ATRAN_SDC - Modelling Atmospheric Transmission Spectra for Airborne & Ground-Based Infrared Observations

Aaron Bryant, Jonas Früh, Benjamin Greiner, Christof Iserlohe, Bastian Knieling, Mario Ruoff, Bernhard Schulz

SOFIA Data Center, Institut für Raumfahrtsysteme, Universität Stuttgart, Pfaffenwaldring 31, 70569 Stuttgart, Germany

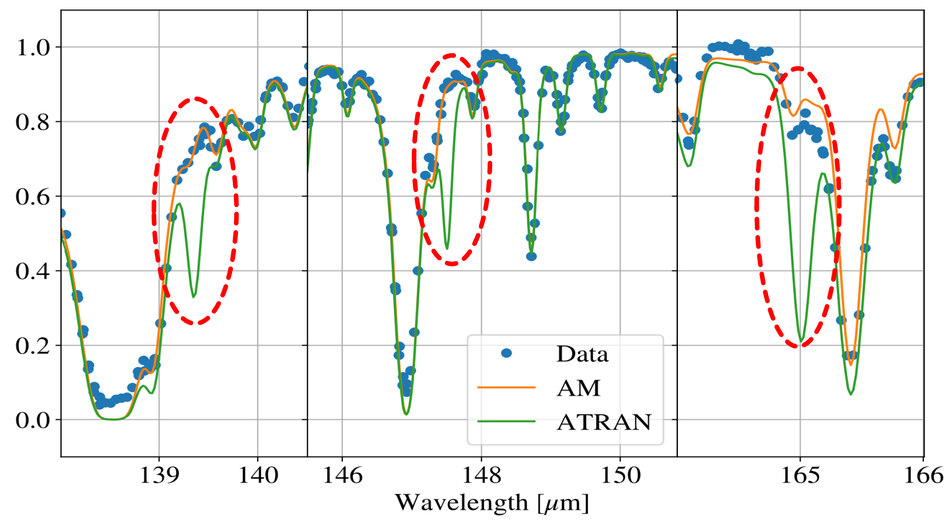
Introduction

At the **SOFIA Data Center** (SDC), a revised version of the **ATRAN atmospheric transmission** code has been developed, with the permission of the author, incorporating upgrades and fixes matching the specific needs of SOFIA science data. This new model, named **ATRAN_SDC**, has been used to generate a databank of mid- and far-infrared transmission spectra. These are made available in the form of a new **standalone web application**, which allows users to generate custom ATRAN_SDC transmission spectra, and donwload them for further analysis and usage on **ground-based and airborne infrared datasets**.

ATRAN Transmission Model

ATRAN (Atmopsheric TRANSmission) was developed by Steve Lord in 1992[1] to calculate the transmittive properties of the Earth's atmosphere due to the presence of molecular absorbants like **water vapour & ozone**.

The model derives abundances from HITRAN, albeit with a significant error in the **$^{17}O^{16}O$ isotopologue** of oxygen, resulting in faulty telluric features (e.g. Fadda et al. 2023)[2].



1: https://ntrs.nasa.gov/citations/19930010877 2: https://doi.org/10.3847/1538-3881/acffb4

Updated ATRAN_SDC Database

ATRAN_SDC fixes the $^{17}O^{16}O$ error, and was used to generate a set of transmission curves corresponding to the typical atmospheric conditions and wavelength ranges of the SOFIA instruments **FIFI-LS, EXES and FORCAST**.

ATRAN_SDC transmission spectra stored on DaRUS:

darus.uni-stuttgart.de/dataverse/irs-sofia-ad/?q=ATRAN

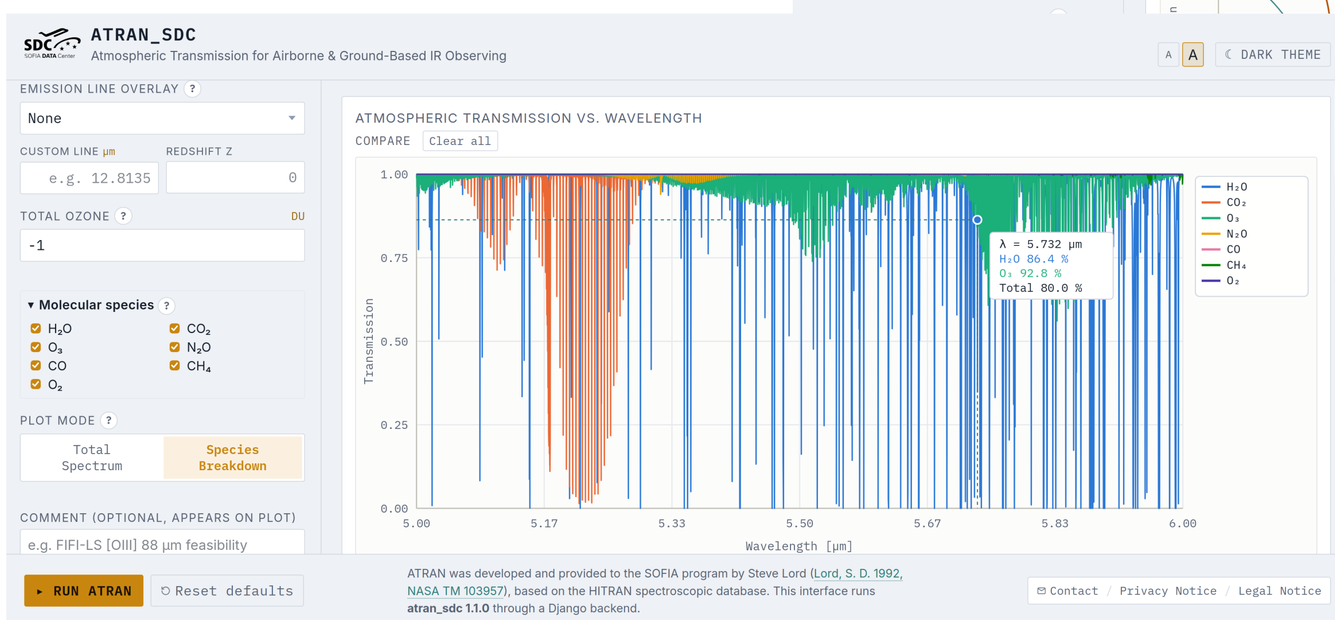
- **Profiles generated for fixed:**
  - Water Vapour Overburden
  - Ozone Column/Latitude Profile
  - Altitude
  - Zenith Angle

The new curves are made available to the community via the **Data Repository of the University of Stuttgart** (DaRUS), and will be utilised by the Redux pipeline suite for telluric correction.

ATRAN_SDC Web Application

- Django-based interactive interface
- Queries ATRAN_SDC model and generates **transmission curves on-the-fly**
- Molecular species breakdown
- Output .svg, .dat or Redux-compatible FITS







Generate your own ATRAN_SDC spectra:

atran.sofiadatacenter.de

Supports Windows, Mac, Linux, Android

The SDC is funded by the DLR Space Administration under grant number FKZ 50OK2404

University of Stuttgart
Germany

ADASS XXXVI
1-5 November 2026

Contact: aaron.bryant@irs.uni-stuttgart.de