

Development of a CALIPSO IIR radiance simulator

Chia-Pang Kuo^{1,*}, Ping Yang¹, Shaima L. Nasiri¹, Yongxiang Hu²

Paper: 160

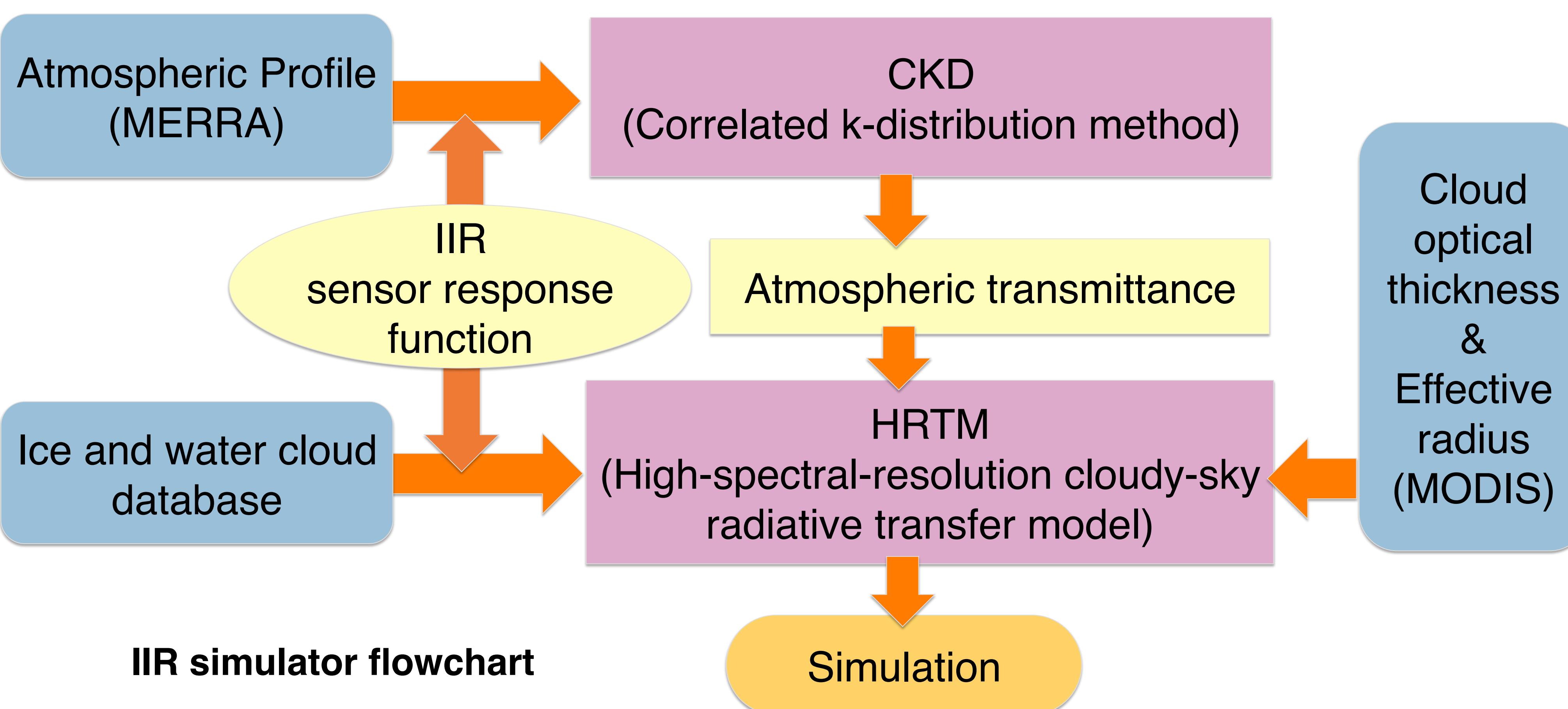
Introduction

Numerical radiance simulators can be applied to theoretical error analysis and calibrations of satellite instruments in addition to the simulations of radiances and fluxes under various atmospheric and surface conditions.

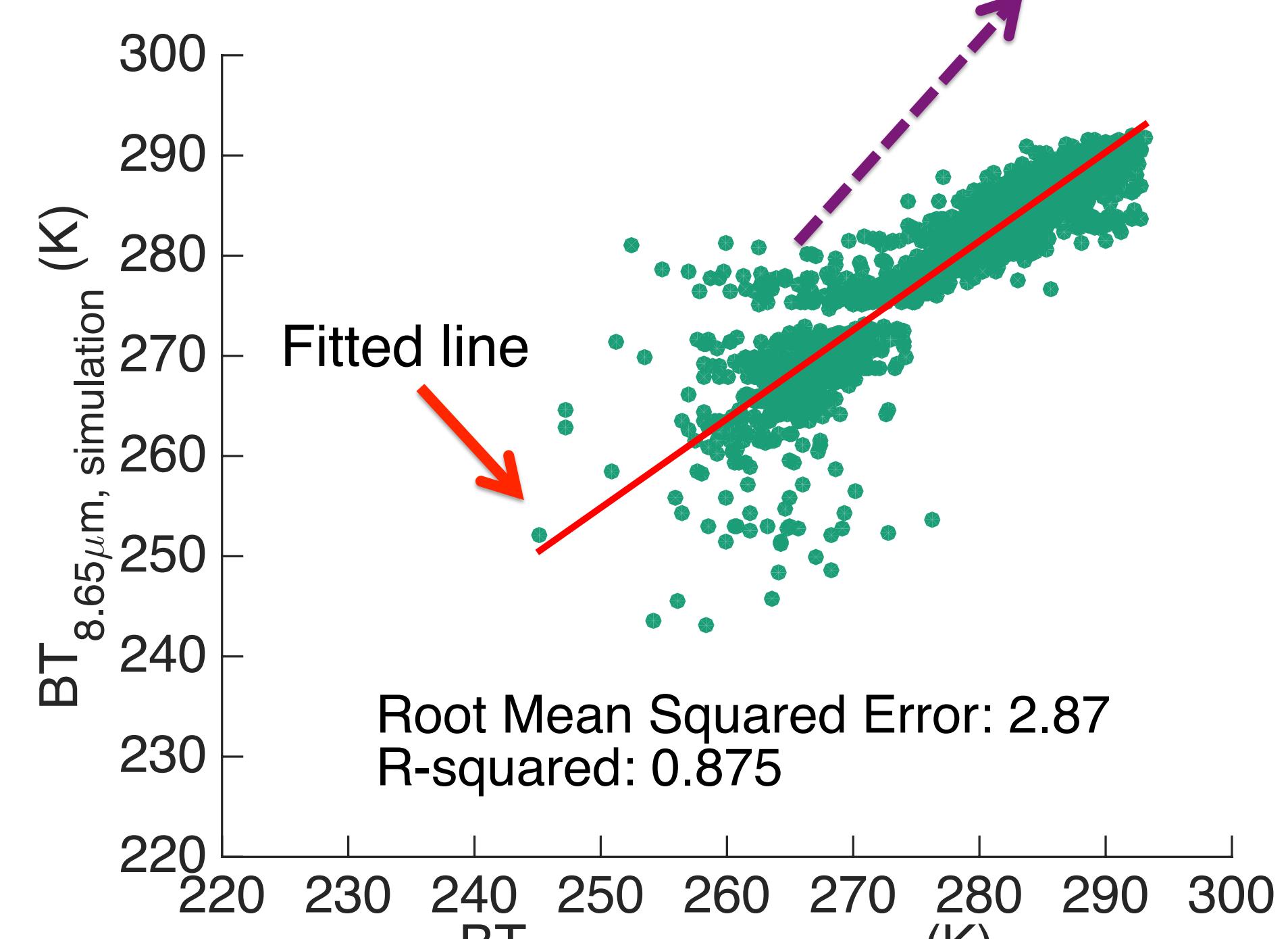
Methodology

Table 1. IIR simulator information

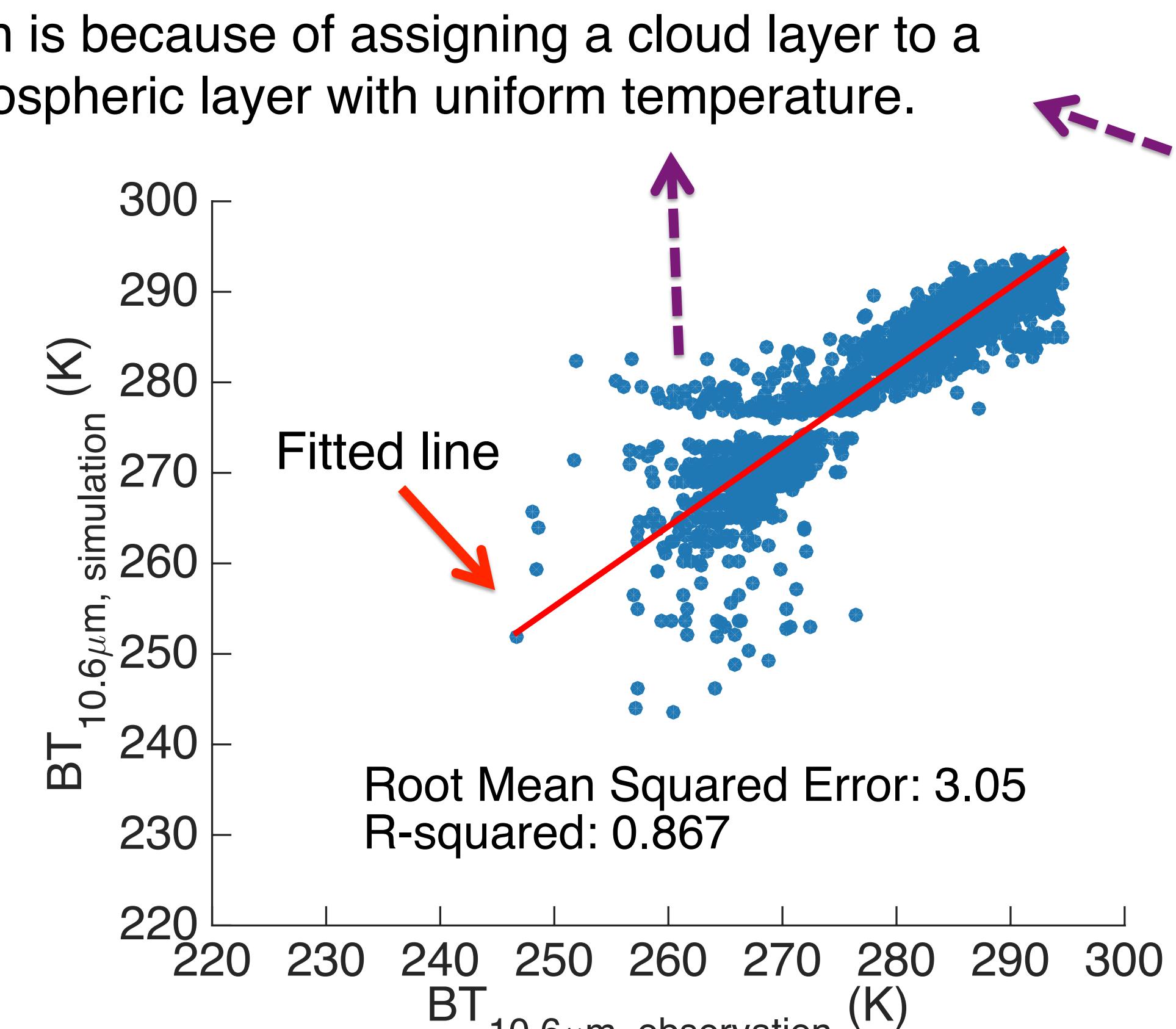
IIR Channel	Absorption Gases Considered	Number of g Values in Cumulative Distribution Function
1 (8.65 μm)	H ₂ O, N ₂ O, O ₃	8
2 (10.6 μm)	H ₂ O, CO ₂ , O ₃	4
3 (12.05 μm)	H ₂ O, CO ₂ , O ₃	8



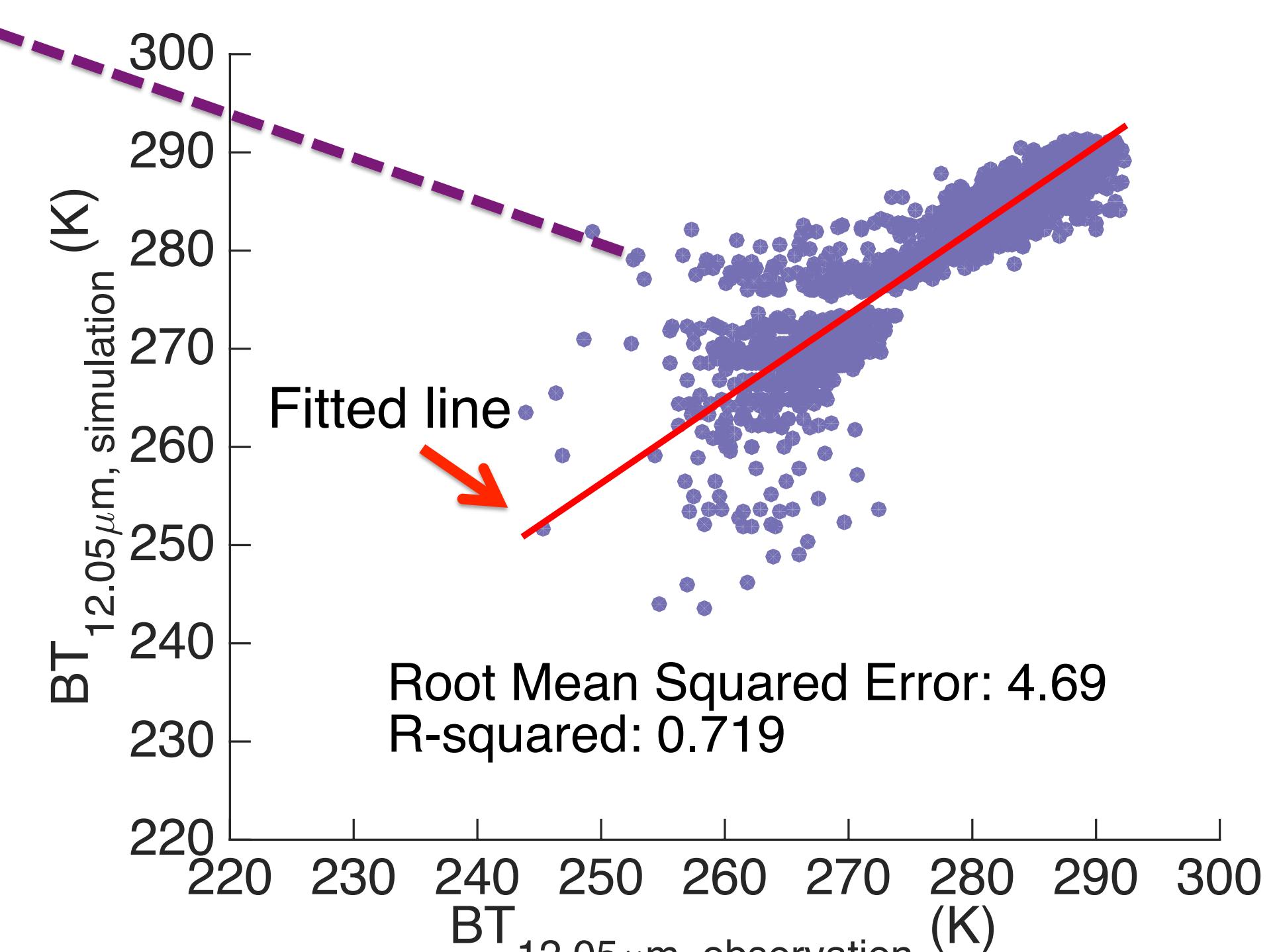
Result



Comparison of water cloud simulation and observation for IIR channel 1



Comparison of water cloud simulation and observation for IIR channel 2



Comparison of water cloud simulation and observation for IIR channel 3

References

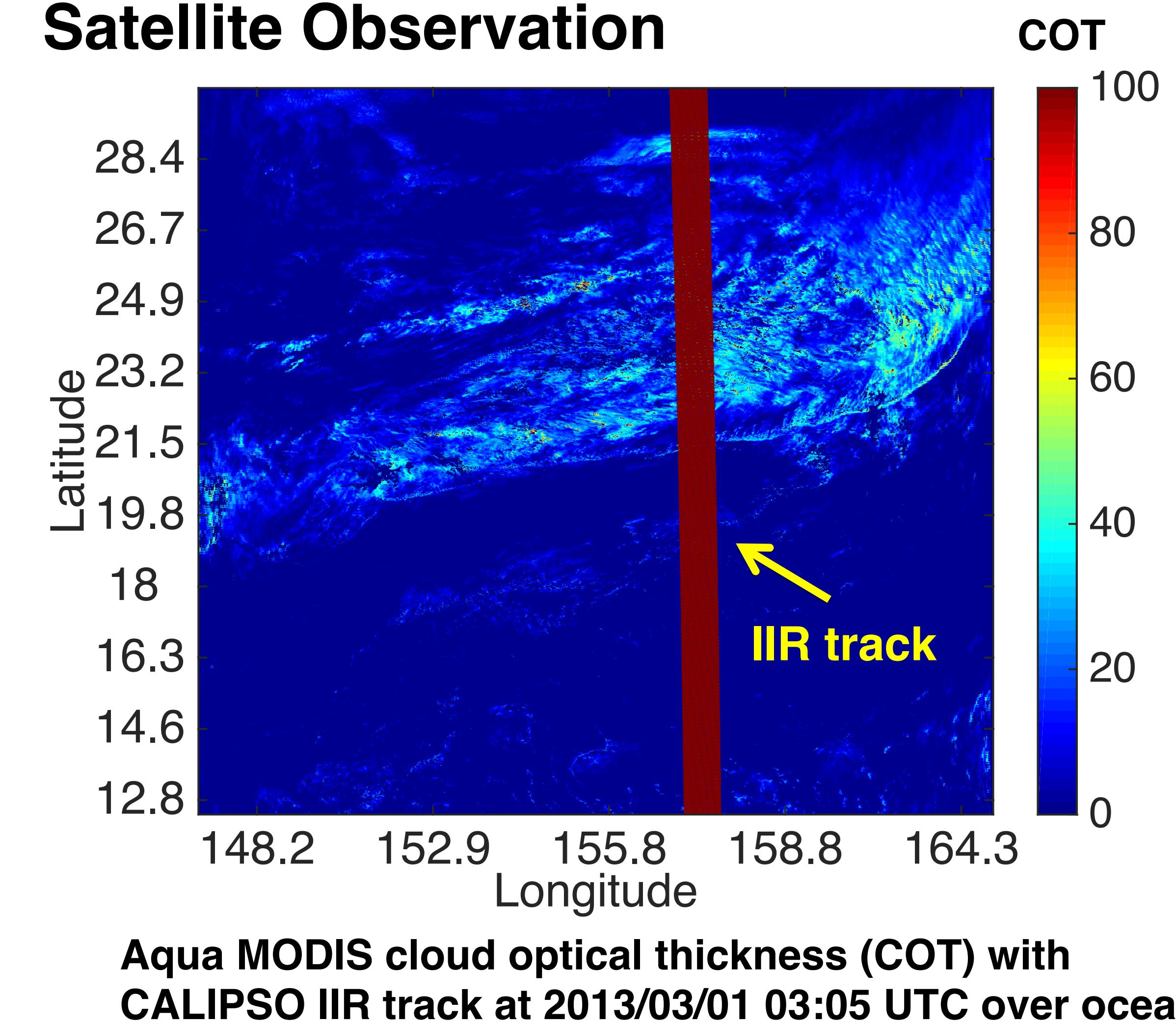
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In this study, we report on the development of a computationally efficient simulator to model outgoing clear- and cloudy-sky radiances observed by the Infrared Imaging Radiometer (IIR) on board the Cloud–Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) satellite.

Satellite Observation



Aqua MODIS cloud optical thickness (COT) with CALIPSO IIR track at 2013/03/01 03:05 UTC over ocean

Discussion

A CALIPSO IIR simulator is developed based on the CKD method and a fast radiative transfer model; gaseous absorption is characterized for each channel. Simulations slightly overestimated the brightness temperature and could be effected by following factors:

- Multilayer cloud structure.
 - In this study, we assume single cloud layer.
- Coarse assimilated atmospheric profile.
 - The resolution of MERRA is 125 x 125 km², but resolutions of MODIS and IIR image are 1 x 1 km².
- Cloud optical thickness and effective particle size retrieved from MODIS.
 - MODIS retrieval products are based on assumptions and are not perfect.
- Fast approximation method (CKD and HRTM).
 - CKD + HRTM model is not accurate as robust model, such as LBL + DISORT.

Acknowledgements

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