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FTS Opacity Measurements Of The South Pole Submillimeter Sky

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Abstract. A submillimeter Fourier Transform Spectrometer (FTS) was used at the South Pole to acquire wide frequency span (300 GHz $< \nu <$ 2 THz) measurements of the atmospheric opacity, $\tau(\nu)$. Comparisons were made with other ongoing measurements to allow inference of typical wintertime observing statistics.

A submillimeter wavelength FTS of the Martin-Puplett type (Martin 1982) was deployed to the South Pole in 2001. In 2001 it was operated as frequently as operational constraints allowed to make measurements of $\tau(\nu)$. Comparisons were made with narrow bandwidth τ from the Antarctic Submillimeter Remote Telescope Observatory (AST/RO) near 806 GHz and broad bandwidth τ_{CMU} from the NRAO/CMU 860 GHz atmospheric radiometer (Peterson et al. 2003). Compared to the FTS and the AST/RO telescope, the uncorrected τ_{CMU} were offset but otherwise well correlated. The τ_{CMU} offset was likely caused by uncompensated antenna loss efficiency (Davis & Vanden Bout 1973, Calisse 2003). The observed correlation with the continuous τ_{CMU} record was used to extrapolate the FTS $\tau(\nu)$ to infer statistics for an entire annual cycle, see Chamberlin et al. (2003). The statistics from this extrapolation are probably characteristic of all years since South Pole wintertime submillimeter observing conditions are expected to have only a slight inter-annual variation (Chamberlin 2001). In the centers of the 1.3 THz and 1.5 THz windows our results indicate observing is possible about 50 days a year with $\tau < 2$ and about 20 days a year with $\tau < 1.75$.

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