

Observation and modelling of rain isotopes in Western ghats : Clues to subcloud processes and climate reconstruction

Anbarasu Subramaniyan¹, Jitendra Bhilala¹ and Saikat Sengupta¹

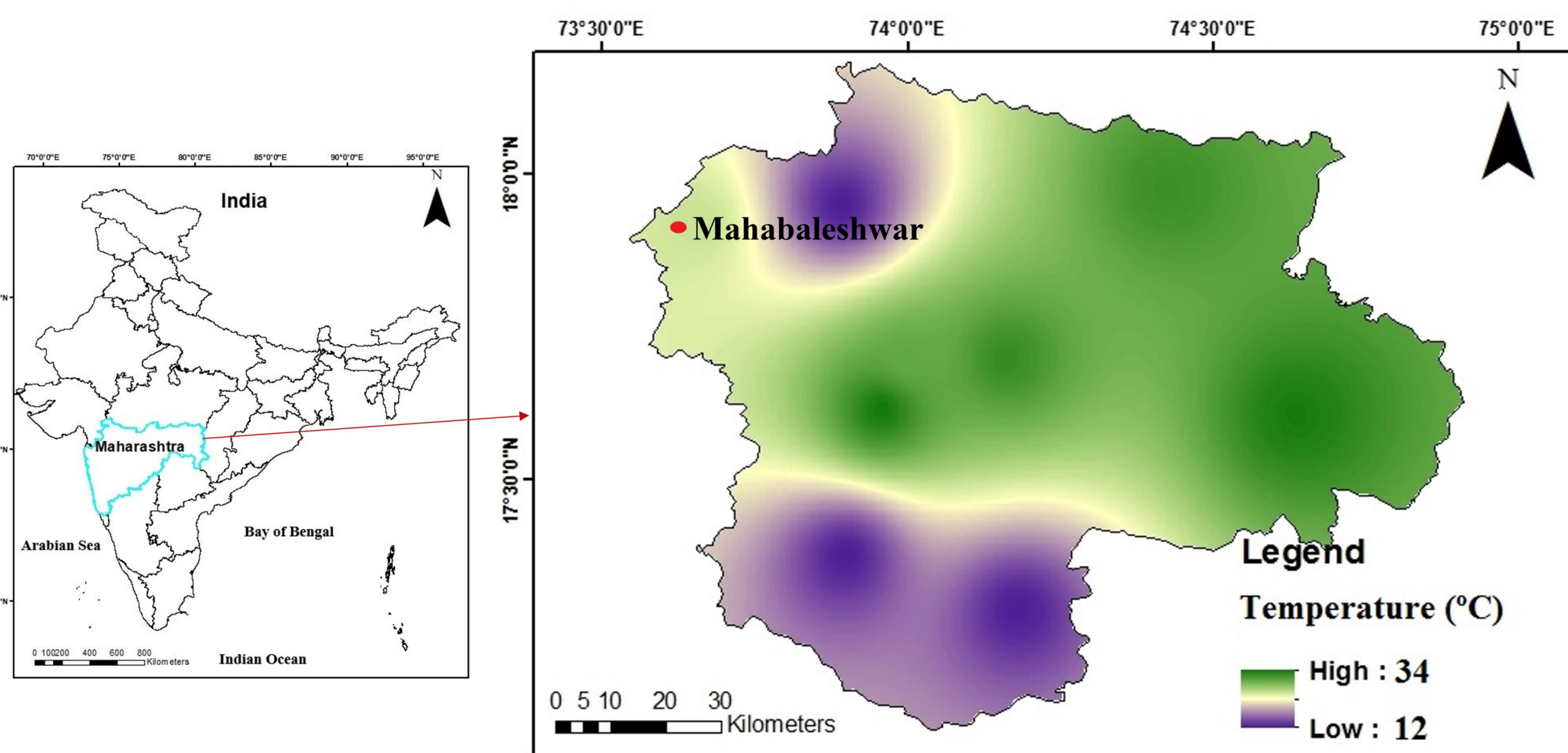
¹Centre for Climate Change and Research, Indian Institute of Tropical Meteorology, Pune,

India, anbarasu@tropmet.res.in



INTRODUCTION

- Rainwater isotopes serve as valuable tracers of various physical processes operating within the hydrological cycle.
- Their relationships with key climate parameters such as rainfall, humidity, and temperature provide essential insights for reconstructing past climates from natural archives.
- Mahabaleshwar, located in the Western Ghats of India, is a crucial region for climate and hydrological studies due to its significant monsoonal precipitation and unique orographic influence.



METHODOLOGY

Precipitation sample collection for stable isotope

Liquid Water Isotope Analyzer (LWIA)

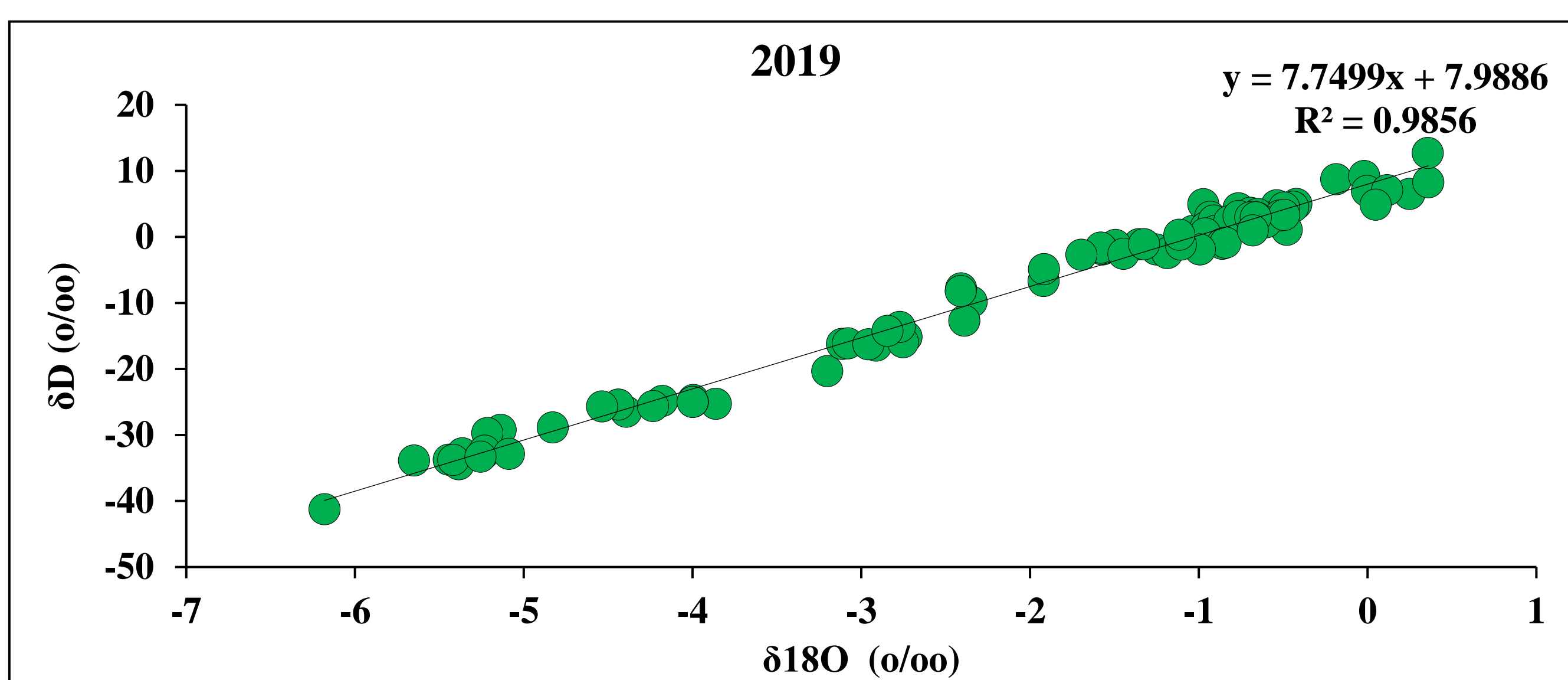


$$\delta = \frac{R_{measured} - R_{VSMOW}}{R_{VSMOW}}$$

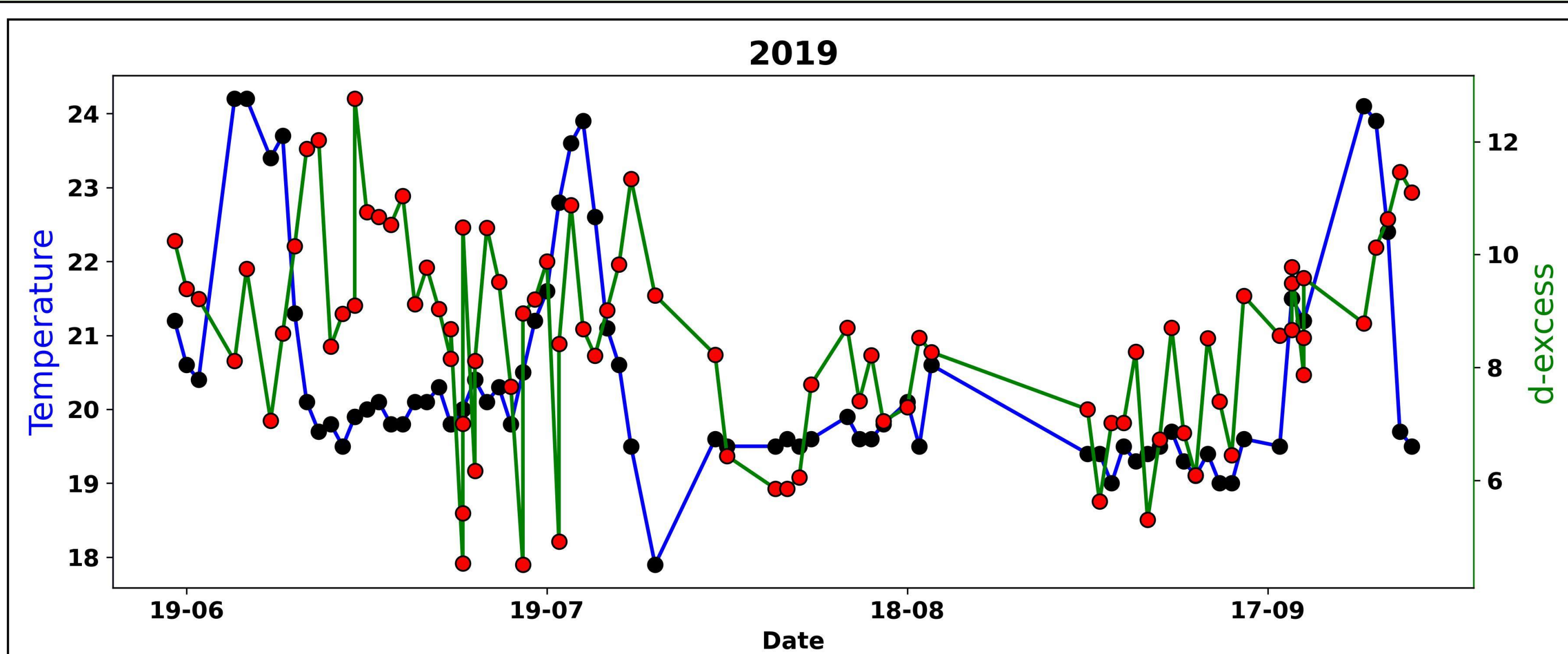
Where R = ²H/¹H or ¹⁸O/¹⁶O (‰)

RESULTS AND DISCUSSION

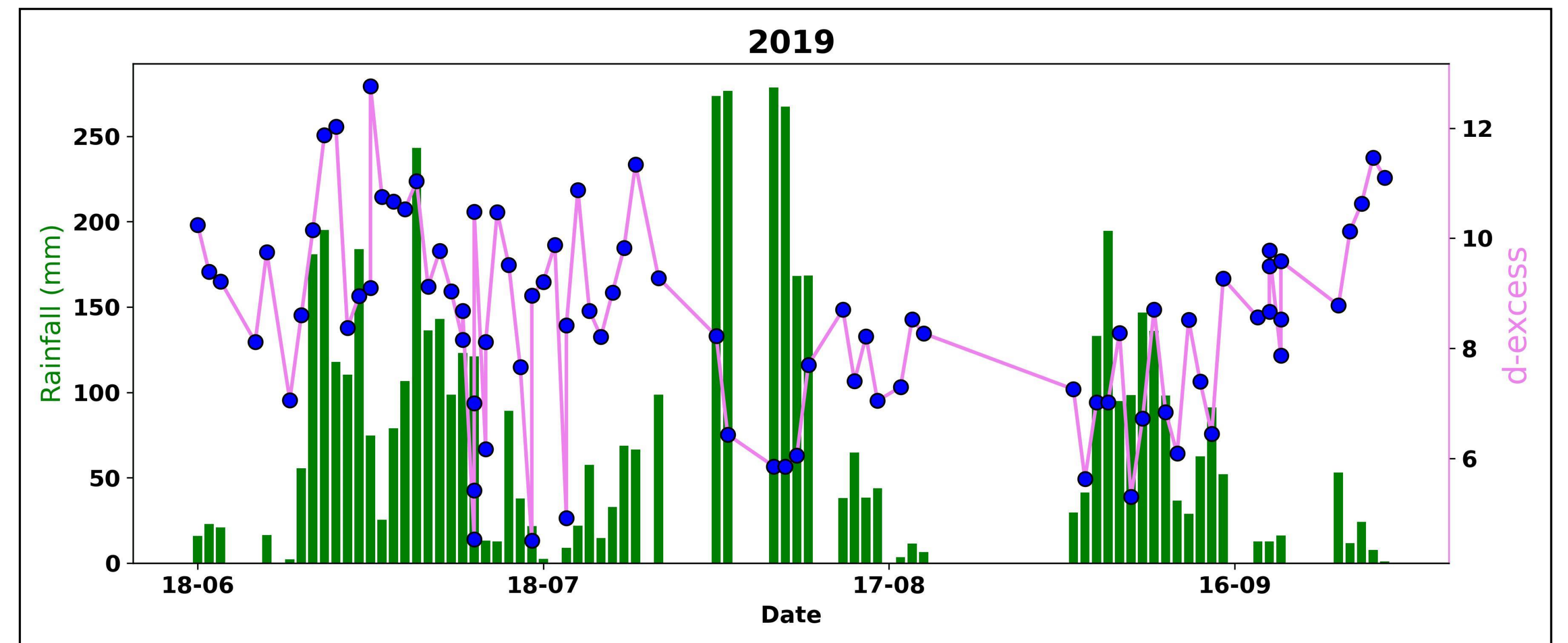
Linear relationship of rain isotope $\delta^{18}O$ and δD 2019 in Mahabaleshwar



Relationship of d-excess in precipitation and temperature in Mahabaleshwar

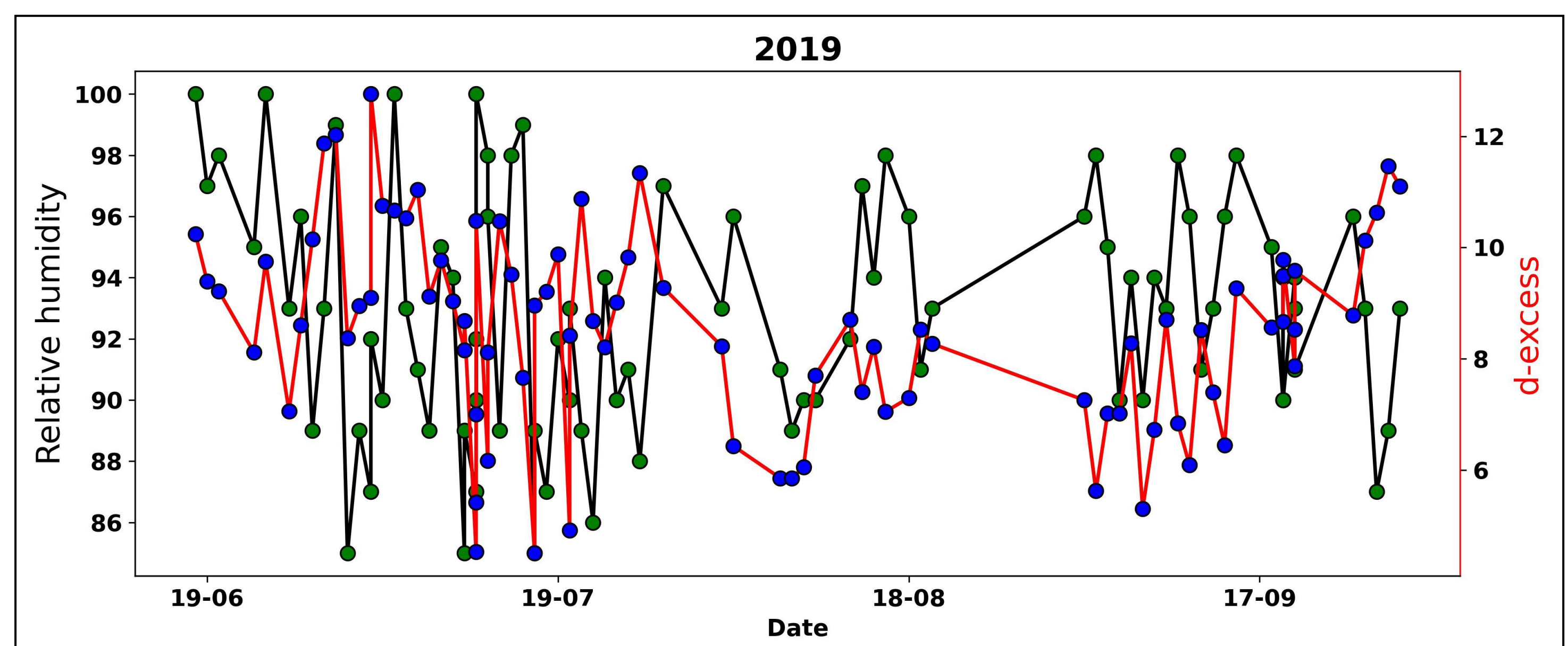


Relationship of d-excess in precipitation and rainfall 2019 in Mahabaleshwar



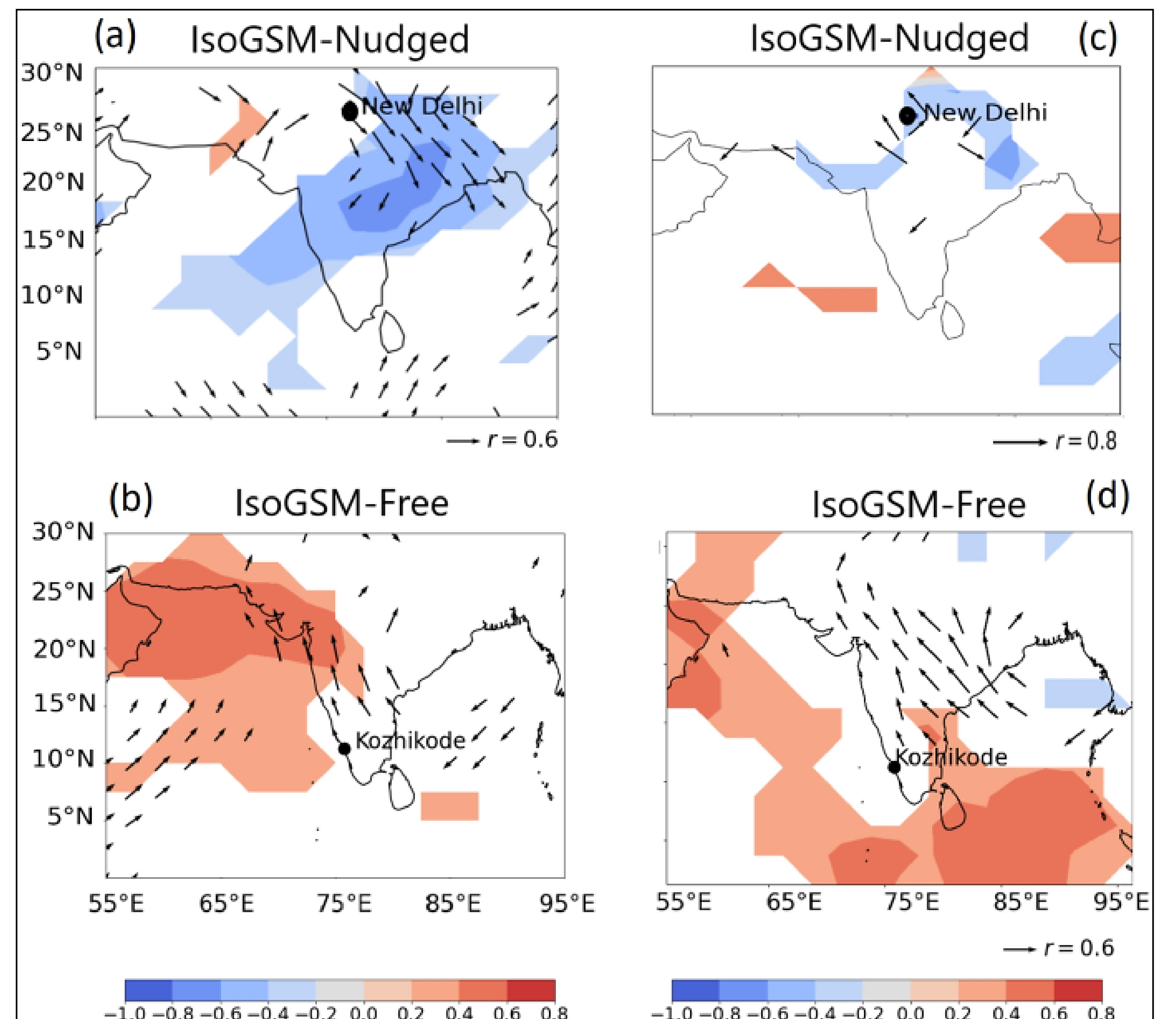
The increase in d-excess value is due to the dominance of moisture sources from distant, arid regions and kinetic fractionation processes.

Relationship of d-excess in precipitation and relative humidity 2019



Higher relative humidity conditions indicate minimal evaporation, lead to relatively stable d-excess.

Spatial correlation between the humidity bias (shaded) and VIMT bias with rain $\delta^{18}O$ bias



CONCLUSION

- This study shows that the importance of long-term isotope datasets in understanding climate dynamics.
- By exploring isotope-climate (temperature, rainfall, and relative humidity) relationships and identifying model biases, this research offers valuable guidance for refining climate models and enhancing our understanding of past and present climate variability.

ACKNOWLEDGMENT

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