

#### 4.1.6. ATMOSPHERIC WATER VAPOR

Water vapor measurements using balloonborne, frostpoint hygrometers continued in Boulder, Colorado. In addition, water vapor soundings were done from Kiruna, Sweden, during November 1999 as part of the NASA Stratospheric Aerosol and Gas Experiment (SAGE) III Ozone Loss and Validation Experiment (SOLVE) campaign. The long-term record of stratospheric water vapor measurements at Boulder continues to show an increase of about  $1\% \text{ yr}^{-1}$  as illustrated in the time series for the 20 to 22-km layer (Figure 4.3). This layer is typical of the increase seen at all altitudes above about 16 km over Boulder. An earlier set of water vapor soundings made in Washington, D.C., from 1964-1977 (Figure 4.4) also shows an increase of about the same magnitude as seen at Boulder, suggesting that the increase in stratospheric water vapor has been occurring for several decades.

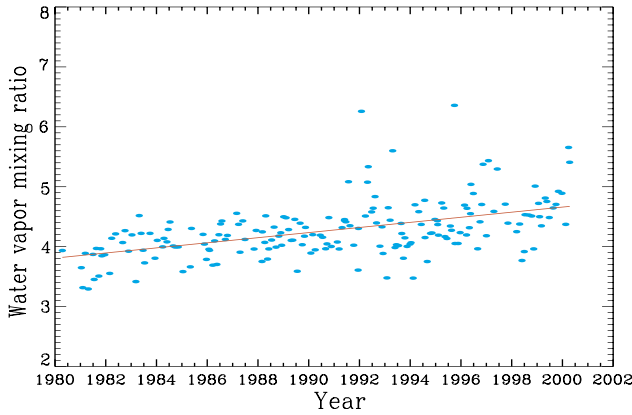


Fig. 4.3. Water vapor mixing ratios (ppmv) for the 20-22 km layer over Boulder, Colorado. The solid line is a linear fit to the individual sounding layer average mixing ratios. The trend value is  $1.0 \pm 0.2\% \text{ yr}^{-1}$ , and the error is for the 95% significance level.

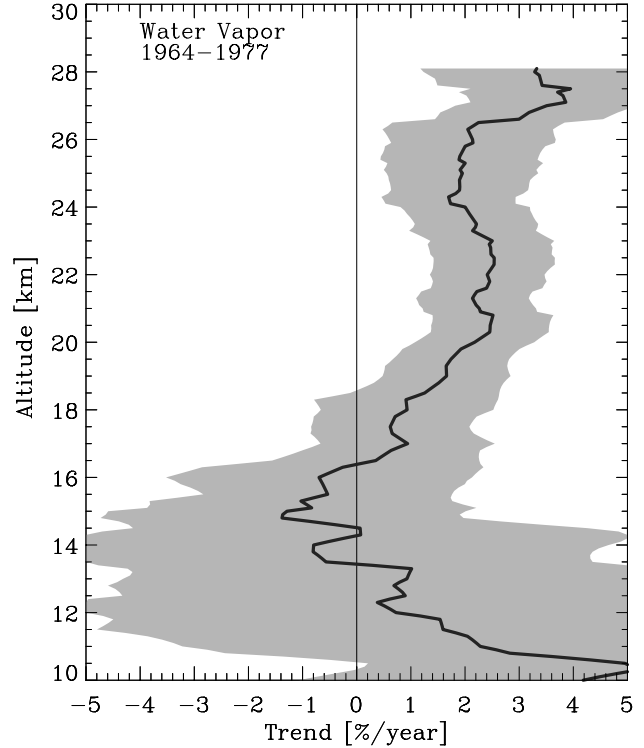


Fig. 4.4. The linear trend in percent per year as a function of altitude for the water vapor mixing ratio over Washington, D.C., during 1964-1977. The shaded area represents the 95% significance level (i.e., if the shaded area intersects the zero line, the trend is not significantly different from zero).

