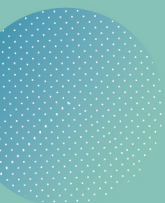




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Tested and improved atmospheric model for millimeter and submillimeter astronomical observatories

by J.R. Pardo, et al., (including F.M. Montenegro-Montes)

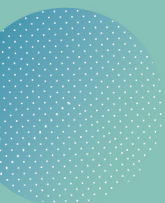
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Abstract

The megahertz spectral-resolution atmospheric radiative-transfer model for ground-based observatories working at millimeter and submillimeter wavelengths has been improved following an observational campaign with the Atacama Pathfinder EXperiment (APEX). Atmospheric spectra were acquired under different diurnal, seasonal, and general weather conditions, followed by a careful analysis of the valid data. The final data set considered in this work consists of 57 spectra that, all combined, cover the 157.3–742.1 GHz frequency range. They span one order of magnitude (~ 0.35 – 3.5 mm) in precipitable water vapor columns (PWVC) – which are typical of the site – and were gathered over a two-year period from 21 Oct. 2020 to 5 Sep. 2022. With those data a few weak but detected lines missing from the model were added; the accuracy of line shapes and collision-induced absorption (CIA) was checked along with the assumptions on the vertical profiles of pressure, temperature, water vapor, and minor gases. The resulting atmospheric model parameters were implemented in the Atacama Large Millimeter/Submillimeter Array (ALMA) Telescope Calibration software subsystem (TelCal) and in the Common Astronomy Software Applications package (CASA) Common Software (ACS) libraries.

