

# Validation of IASI Level-2 Temperature and Humidity Profiles Using Radiosonde Observations over India

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## Introduction

Accurate atmospheric temperature and humidity profiles are important for numerical weather prediction and climate studies. Satellite sounders, such as the Infrared Atmospheric Sounding Interferometer (IASI), provide global observations with high spatial coverage, while radiosondes provide reliable in situ measurements for validation.

In this study, IASI Level-2 temperature and humidity retrievals are compared with radiosonde observations over India. Radiosonde launches are mainly conducted at 00 UTC and 12 UTC over India, consistent with the standard global upper-air observation network coordinated by the World Meteorological Organization.

The comparison is performed to evaluate the agreement between satellite retrievals and radiosonde measurements using statistical parameters such as bias, RMSE, and correlation. This assessment helps understand the quality of IASI retrievals over the Indian region and their potential applications in weather forecasting and data assimilation.

## Methodology

- IASI Level-2 temperature and humidity profiles are compared with radiosonde observations over India.
- Two different months, March 2025 and July 2025, are selected to represent different seasonal conditions.
- Radiosonde observations available mainly at 00 UTC and 12 UTC are collocated with corresponding IASI observations using spatial and temporal matching criteria.
- The comparison is carried out at different atmospheric pressure levels for temperature and humidity profiles.
- Statistical parameters such as Bias and Root Mean Square Error (RMSE) are used to evaluate the performance of IASI retrievals against radiosonde observations.

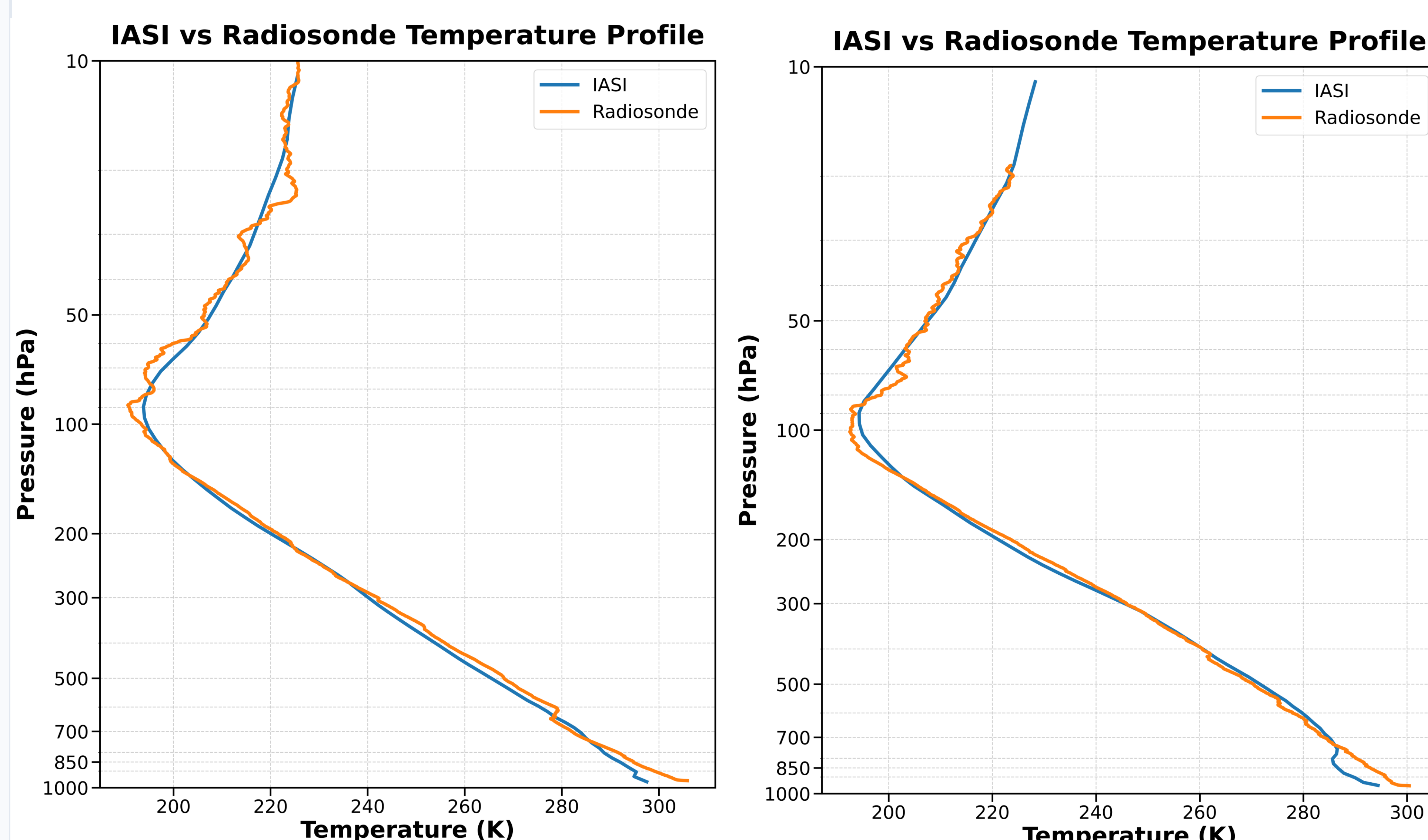
$$RMSE = \sqrt{\frac{\sum_{i=1}^n (X_i - Y_i)^2}{n}}$$

$$Bias = \frac{1}{n} \sum_{i=1}^n (Y_i - X_i)$$

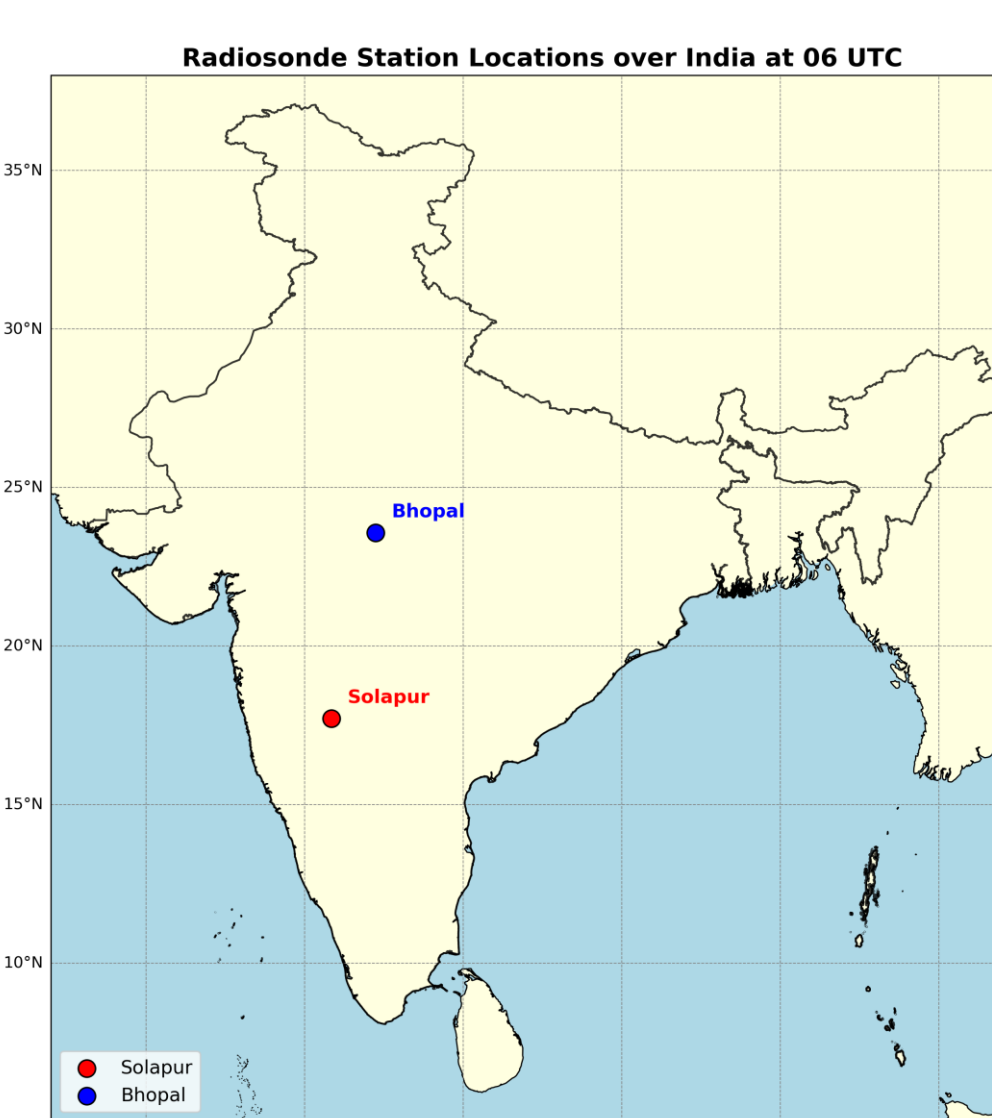
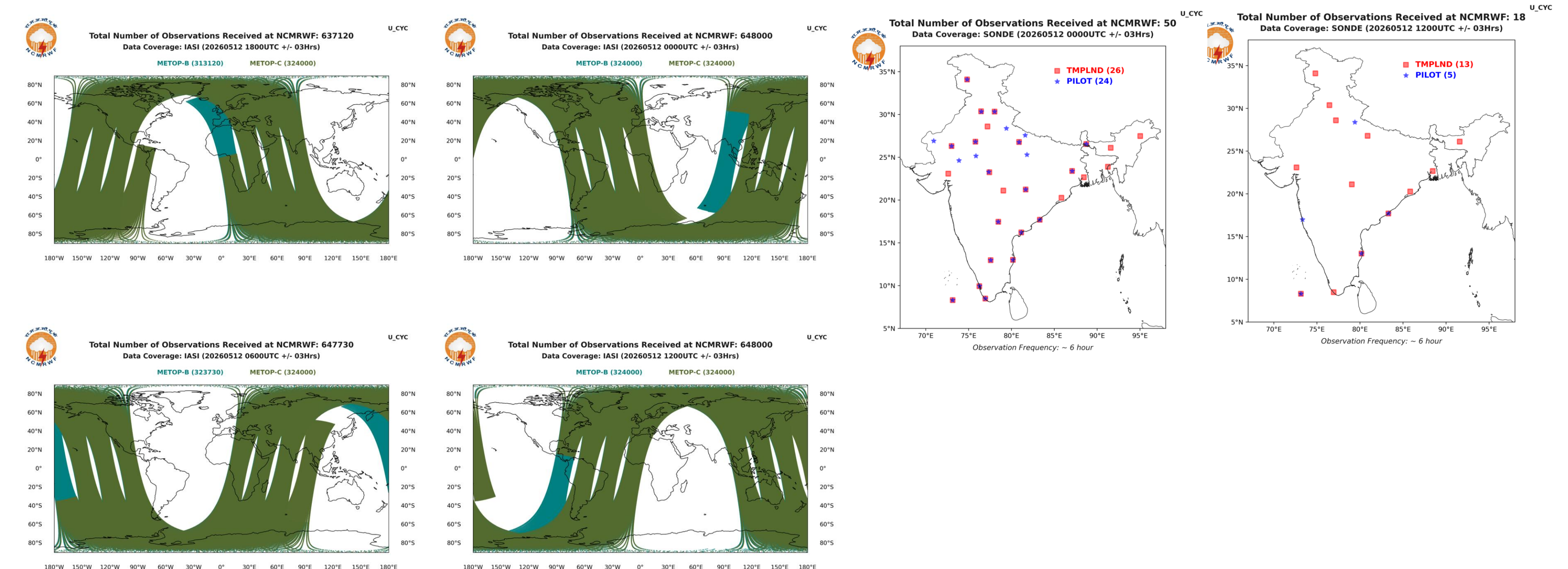
$X_i$  = IASI Level-2 retrievals  
 $Y_i$  = Radiosonde observations  
 N = Number of collocated observations

## Results

Temperature Profiles from IASI and Radiosonde Over Solapur and Bhopal



## Discussion

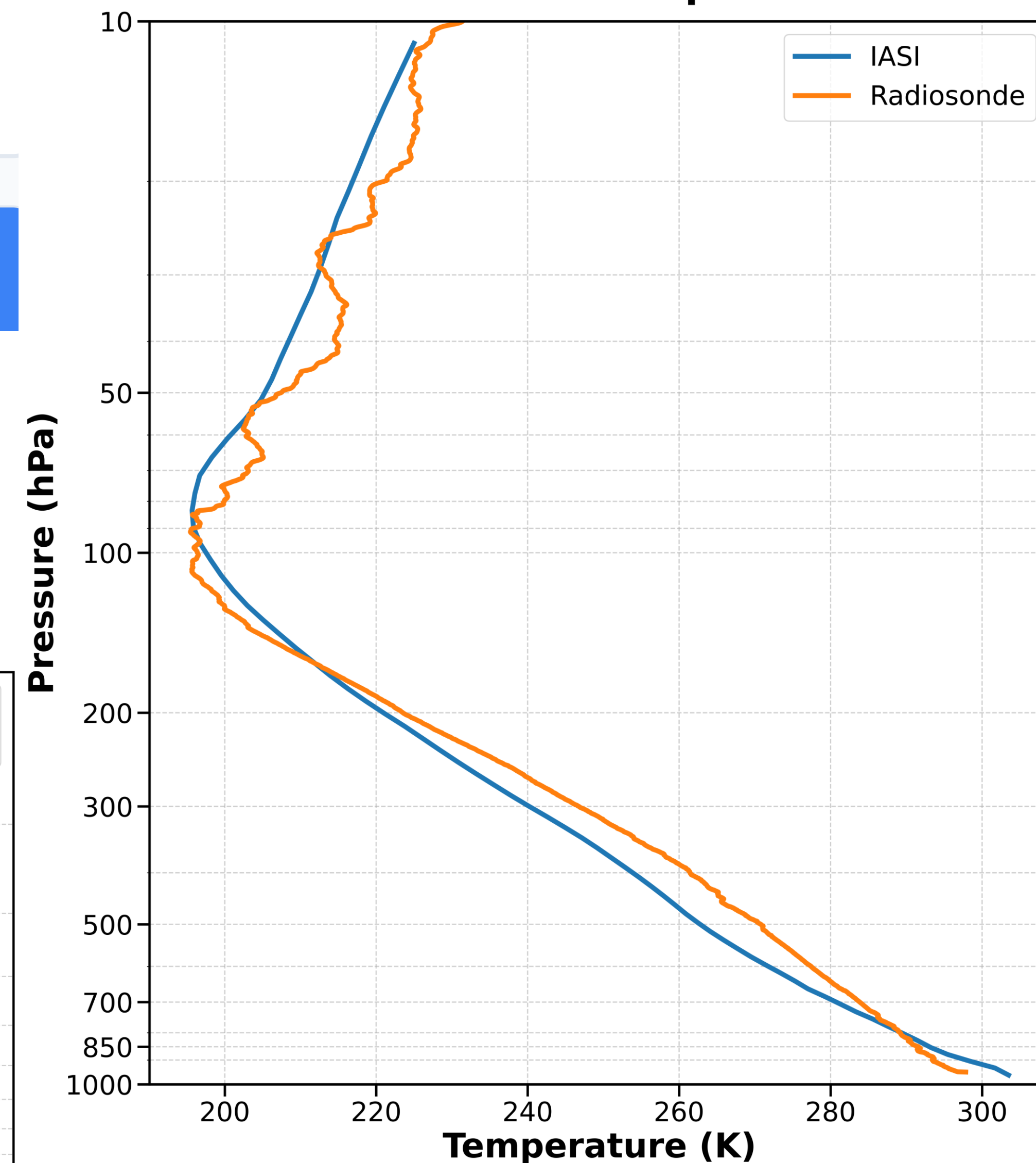


- Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEX) Radiosonde at Solapur and IITM ART test bed at Bhopal.
- ART works only in the monsoon season, June-Sep. Solapur RS is available throughout the year at 06 UTC, whereas the radiosonde at Bhopal is operated at 06 UTC and 12 UTC.
- The IASI pass is available between 4-5 UTC and 16-17 UTC over the Indian Region

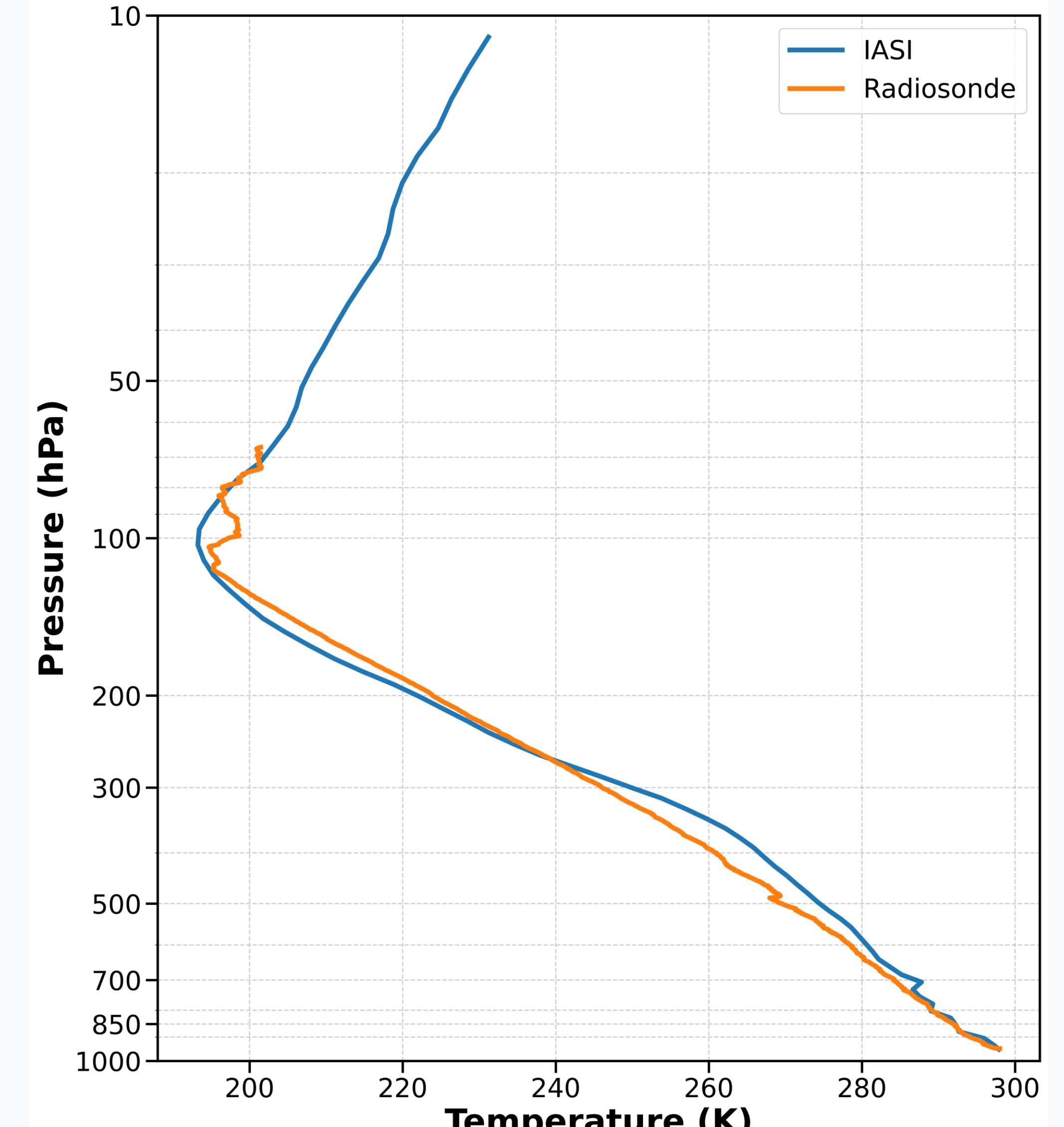
## Conclusion

- The IASI pass is available between 4-5 UTC and 16-17 UTC over the Indian Region
- Radiosonde observations are available mostly at 00 UTC and 12 UTC over the Indian region
- It is difficult to do validation as the time window for both the satellite and RS observation is large.
- We are utilising two of the radiosonde observations available over the Indian region at 06 and 12 UTC.

IASI vs Radiosonde Temperature Profile



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## Acknowledgements

We gratefully acknowledge the Ministry of Earth Sciences (MoES), Government of India, for providing the necessary resources and encouragement to carry out this study. The authors also extend their sincere thanks to the ARUNIKA support team for their valuable assistance.