

# Cross Scale Quantification and Characterization of Precipitation Extremes for the Indian Peninsular Region

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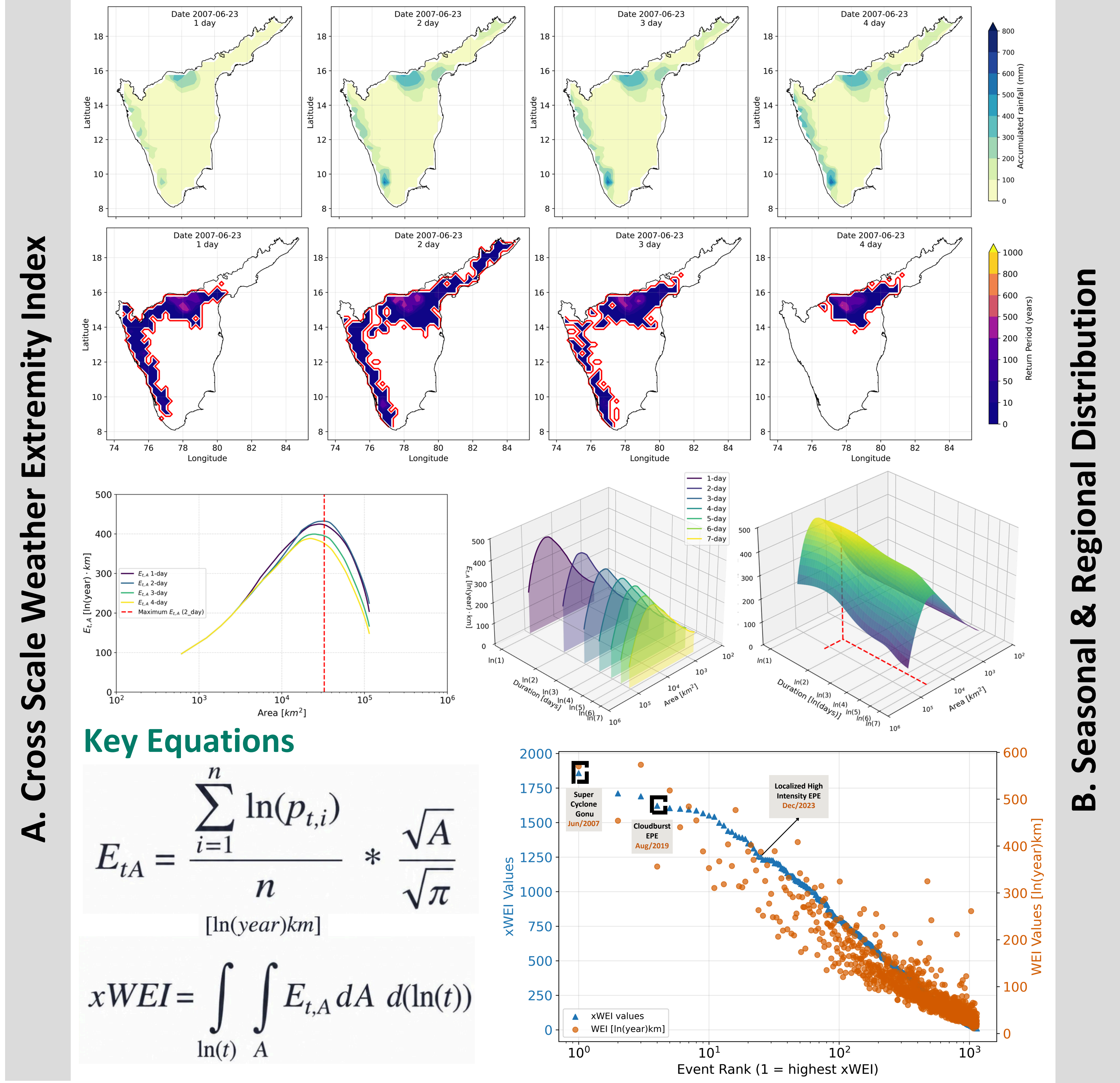
## 1 Research Motivation

- **Extreme Precipitation Events (EPEs)** have substantial socioeconomic impacts and challenging to identify for diverse climatic conditions.
- **Rainfall-induced impacts exhibit a compound nature**, as the underlying processes are scale-dependent and can overlap and intensify one another.
- **Under exploration of Peak over Threshold (POT)** to identify precipitation extremes and cross-scale extremity.

## 2 Research Objectives

1. Ranked Catalogue of EPEs using **cross-scale weather extremity index** and peak over threshold approach.
2. **Extremity across seasons, meteorological divisions** for characterization of the EPEs.

## 3 Unveiling Patterns: Spatiotemporal Insights into Precipitation Extremes and Cross-Scale Weather Extremity Index



## 4 Key Findings

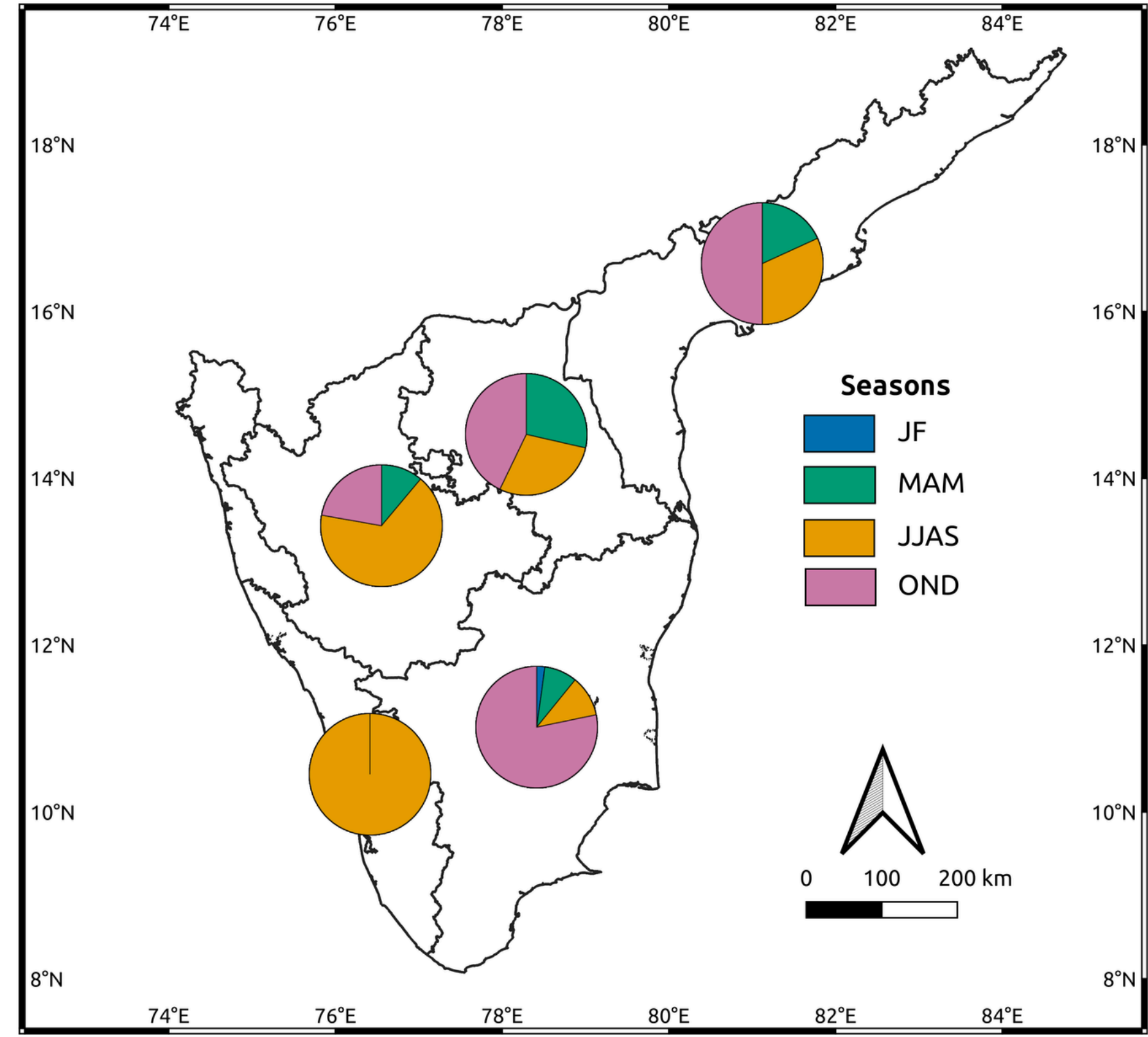
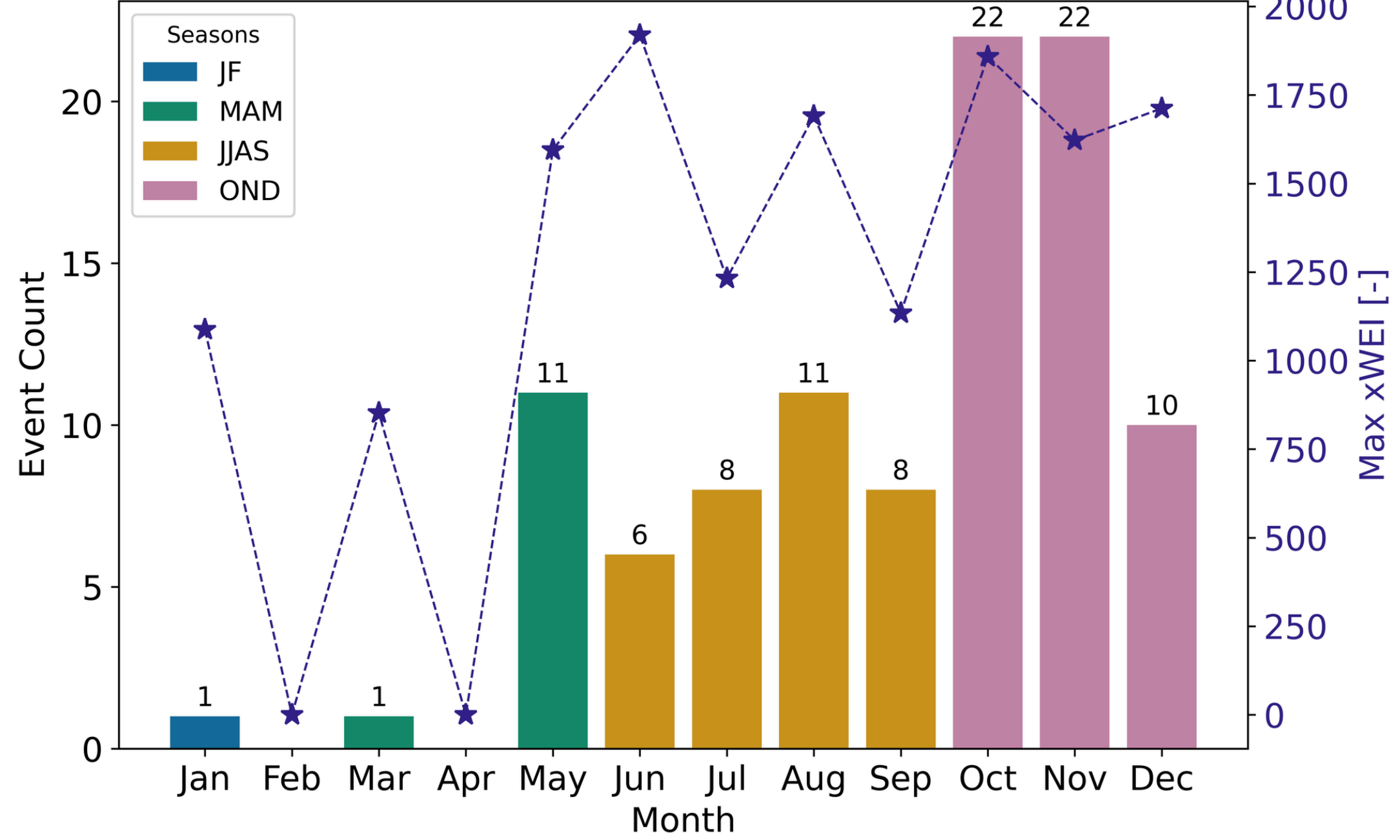
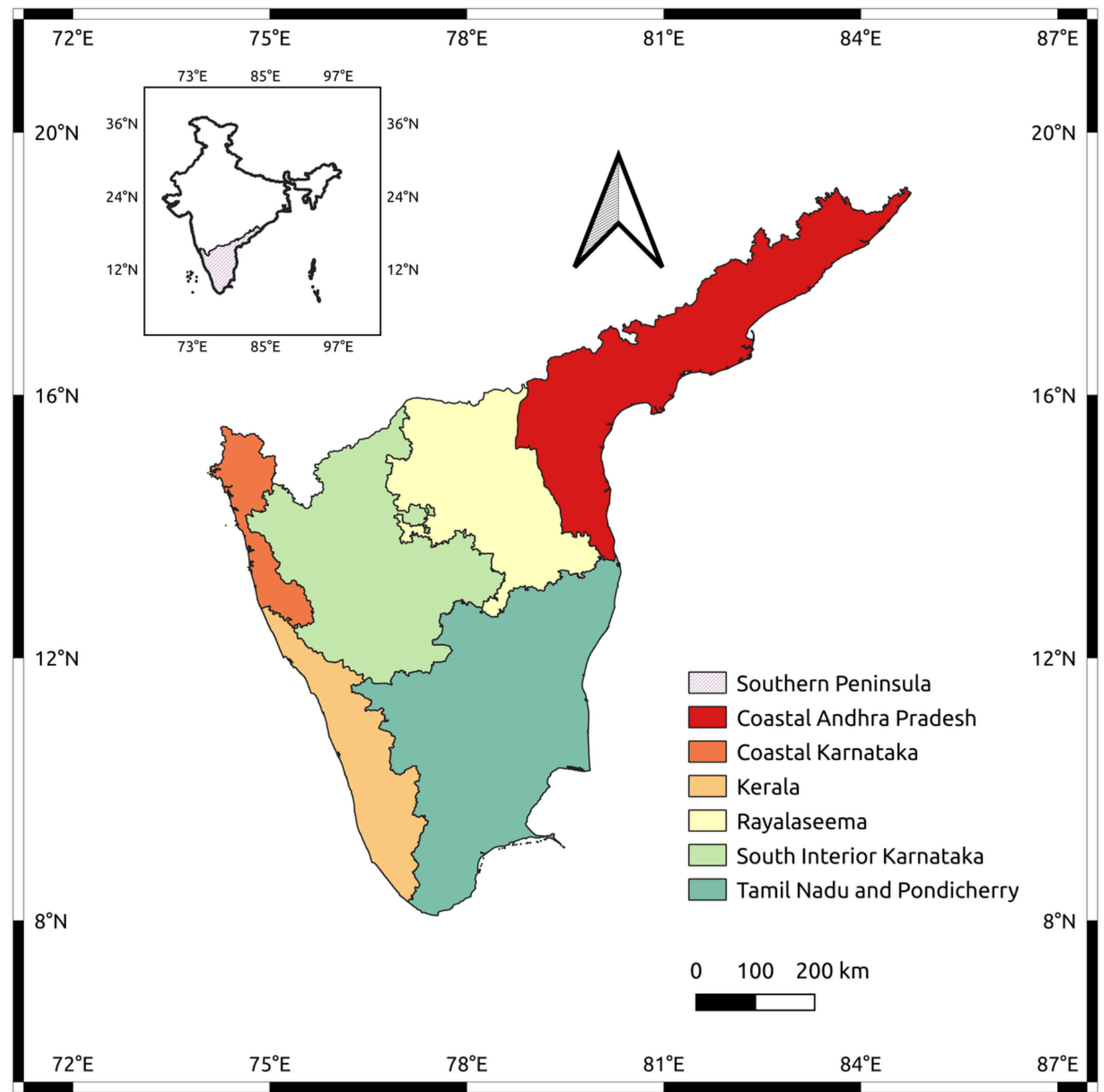
- Around **1141 spatiotemporally independent EPEs** were catalogued between 1951 and 2023.
- xWEI provides a **physically meaningful characterization** by quantifying the extremeness across different scales.
- OND contributes around 54%, and JJAS around 36%, indicating the **dominance of OND extremes** in the SP region of India.

## References

1. Sree Anusha G., Paul V., Maheswaran R., Norbert M., Quantification, Ranking and Hierarchical Classification of Multi-Day Precipitation Extremes Using Cross Scale Weather Extremity Index, J. of Hydro. (Under review)  
2. Voit, P., & Heistermann, M. (2022). A new index to quantify the extremeness of precipitation across scales. Natural Hazards and Earth System Sciences, 22(8), 2791–2805. <https://doi.org/10.5194/nhess-22-2791-2022>  
3. Müller, M. and Kaspar, M.: Event-adjusted evaluation of weather and climate extremes, Nat. Hazards Earth Syst. Sci., 14, 473–483, <https://doi.org/10.5194/nhess-14-473-2014>.  
4. Sree Anusha G., Maheswaran R., Quantitative Assessment of Automated Threshold Selection Methods for Generalized Pareto Distribution for Modelling Precipitation Extremes in the Indian Subcontinent. Journal of Hydrology <https://doi.org/10.1016/j.jhydrol.2025.134166>.

## 5 Conclusion at a Glance

- Comprehensive catalogues **capture diverse EPEs, including short-lived, intense events** causing flash floods and **long-lived, moderate events** from monsoon depressions.
- **Subcategorization by areal extent, duration, and extremity** can further refine the EPE typology for a systematic classification of EPEs.
- Catalog aids in impact-relevant risk assessments and provides a basis for diagnostic studies.



| Event ID. | Start Date | End Date   | Peak Date  | Duration (days) | Duration Key | Spatial Extent | xWEI Values |
|-----------|------------|------------|------------|-----------------|--------------|----------------|-------------|
| 1         | 2007-06-22 | 2007-06-25 | 2007-06-23 | 4               | 2_day        | 273            | 1919.3      |
| 2         | 1991-10-29 | 1991-11-04 | 1991-10-31 | 7               | 5_day        | 324            | 1858.55     |
| 3         | 1972-12-06 | 1972-12-12 | 1972-12-09 | 7               | 4_day        | 250            | 1712.10     |
| 4         | 2019-08-06 | 2019-08-12 | 2019-08-10 | 7               | 6_day        | 154            | 1690.71     |
| 5         | 1992-11-15 | 1992-11-21 | 1992-11-18 | 7               | 6_day        | 375            | 1621.99     |