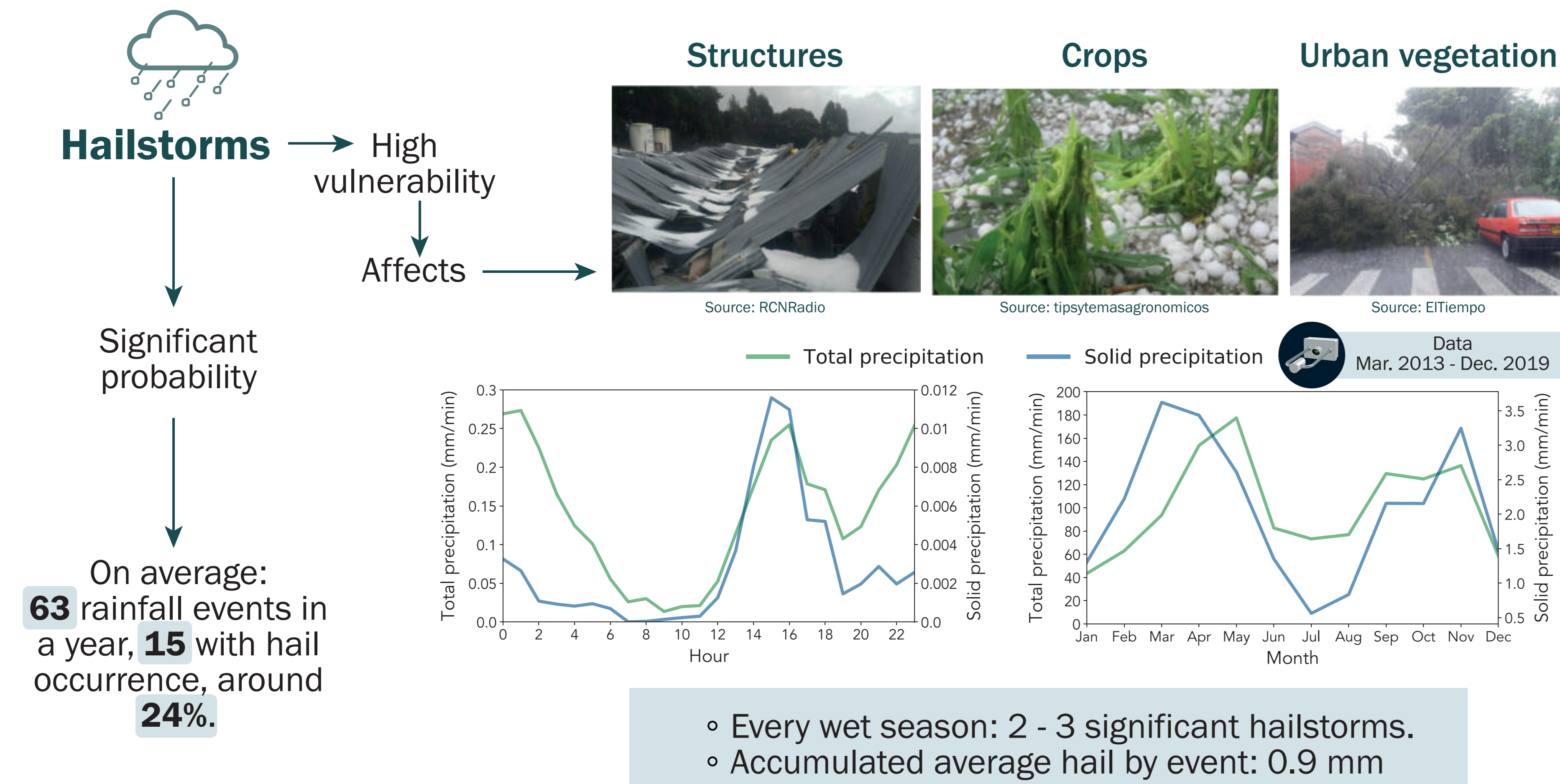


# Characterization and probabilistic discrimination between hailstorm and rainfall events over complex terrain in a tropical environment using remote sensors and in situ data

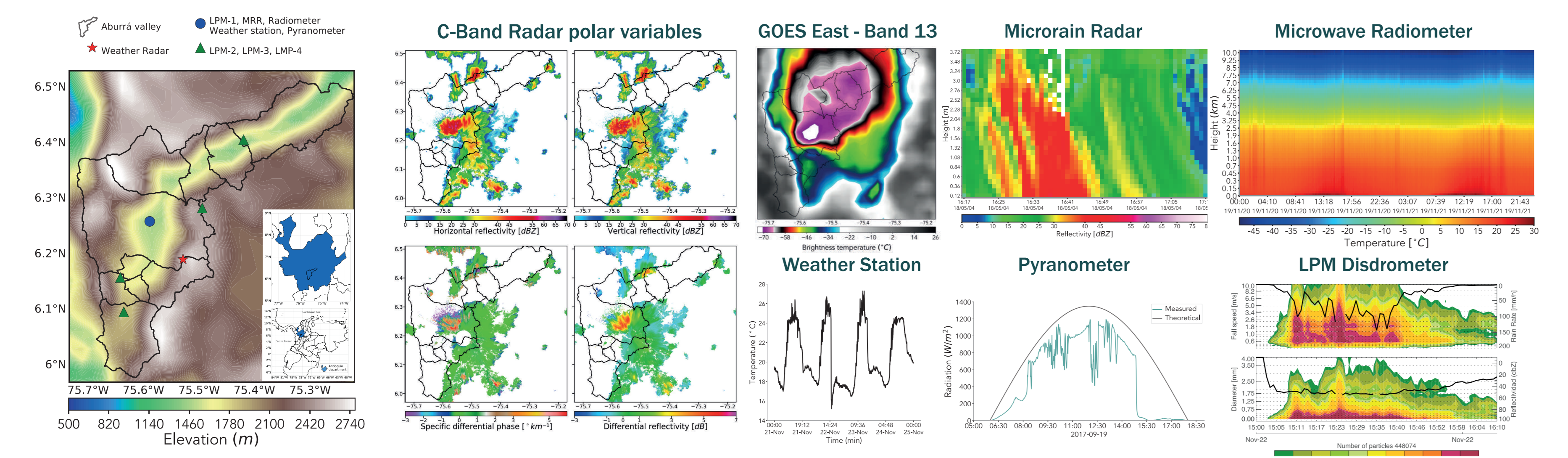
Juan Manuel Valencia<sup>1,2</sup>, Carlos D. Hoyos<sup>1,2</sup>

1. Sistema de Alerta Temprana de Medellín y el Valle de Aburrá - SIATA  
 2. Universidad Nacional de Colombia, Facultad de Minas, Departamento de Geociencias y Medio Ambiente

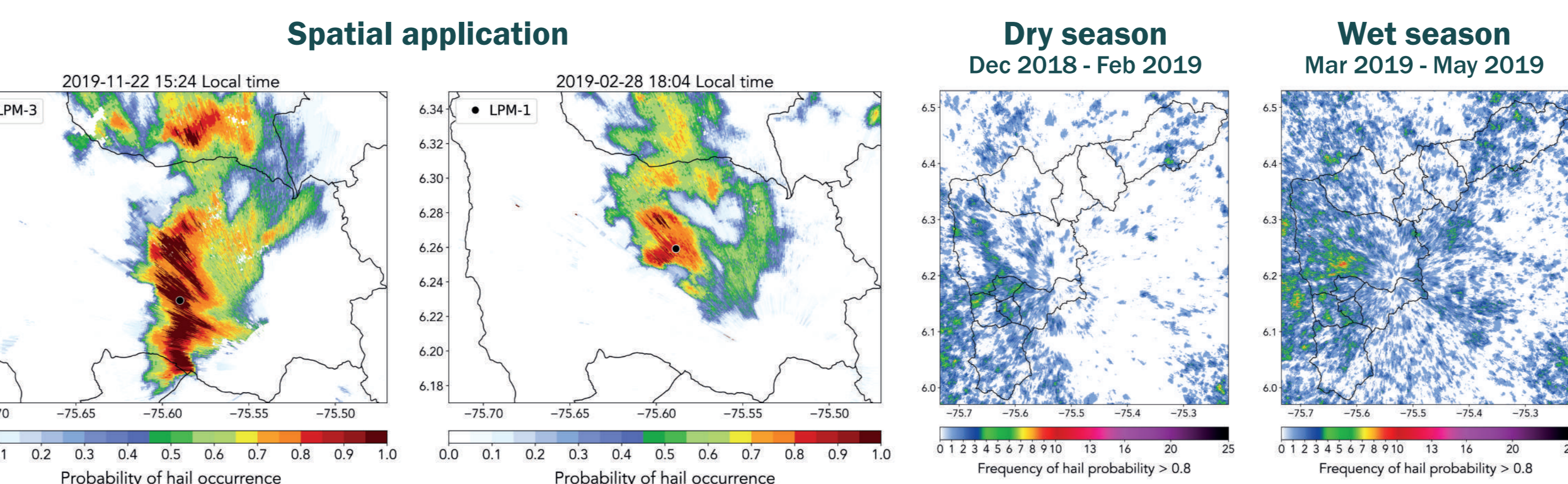
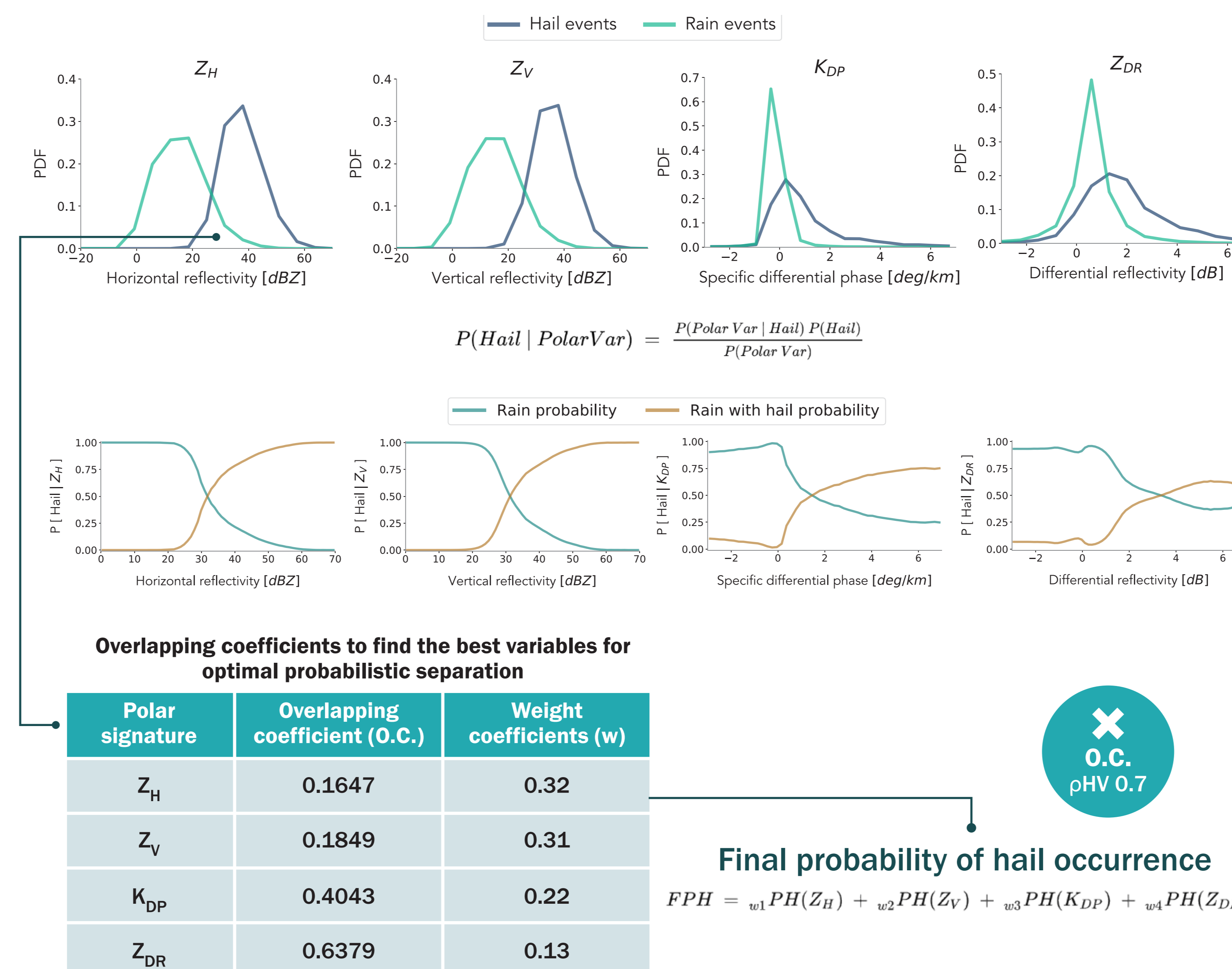
## Introduction



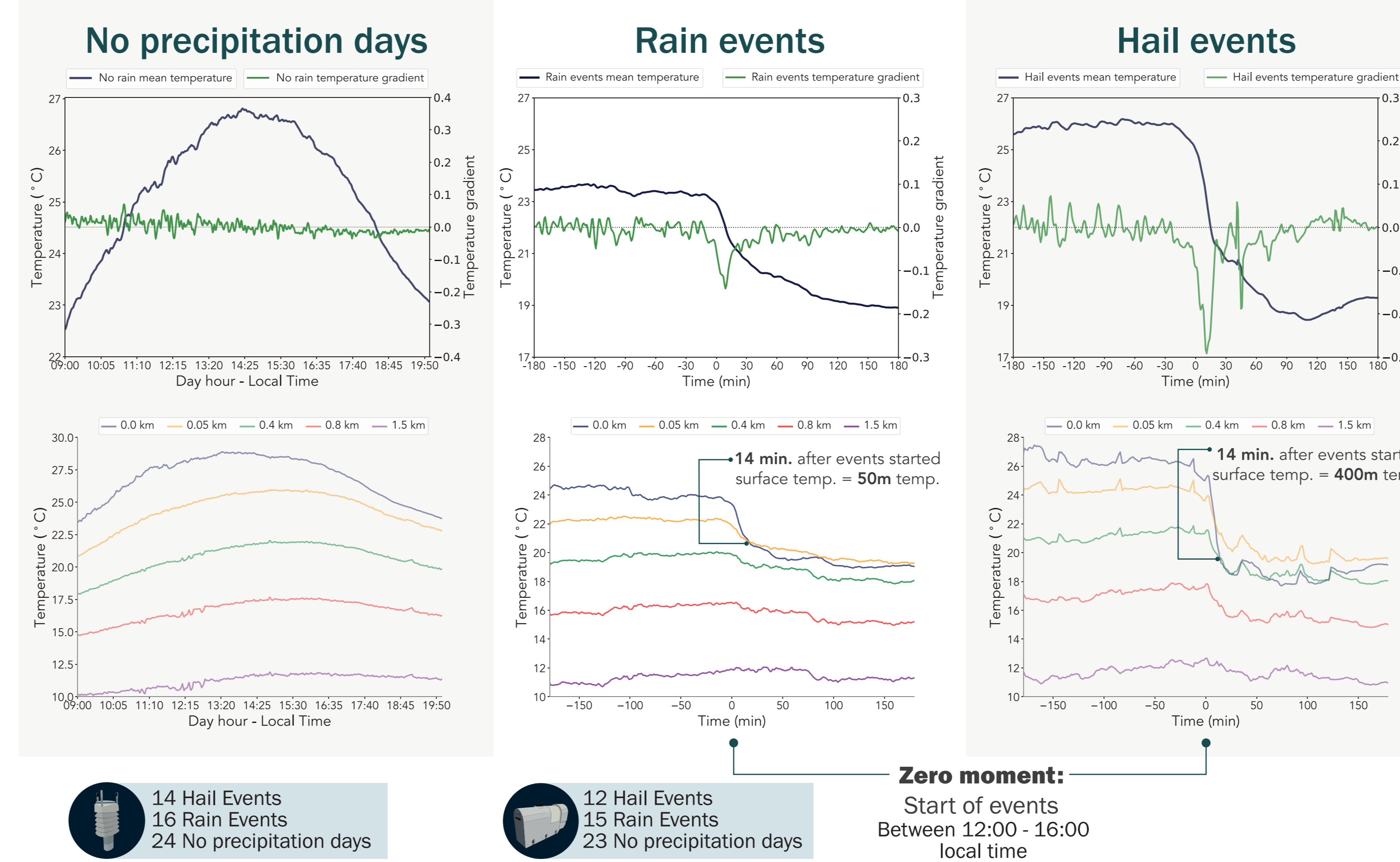
## Data and methodology



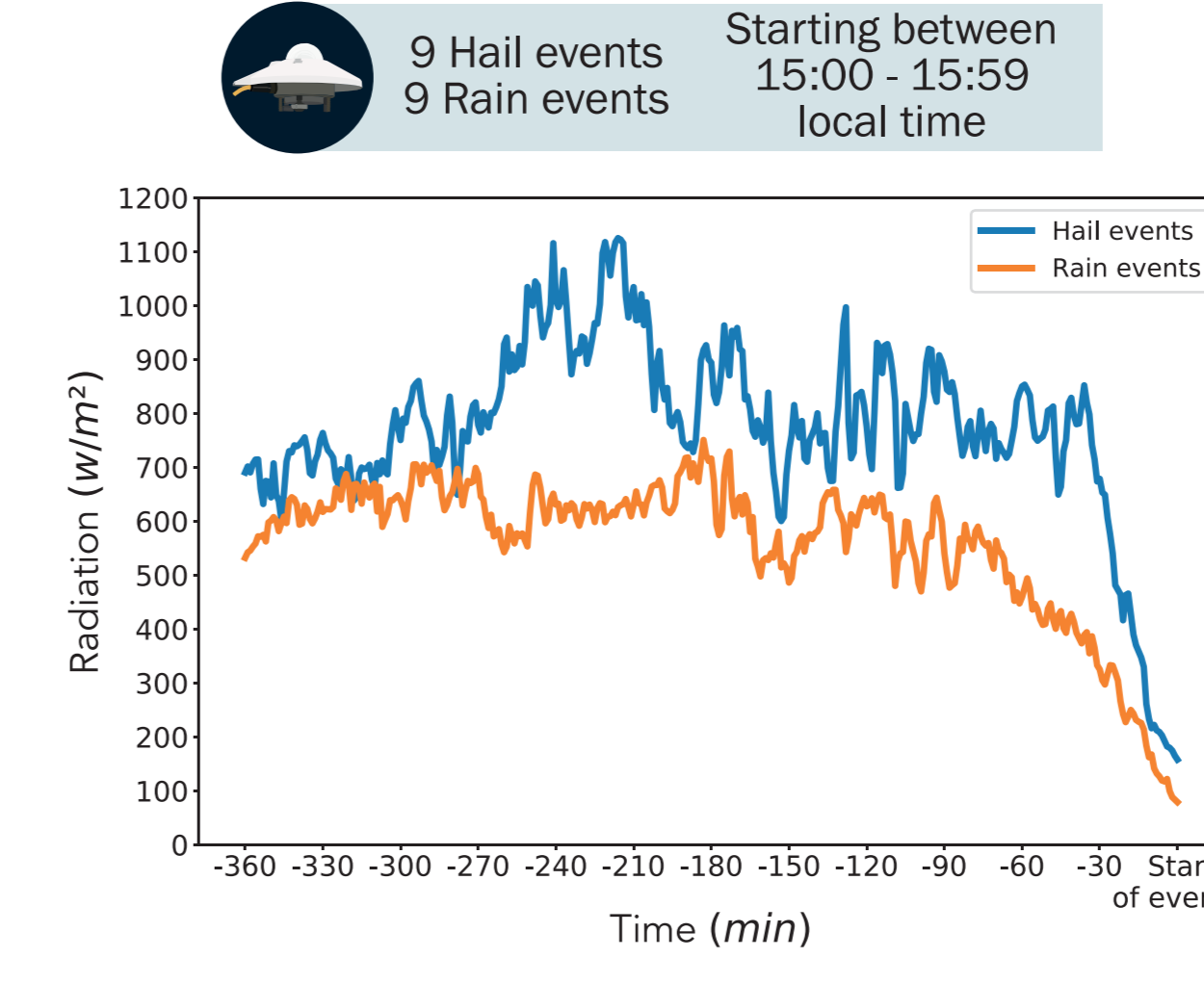
## Probabilistic discrimination and Hail Detection



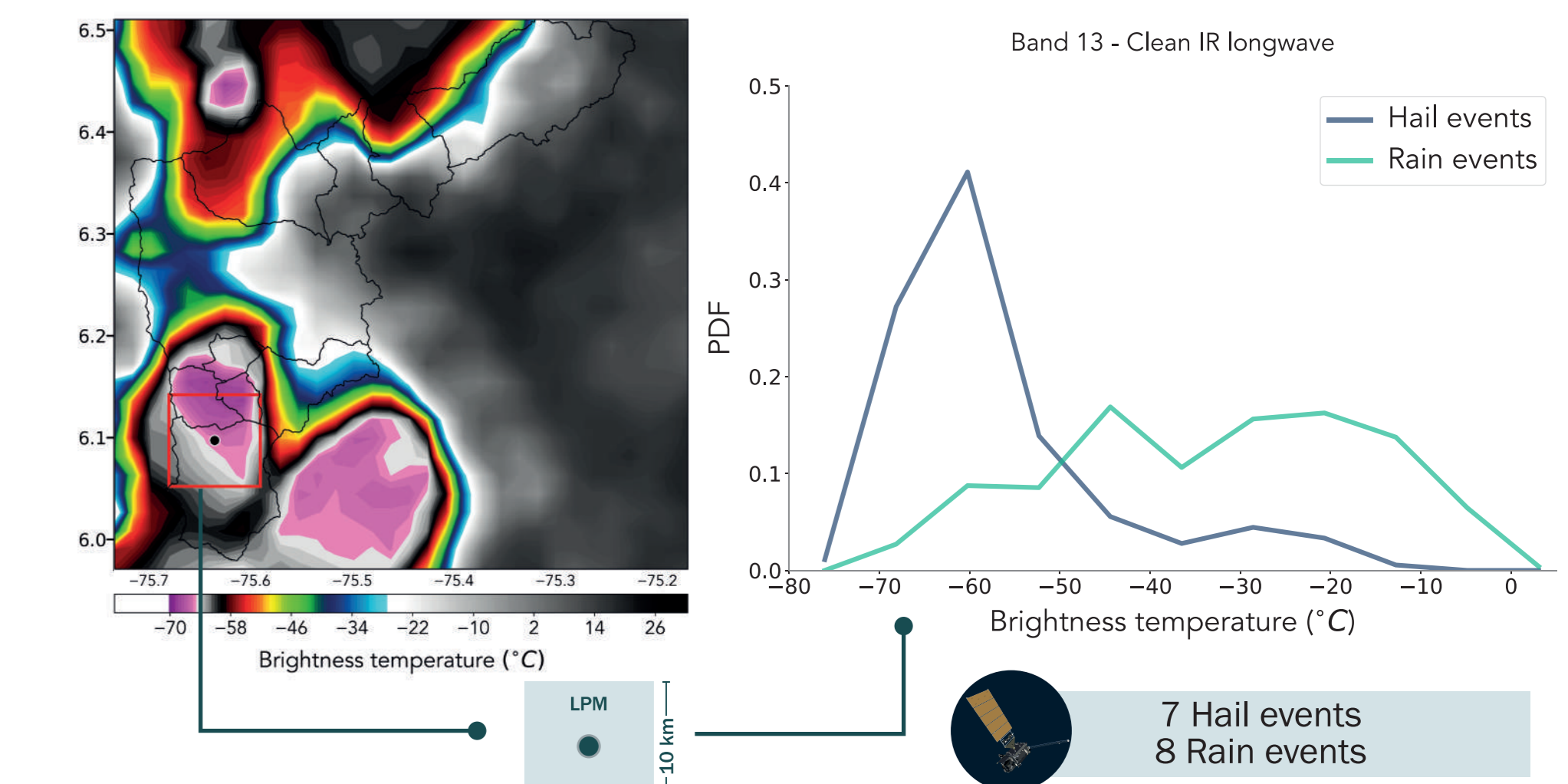
## Cold Pool Generation and Antecedent Radiation



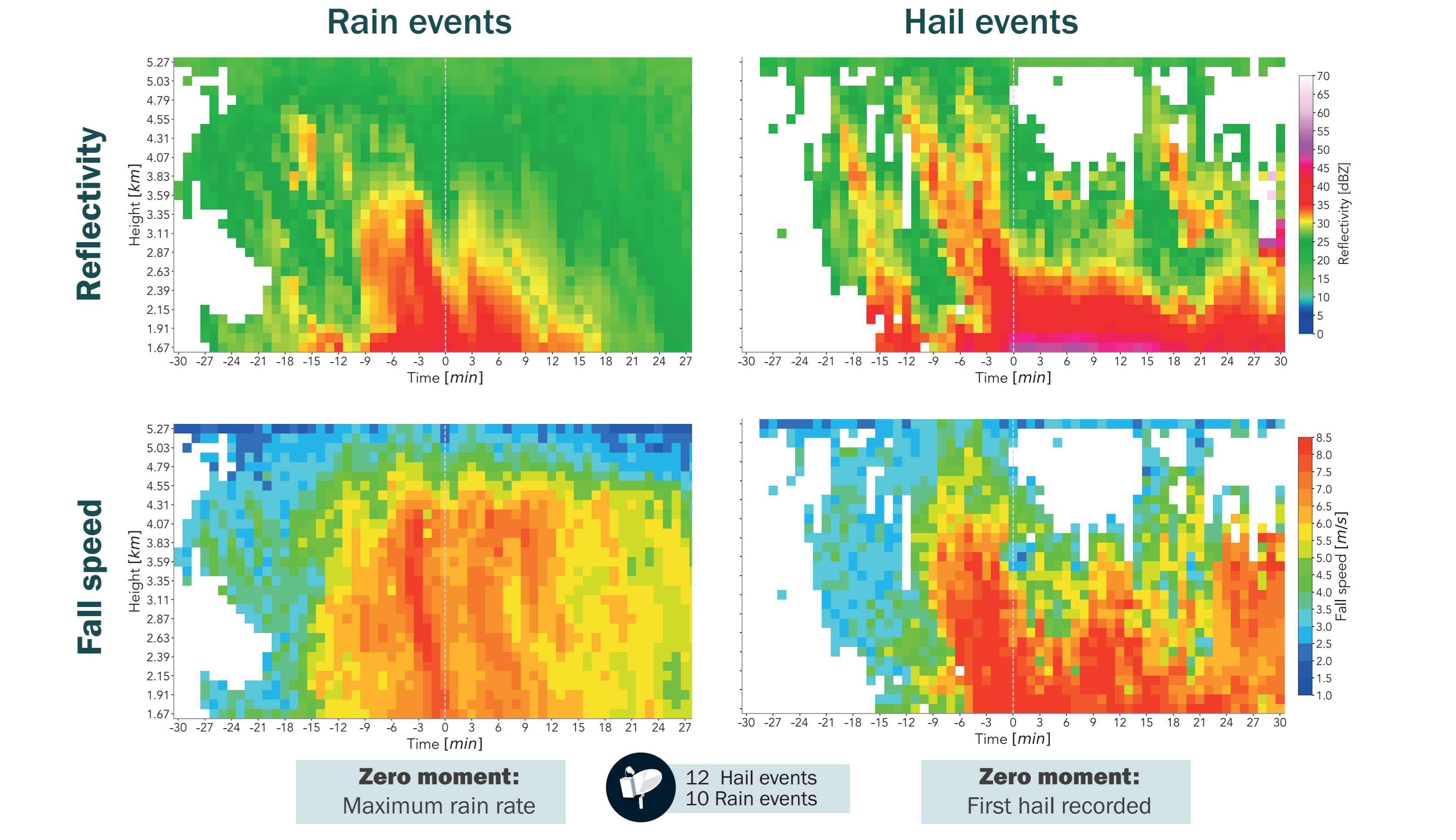
## Radiation



## GOES-based discrimination



## Vertical Structure



## Conclusions

- Probability of hail occurrence becomes greater than only rain probability when  $Z_H > 31.1$  dBZ,  $Z_V > 31.8$  dBZ,  $K_{DP} > 1.49^\circ/\text{km}$ ,  $Z_{DR} > 3.37$  dB
- The probabilistic method based on the Bayes' theorem allows to create Individual hail probability maps and hail "climatology" maps.
- When hail and graupel are precipitating, a much stronger cold pool is produced than when only liquid rainfall occurs, the lower atmosphere stabilizes more rapidly, and the surface reaches the same temperature as 400 meters above after a few minutes.
- Antecedent incoming radiation to hail and rain events suggests that hail events occur in more clear-sky days implying a faster intensification of convection.
- A probabilistic discrimination approach using brightness temperature from GOES ABI infrared data shows that hailstorms present lower values than those events with only raindrops.

## Acknowledgements

This work was supported by Area Metropolitana de Medellín y del Valle de Aburrá, Municipio de Medellín, Grupo EPM, and ISAGEN under the contract CCT504 of 2019. This work is also supported by Universidad Nacional de Colombia, Sede Medellín, Facultad de Minas.

