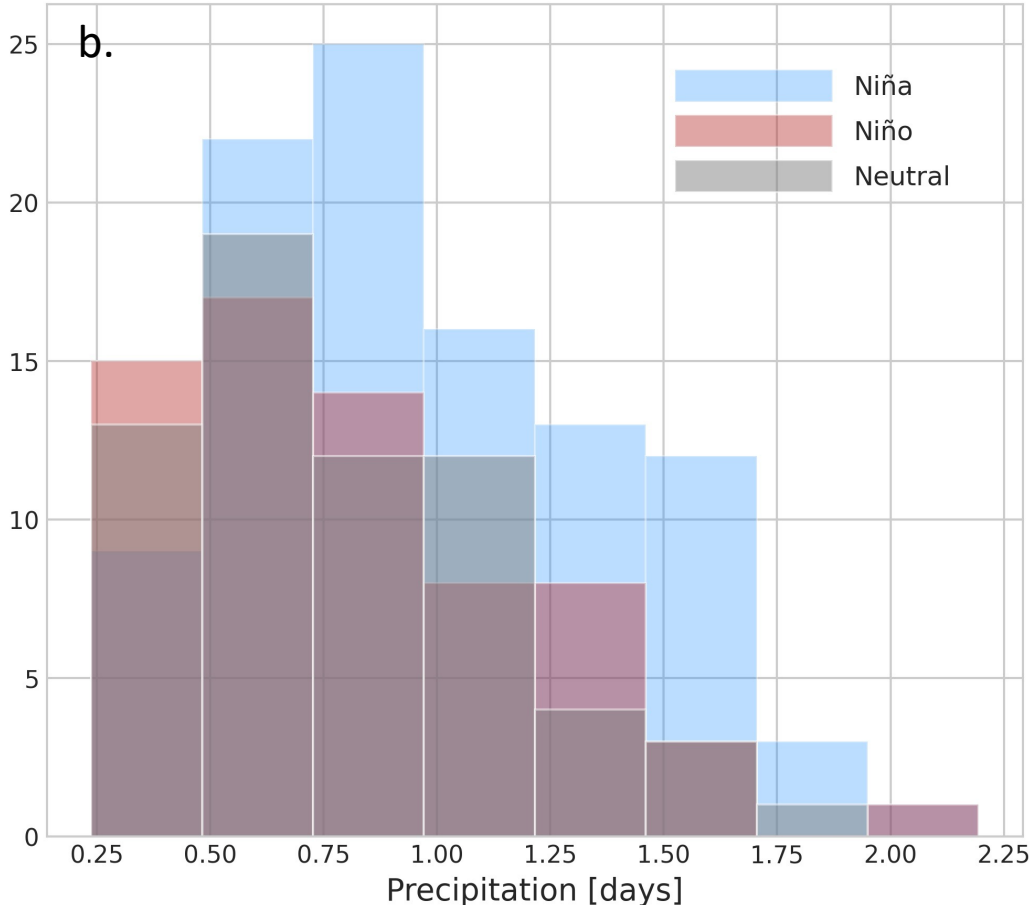
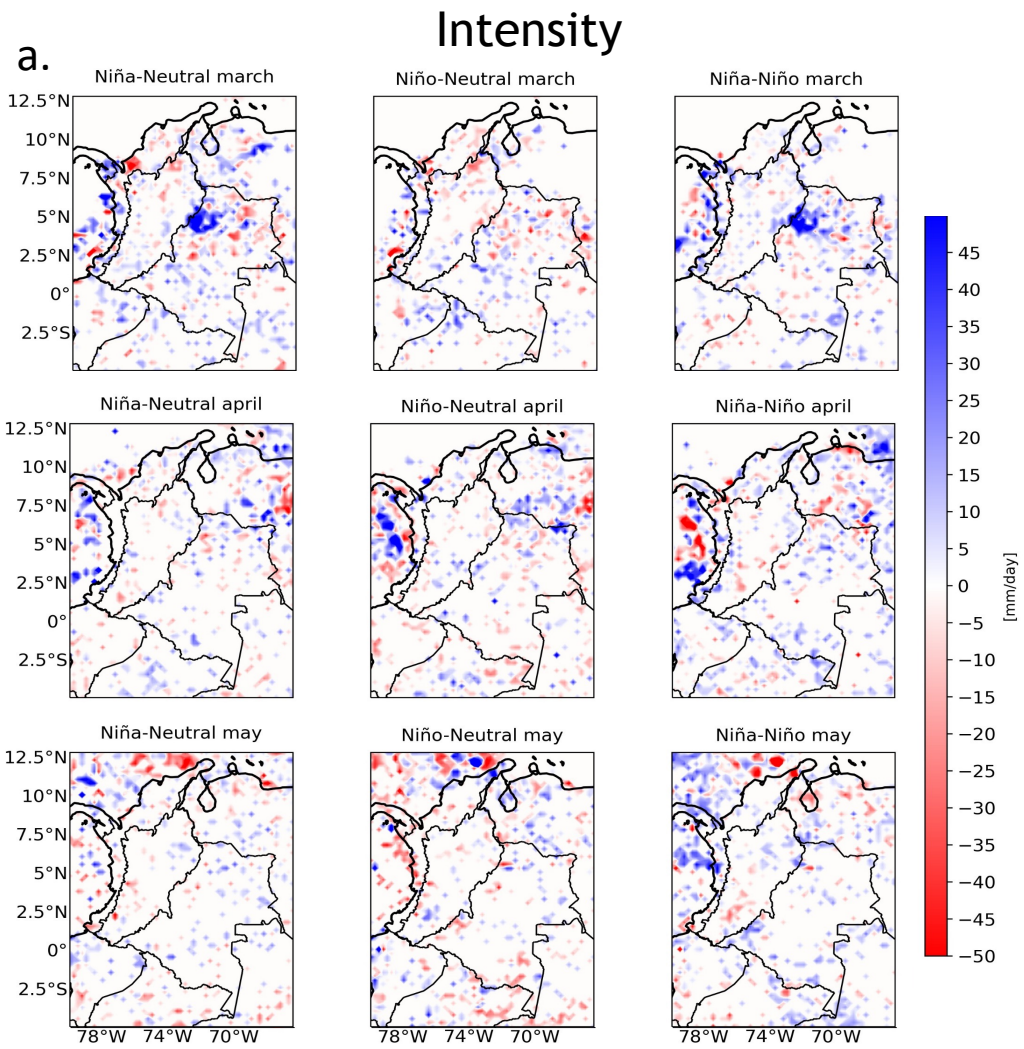


Figure 3 a y b are time series histograms for the period of 1998-2019 for precipitation percentile 95th.

a) The extreme precipitation events are more intense during La Niña.
b) The events are more frequent when the event of La Niña occurs.

RESULTS

Precipitation percentile 95th



The values of the difference are statistically Significant.
$p < 0.05$

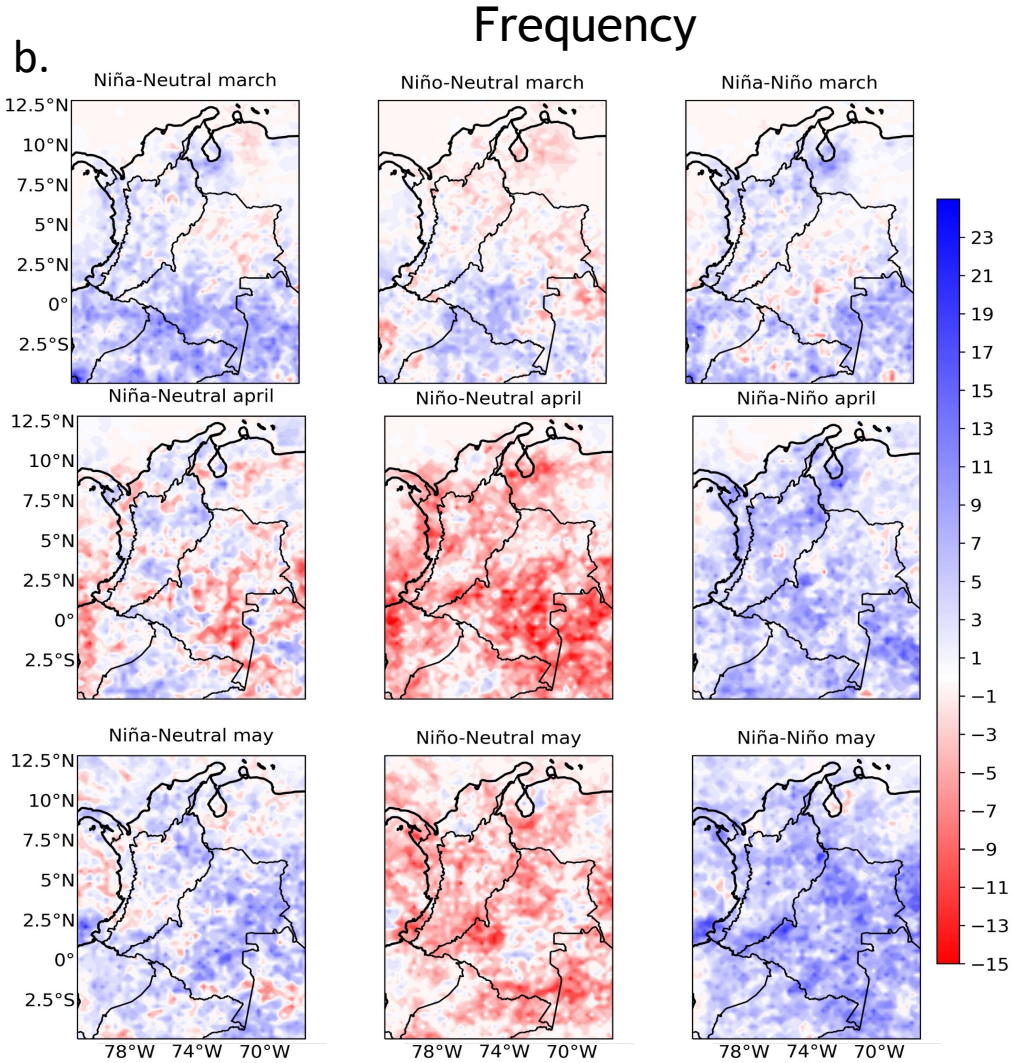


Figure 4 a y b difference between ENSO and neutral years for precipitation percentile 95th.

a) In La Niña, more intense precipitation events occur in specific regions.
b) The number of events is greater during La Niña than in El Niño or Neutral years

RESULTS

Precipitation percentile 95th

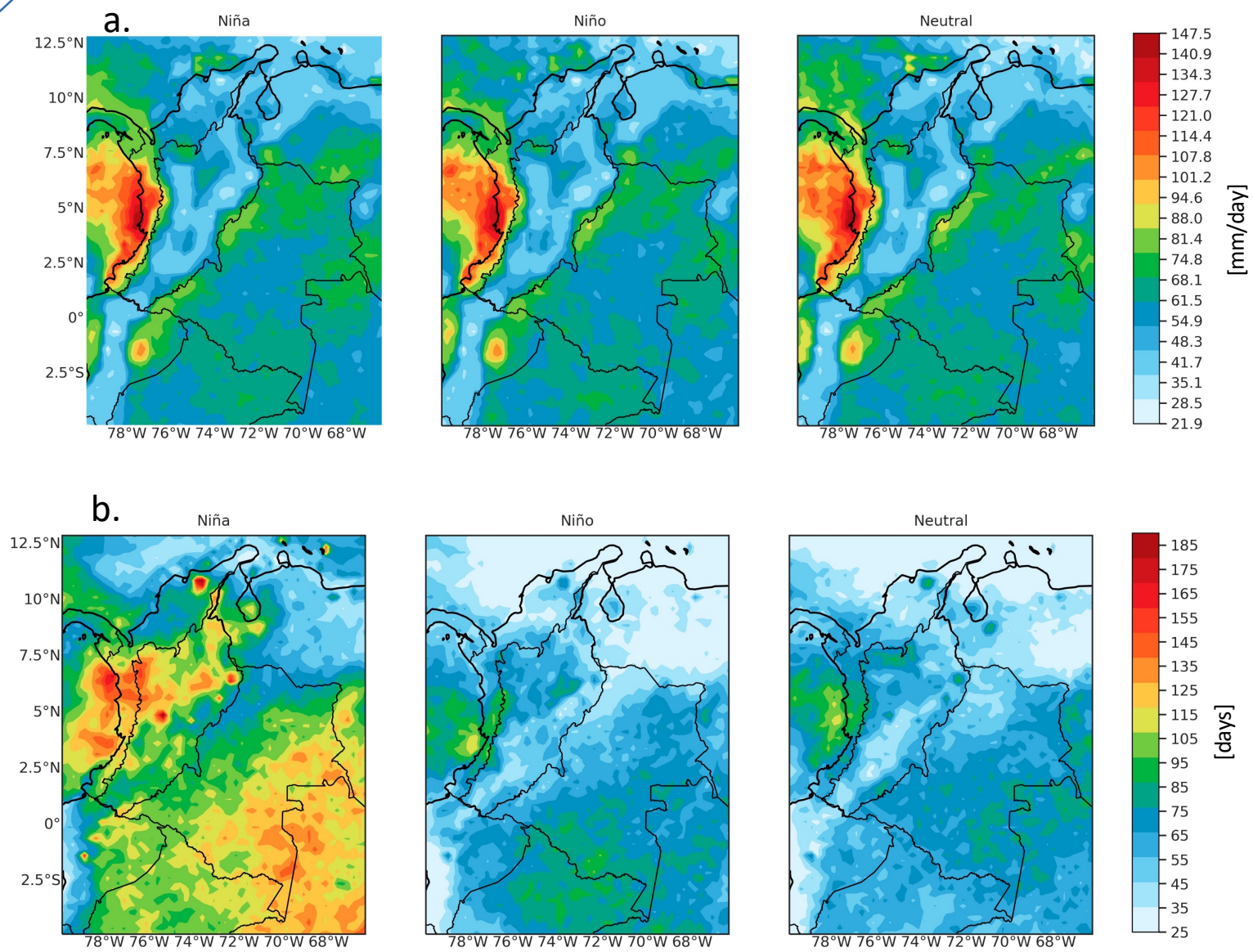


Figure 5 a y b, composite analysis of La Niña, El Niño, and neutral years for precipitation percentile 95th.

a) The composite shows that the intensity of extreme events does not have much variability in ENSO events and neutral years.
b) In La Niña there is a high activity of events.

RESULTS

Temperature percentile 90th

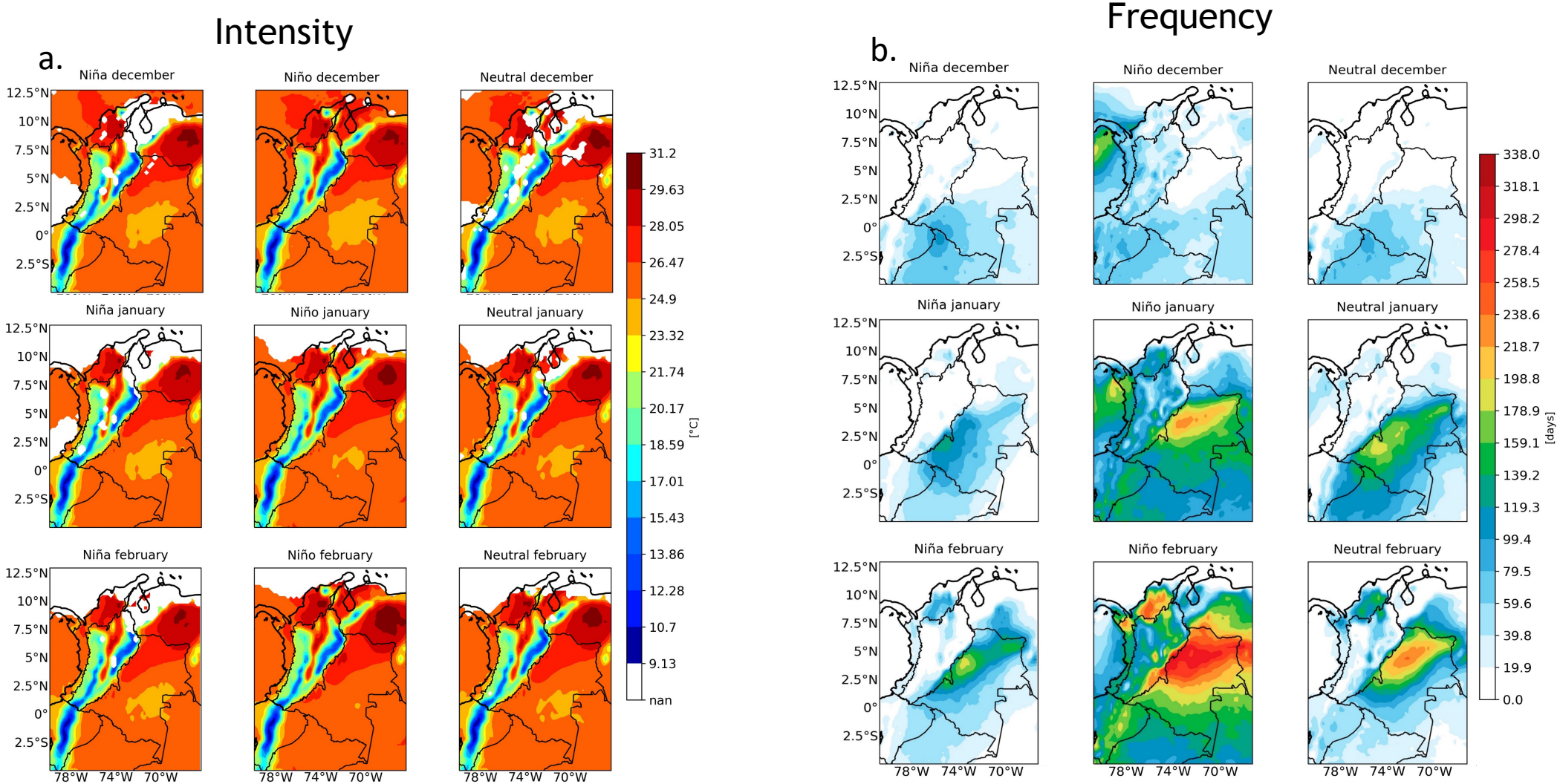


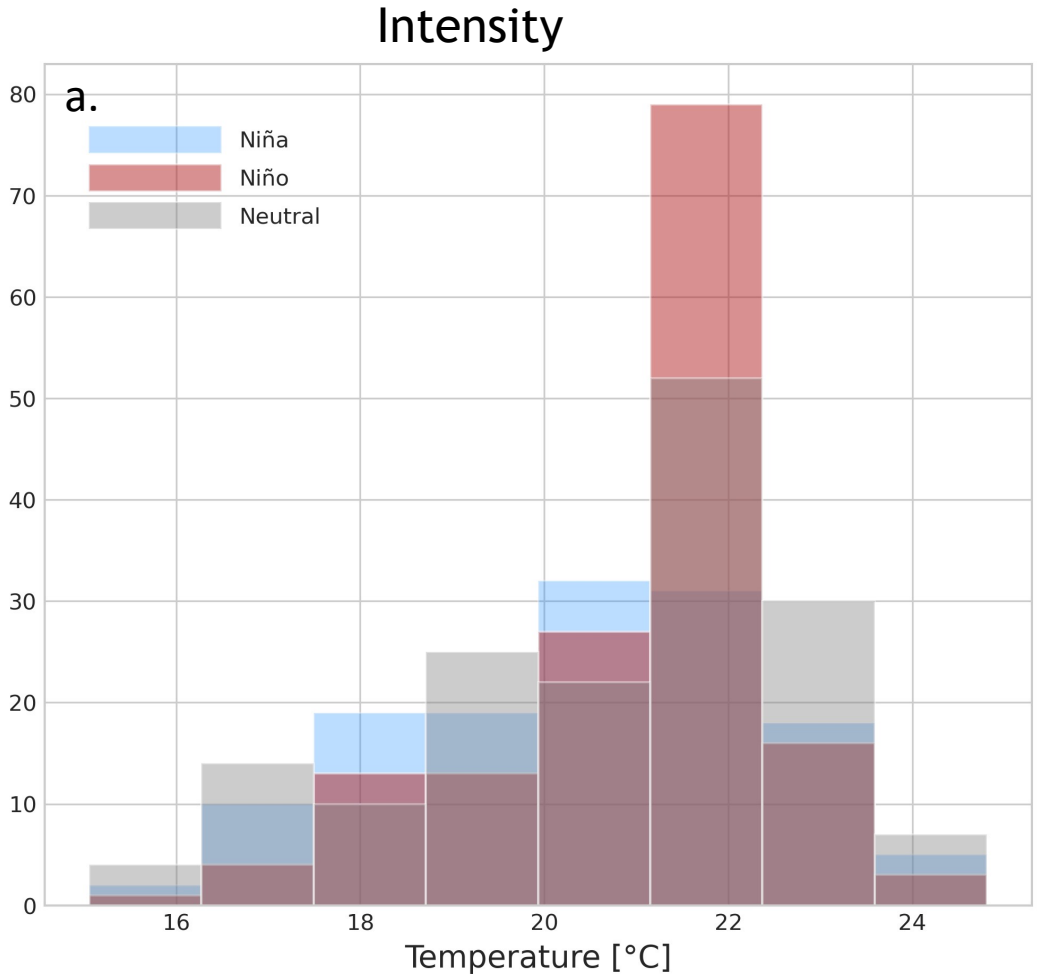
Figure 6 a y b season December, January, and February of temperature percentile 90th.

a) Extreme temperature events are higher in low-slope areas.

b) During El Niño, the events are more frequent.

RESULTS

Temperature percentile 90th



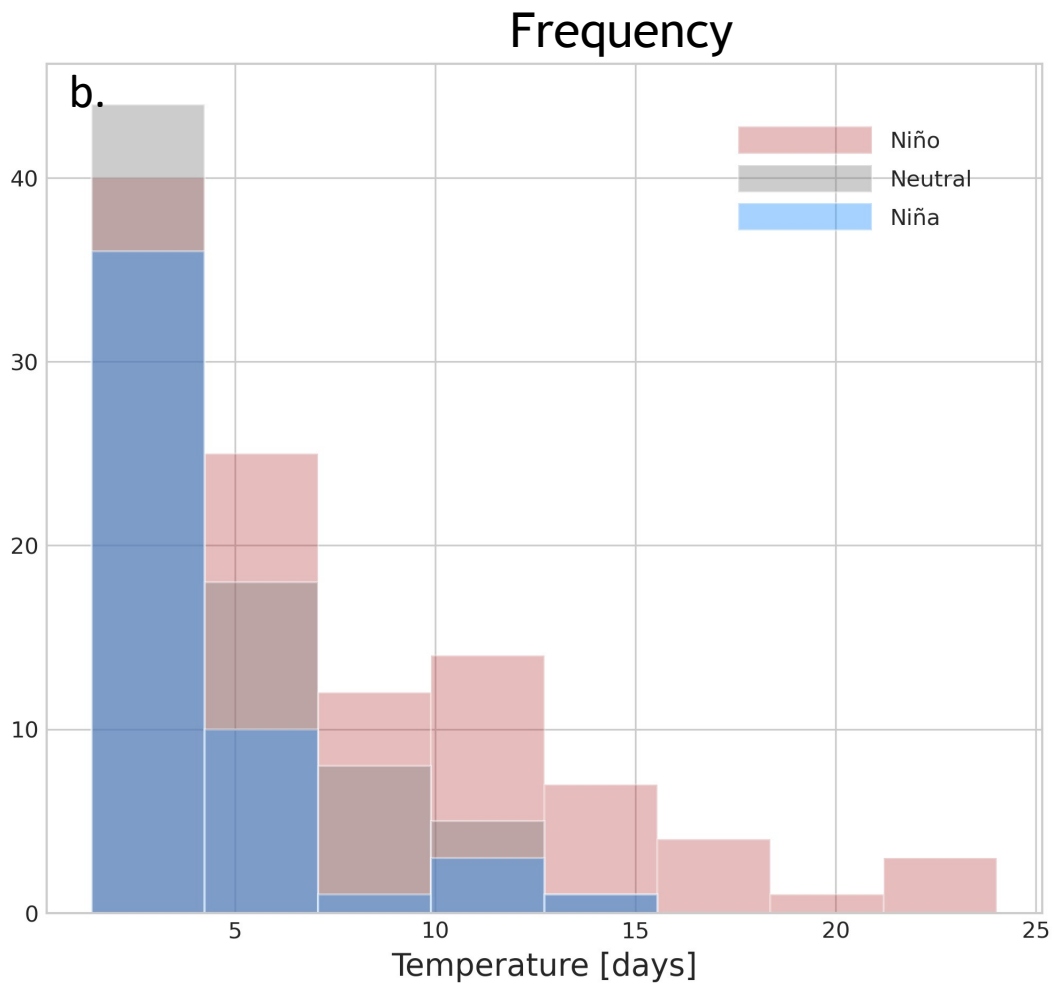
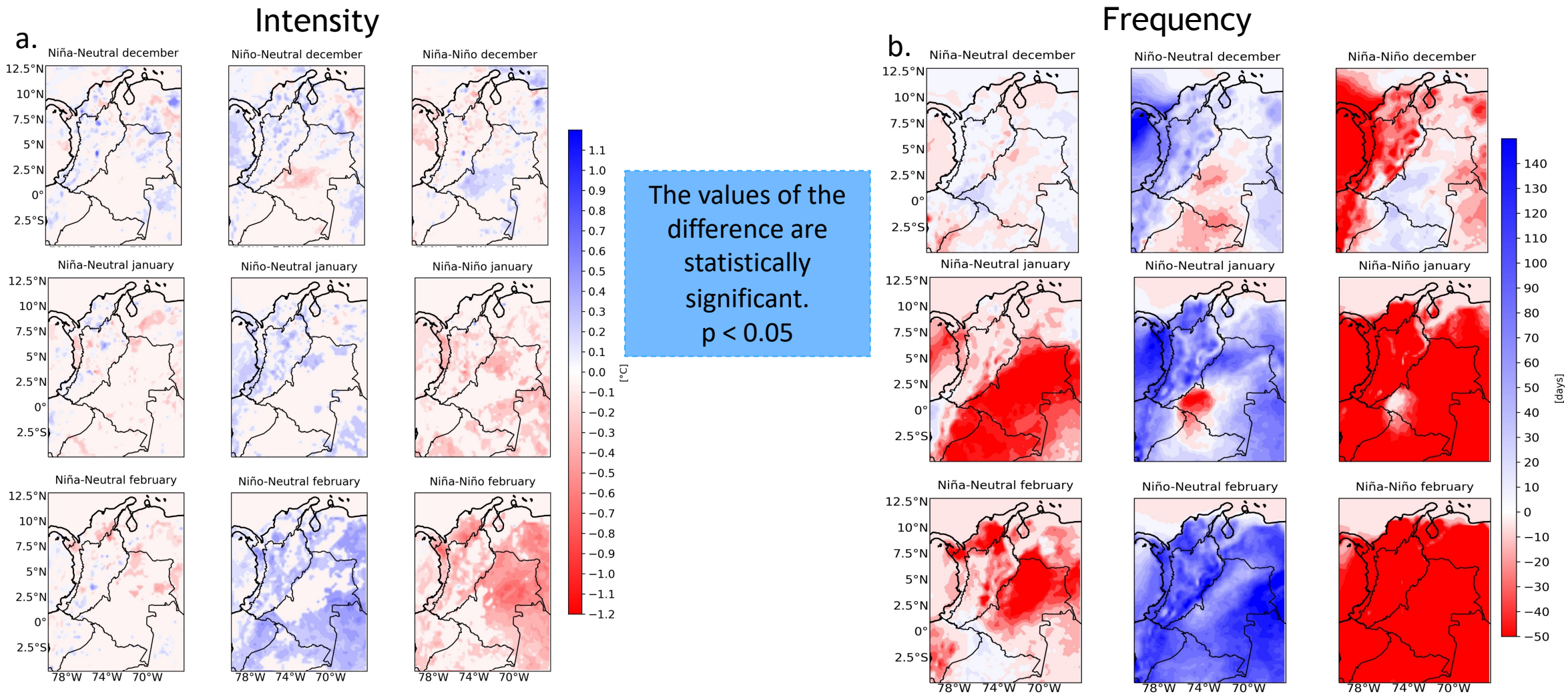


Figure 7 a y b are time series histograms for the period of 1979-2019 for temperature percentile 90th.

a) The intensity values have few variations between periods analysis.
b) The frequency histogram shows that in general there is an increase in extreme temperature events in El Niño.

RESULTS

Temperature percentile 90th



The values of the difference are statistically significant.
$p < 0.05$

Figure 8 a y b, difference between ENSO and neutral years for temperature percentile 90th.

a) In this season, there are extreme temperature events during El Niño in the Colombian Andes.

b) The differences clearly show that during El Niño, there are more frequent events compared to La Niña and neutral years.

RESULTS

Temperature percentile 90th

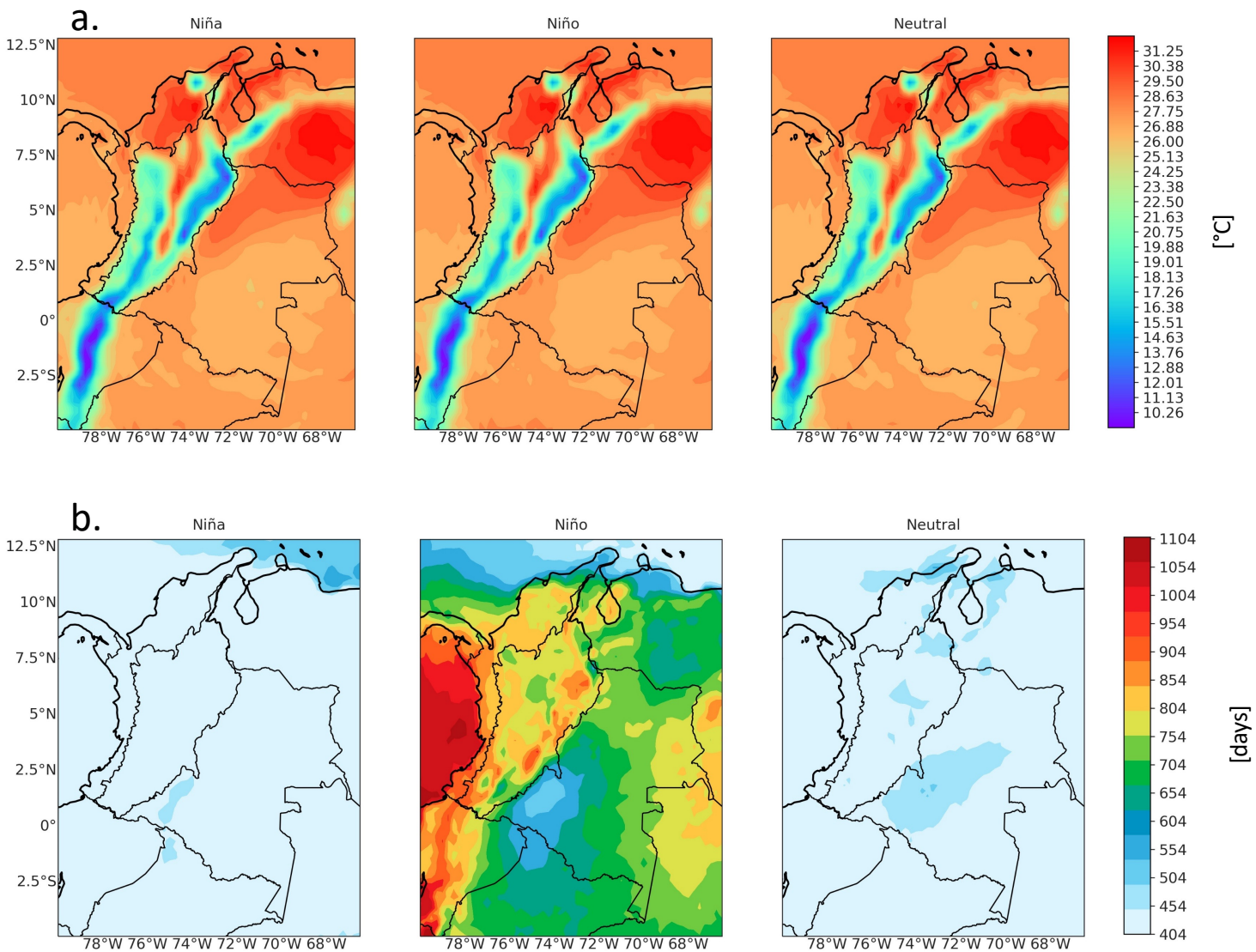


Figure 9 a y b, composite analysis of La Niña, El Niño, and neutral years for temperature percentile 90th.

a) The intensity composite does not show values different between La Niña, El Niño, and Neutral years.
b) The frequency composite does show the high activity of extreme events in the Andes during El Niño.

CONCLUSIONS

- The negative phase of ENSO (La Niña) presents higher magnitudes in extreme precipitation events in intensity and frequency than during El Niño and neutral years in the Andes. El Niño presents lower values respec neutral years in March, April, and May. This season corresponds to the highest monthly precipitation values during the year.
- December, January, and February El Niño conditions favor more frequent extreme temperature events in the Andes.

Thank you

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