

# EXPLORING THE COMPLEX DYNAMIC OF SUMMER EXTREME EVENTS IN THE EUROPEAN ALPINE REGION USING THE HIGH-RESOLUTION CORDEX-FPS ENSEMBLE

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## Introduction

**Extreme sub-daily precipitation** events display a distinct spatial pattern, commonly referred to as the **reverse orographic effect**.

## Research questions

- What drives this pattern?
- Which processes are involved at different elevations?
- What types of phenomena dominate these events—convection, for example?

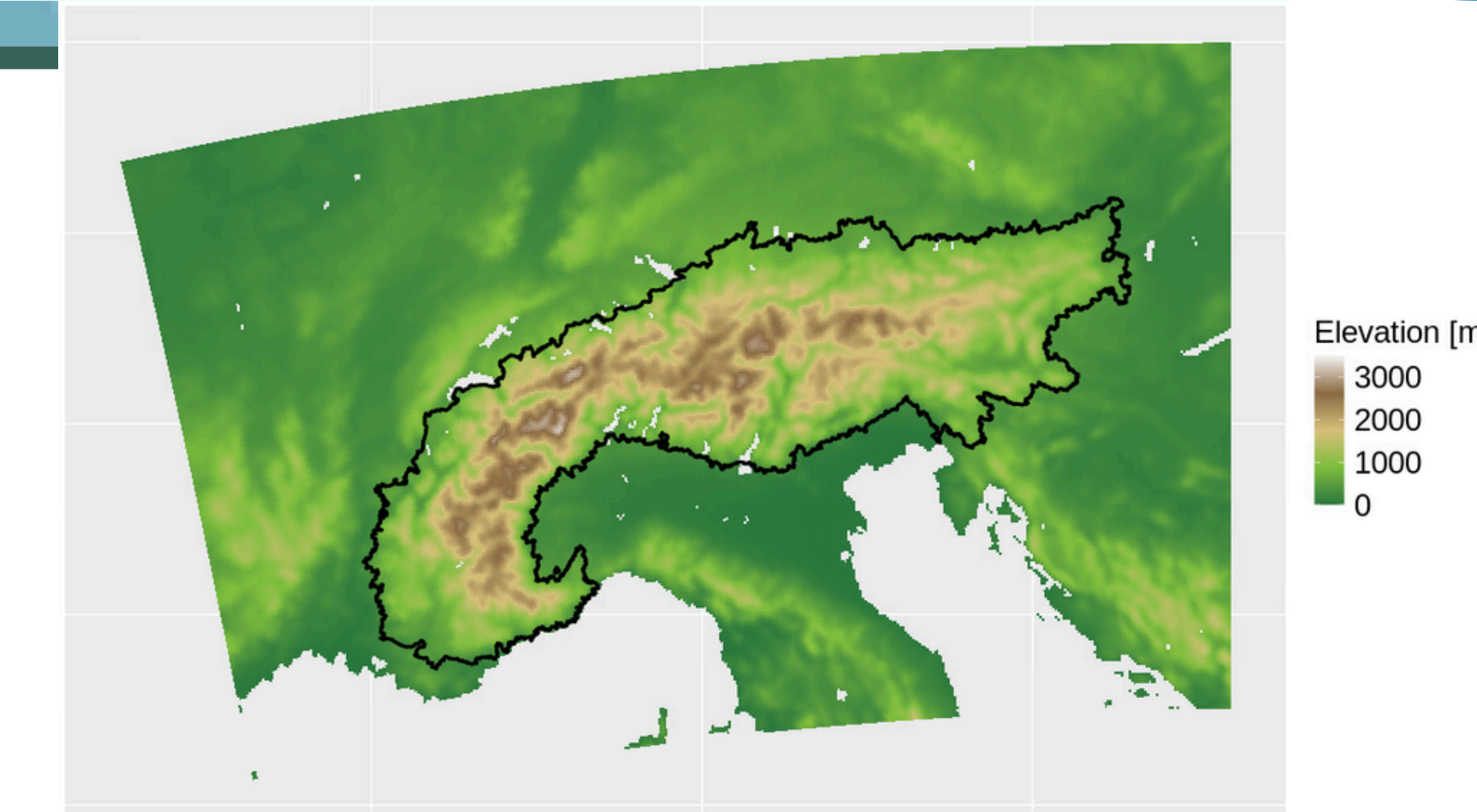
## Data



- 4 high-resolution simulations from the **CORDEX Flagship Pilot Study** [Ban et al. 2021; Pichelli et al. 2021]: **Precipitation, CAPE** variables
- **Gridded EUCLID cloud-to-ground lightning dataset** [Manzato et al. 2022]

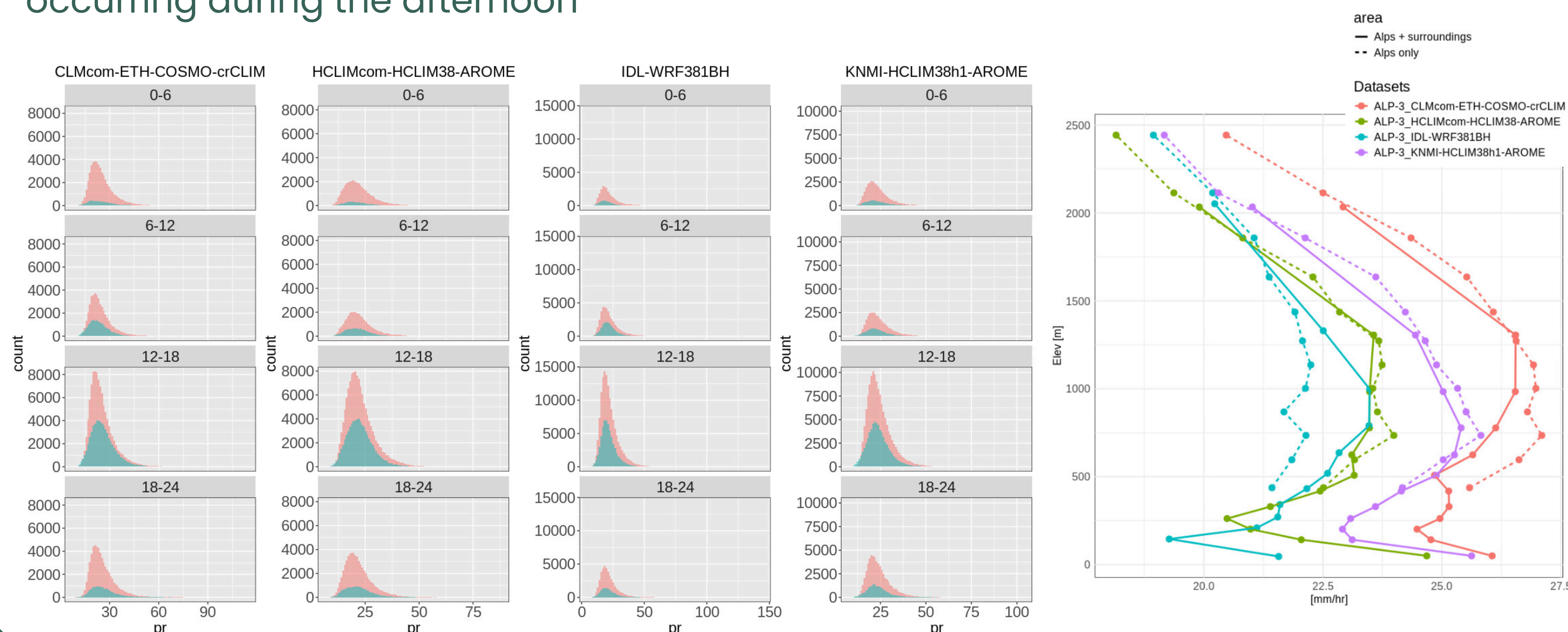
## Methods

- Extended summer season (**AMJJAS**)
- Time period: **2005–2009**
- **European Alps** (and Alpine convention area)
- **Model ensemble** approach
- **Extreme precipitation** events defined as the upper 0.02% of the distribution
- **CAPE and lightning** are used to classify and cluster events
- Spatial analysis with focus on **elevation-dependent** characteristics

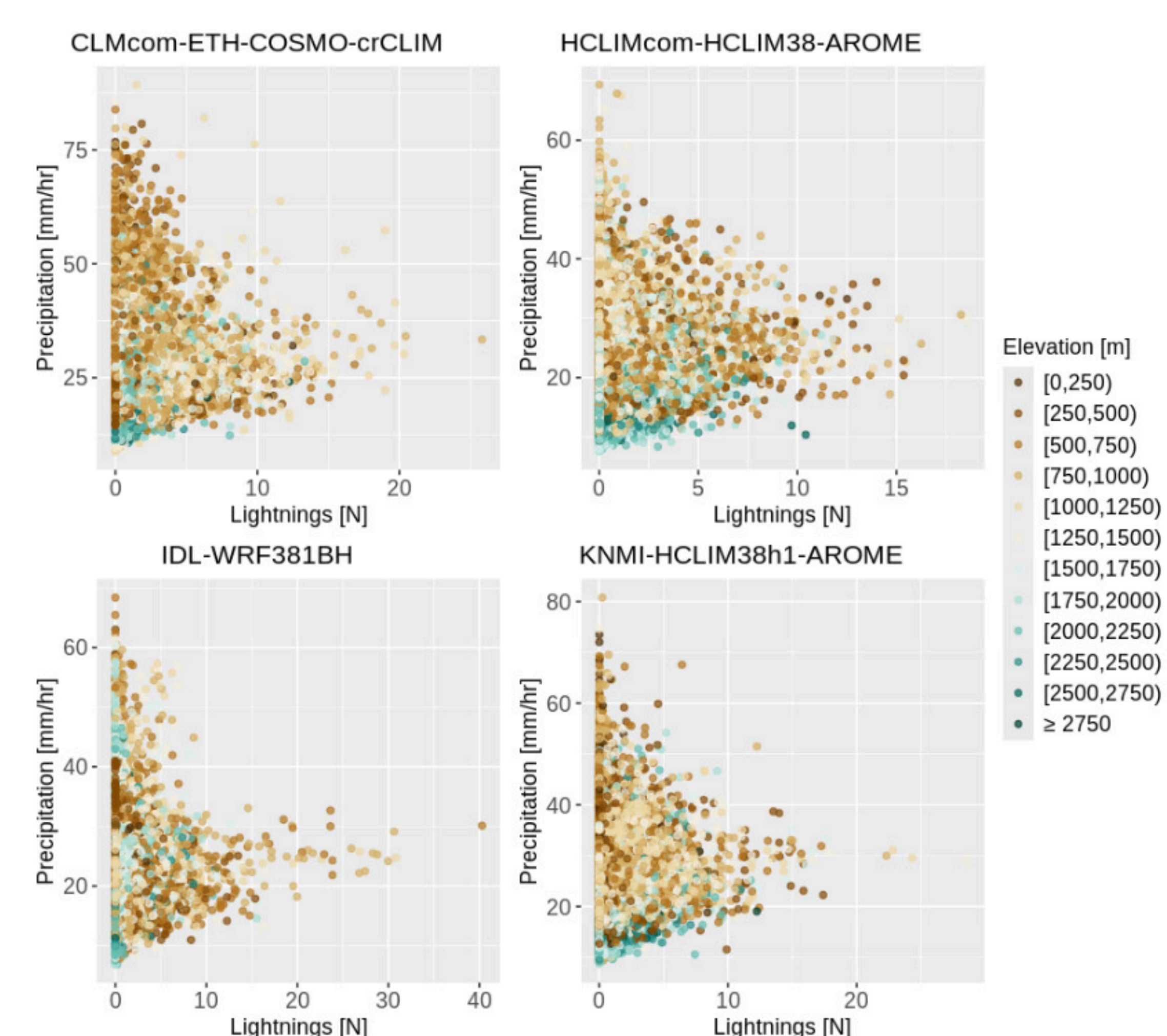


## First insights

Elevation and daily timing of the **most extreme hourly precipitation events** across the four simulations: clear reverse orographic pattern, with events predominantly occurring during the afternoon



**Daily lightning counts for each most extreme Alpine event (c): 40% of events are accompanied by lightnings**



**Probability density function of hourly CAPE** across different elevation bands: mean CAPE decreases with the elevation → work in progress question: *how are precipitation extremes characterized by CAPE?*

