TIANHAO LE

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EDUCATION

California Institute of Technology, Pasadena, California, USA *Aug. 2016 - Dec. 2021 (expected)*
Ph.D. in Geological and Planetary Science (**GPA:4.1/4.0**)
Minor in Computational Science and Engineering

Peking University, Beijing, China *Sep. 2012 - Jun. 2016*
B.S. in Physics
Double degree in Applied Mathematics

RESEARCH INTERESTS

Planetary Atmospheres, Climate Change, Radiative Transfer, Data Mining

RESEARCH EXPERIENCE

Peking University (School of Physics) October 2014-August 2015
Advisor: Prof. Yongyun Hu

· **Undergraduate Research** & **Training Program**

- Ran VPL and SBDART model for real case of Venus, Mars and Earth. Simulated and calculated the atmospheric profile of Earth and surface temperature of Venus and Mars.

The University of California, Santa Cruz (EPS) August 2015-October 2015
Advisor: Prof. Xi Zhang

· **Correlated-k Radiative Transfer model**

- Studied basic knowledge on correlated-k method and tried to find a quicker method of calculation during doing correlated-k. Ran RRTM and compared our correlated-k model's result with RRTM's result. Results published in ***Journal of Quantitative Spectroscopy and Radiative Transfer*** as second author.

California Institute of Technology (GPS) Aug. 2016-present

· **Radiative Transfer and Climate Change (with Prof. Yuk Yung)**

- Investigated the interplay between emissions, chemistry, and meteorology during the COVID-19 pandemic using near real-time satellite observations and GCM simulations, results published in ***Science*** as first author.
- Implemented a fast hyperspectral radiative transfer model using neural networks in Keras which achieved better performance (relative error $\sim 0.5\%$) compared with the traditional PCA based models, results published in ***Journal of Quantitative Spectroscopy and Radiative Transfer*** as first author.
- Characterized the jet stream and mid-latitude storm variabilities using long-term observational data (35 years) and state-of-art climate model simulations and to reveal the relationship between aerosol emissions and winter extreme weather, results published in ***Nature Climate Change*** as second author.

3D radiative transfer in LES (with Prof. Tapio Schneider) Aug. 2016-Dec. 2017

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- Implemented a 3D radiative transfer model (Tenstream) into a Python based Large-Eddy Simulations model (PyCLES). Compared the fluxes with the standard two-stream methods and evaluated the biases due to neglect 3D cloud effect (e.g., cloud shadow effect).
- Quantified the top-of-atmosphere albedo biases that result from the neglect of 3D cloud structure and proposed potential corrections in plane-parallel radiative transfer scheme by using a 3D radiative transfer model.

AWARDS

10/2011	1^{st} Prize (**Golden Medal**) of Chinese Physics Olympiad (National Competition Areas)
04/2014	Learning Excellence Award by Peking University in 2013
05/2014	Meritorious Winner of the 2014 Interdisciplinary Contest in Modeling (MCM/ICM)
07/2018	CESASC Scholarship ($1000)
02/2020	Multidisciplinary Research and Education on Big Data + High-Performance Computing + Atmospheric Sciences ($1500)

PUBLICATION

1. Li, C., **Le, T.**, Zhang, X., and Yung, Y. L., (2018), "A high-performance atmospheric radiation package: With applications to the radiative energy budgets of giant planets", *Journal of Quantitative Spectroscopy and Radiative Transfer*, 217, 353-362.
2. Zeng, Z. C., Chen, S., Natraj, V., **Le, T.**, Xu, F., Merrelli, A., and Yung, Y. L. (2020). Constraining the vertical distribution of coastal dust aerosol using OCO-2 O2 A-band measurements. *Remote Sensing of Environment*, 236, 111494.
3. Wang, Y., **Le, T.**, Chen, G. et al. (2020) Reduced European aerosol emissions suppress winter extremes over northern Eurasia. *Nat. Clim. Chang.* , 10(3), 225-230.
4. **Le, T.**, Liu, C., Yao, B., Natraj, V., and Yung, Y. L., Application of Machine Learning to Hyperspectral Radiative Transfer Simulations. *Journal of Quantitative Spectroscopy and Radiative Transfer*, 106928.
5. Liu, C., Yao, B., Natraj, V., Weng, F., **Le, T.**, Shia, R.L., et al. A spectral data compression (SDCOMP) radiative transfer model for high spectral resolution radiation simulations. *Journal of the Atmospheric Sciences,*,77(6), 2055-2066.
6. **Le, T.**, Wang, Y., Liu, L., Yang, J., Yung, Y. L., Li, G., and Seinfeld, J. H. (2020). Unexpected air pollution with marked emission reductions during the COVID-19 outbreak in China. *Science*, 369(6504), 702-706.
7. Wu, J. et. al (including **Le. T.**). Insights into particulate matter pollution in the North China Plain during wintertime: Local contribution or regional transport (2021). *Atmospheric Chemistry and Physics*, 21 (3), 2229-2249.
8. Zube, N., Zhang, X., Li, T., **Le, T.,** Li, C., Guerlet, S., Tan, X., (2021), Radiative-Dynamical Simulation of Jupiter's Stratosphere and Upper Troposphere, *The Astrophysical Journal*, in pres.
9. **Le, T.**, Natraj, V., Aumann, H. H.,,and Yung, Y. L.,(2021), Evaluation of modeled hyperspectral infrared spectra against all-sky AIRS observations using different cloud overlap models, in prep.

CONFERENCE PROCEEDINGS AND PRESENTATIONS

1. **Le, T.**, Li, C., Su, H., Jiang, J. H., Aumann, H. H., Yung, Y. L., (2016). Highly accurate modeling of hyperspectral infrared spectra in clear and cloudy atmospheres. *AGU Fall Meeting 2016*
2. **Le, T.**, Natraj, V., Li, C., Liu, X., Aumann, H. H., Shia, R. L., Yung, Y. L., (2017). Modeling of hyperspectral infrared spectra in cloudy atmospheres. *AGU Fall Meeting 2017*
3. Li, C., **Le, T.**, Zhang, X., Yung, Y. L. (2018) A High-performance Atmospheric Radiation Package: with applications to the radiative energy budgets of giant planets. *Division for Planetary Sciences 2018*
4. **Le, T.**, Natraj, V., Li, C., Braverman, A., Yung, Y. L., (2019). Examining the Fidelity of Cloud Optical Properties and Overlap Statistics Through Comparisons of Radiative Transfer and Cloud Resolving Models Against AIRS Observations. *AMS Fall Meeting 2019* **(oral)**
5. **Le, T.**, Yue, Q., Shia, R.L., Yung, Y.L., (2019). Understanding Diurnal Cloud Cover Response using Satellite observations and Climate Simulations. *AGU Fall Meeting 2019*
6. **Le, T.**, Wang,Y., Zou, F., Weng,K., and Yung, Y.L.(2020). Understanding Aircraft Contrail Radiative forcing Using Satellite observations. *AGU Fall Meeting 2020* (**oral**)

SKILLS

Programming: Python (TensorFlow, PyTorch, Keras), C/C++, CUDA, Fortran, Matlab,R.

Languages: English (fluent), Mandarin (native).