

Solar Radiance Transmission Interferometer Observations at the Southern Great Plains Cloud and Radiation Testbed Site

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The prototype SORTI (SOLar Radiance Transmission Interferometer) has been collecting solar absorption spectra at the Cloud and Radiation Testbed site in the Southern Great Plains since January 1994. The instrument is equipped with two infrared detectors and has a maximum optical path difference of 280 cm, giving a spectral resolution of 0.0035 cm^{-1} (apodized) between 700 and 4000 cm^{-1} ($2.5 \mu\text{m}$ to $14 \mu\text{m}$). However, at full resolution, the maximum bandwidth is about 800 cm^{-1} per spectrum. A mercury-cadmium-telluride detector is used for the 700 to 2000 cm^{-1} region, and an indium antimonide detector is used for frequencies above 2000 cm^{-1} . A servo-controlled tracker brings solar radiation into the instrument. Full resolution spectra take less than 6 minutes. For the test period, the instrument is operated in two modes: full resolution in 4 bands (700 - 1300 cm^{-1} , 1900 - 2450 cm^{-1} , 2400 - 3100 cm^{-1} , and 4000 - 4250 cm^{-1}) 5 times per day; and 0.02 cm^{-1} resolution spectra in the same bands 11 times per day.

The prototype instrument requires liquid nitrogen filling for the detectors and removal of the cover on the solar tracker. Otherwise, it is automatic. The site crew has been able to

run the instrument and correct a few software problems. Data from the instrument are collected on a PC hard disk. We do not yet have a data ingest module, so the data are transferred to Denver via Internet for storage. Anyone interested can get the data from us, either by ftp or on floppy disks. An example of a small portion of the spectra from the afternoon of February 9 is shown in Figure 1; SORTI observations are presented in Table 1.

Table 1. SORTI observations on February 9, 1994. Nominal spectral resolution 0.02 cm^{-1} .

| | <u>Time (CST)</u> | <u>Zenith Angle</u> | <u>Secant</u> |
|---------|-------------------|---------------------|---------------|
| Top: | 12:37 | 51.2 | 1.6 |
| | 14:37 | 57.6 | 1.9 |
| | 16:24 | 72.7 | 3.4 |
| | 16:59 | 78.8 | 5.2 |
| Bottom: | 17:26 | 83.7 | 9.1 |

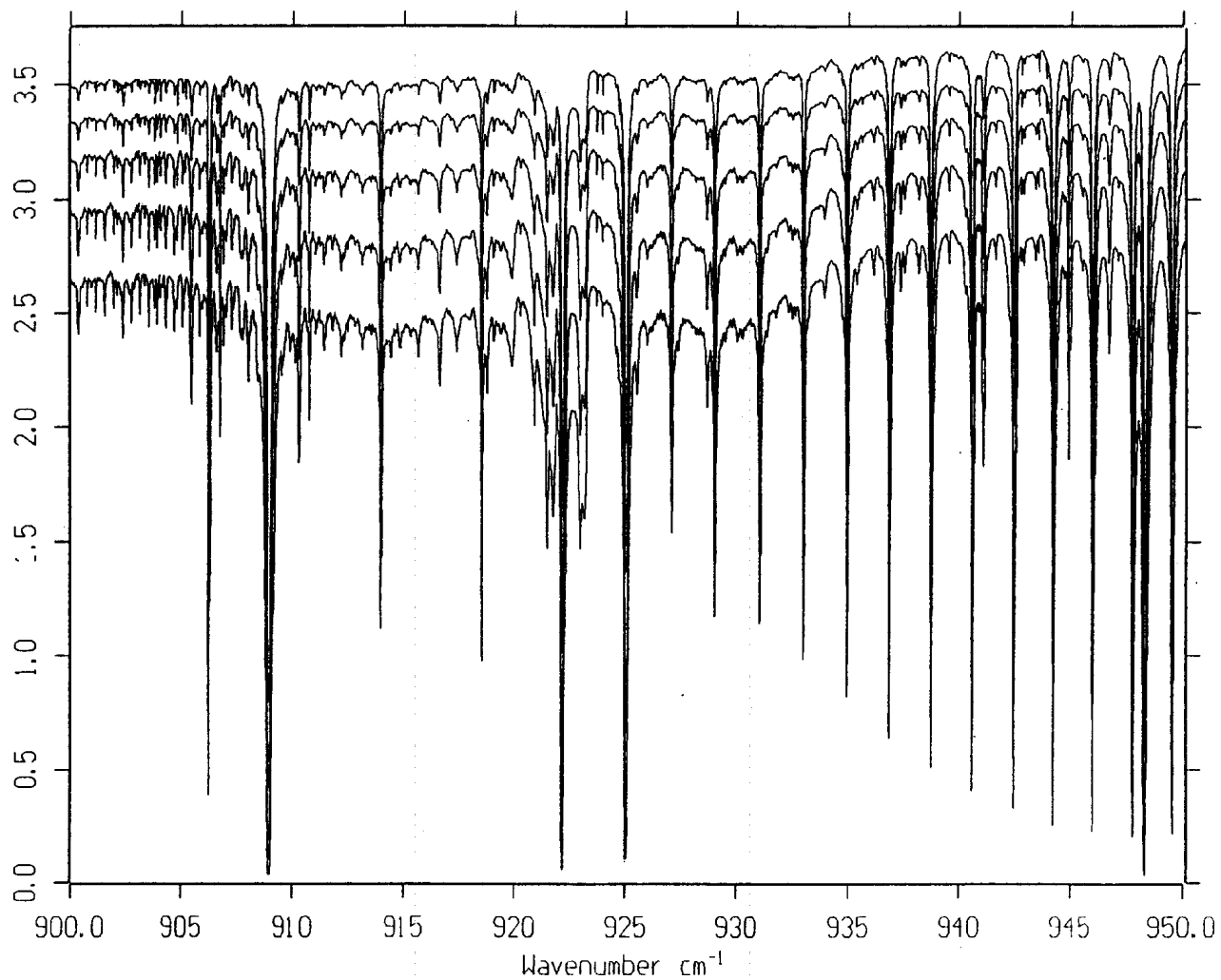


Figure 1. Afternoon solar spectra sequence (see Table 1). The absorption around 925 cm^{-1} is due to CFC-12, other absorbers include H_2O , CO_2 , and HNO_3 .