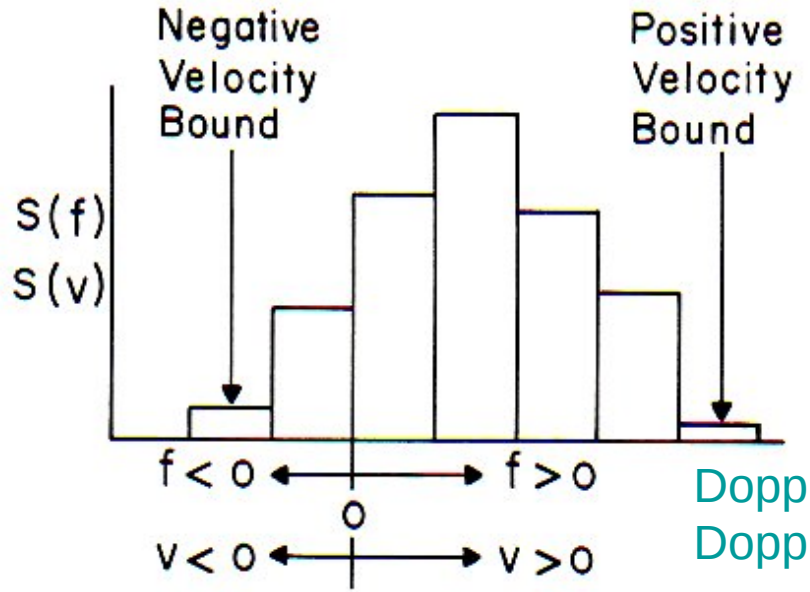
Doppler Spectrum: S(f) or S(v)
where f: Doppler shift frequency and v: Doppler velocity

Doppler Spectrum



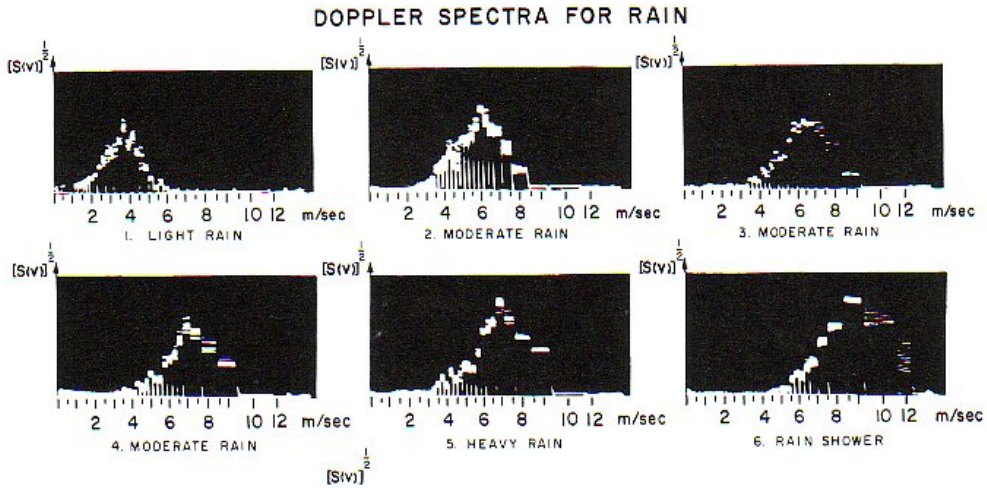
Doppler shift frequency (f)
Doppler velocity (v)

Fig. 8.4. A schematic drawing of a Doppler spectrum showing power as a function of Doppler velocity. When scatterers move downward they produce positive Doppler shift frequencies and velocities.

Battan (1973)

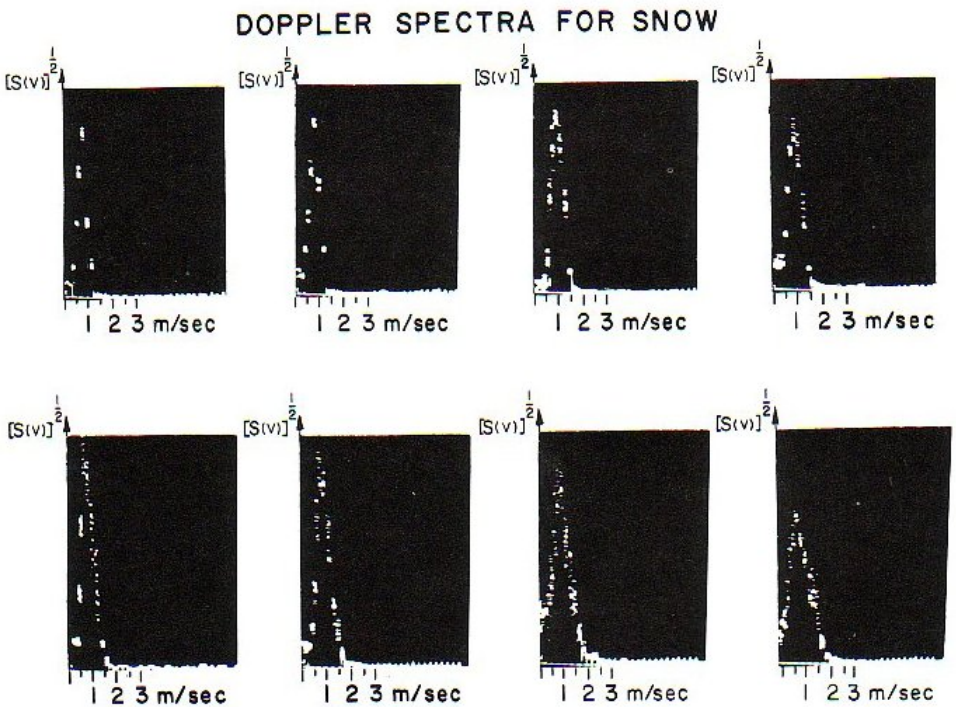
Doppler Spectrum ≡ the distribution of backscattered power as a function of Doppler shift frequency or Doppler velocity

Note: broadening of spectra with increasing rain rate. Why?



Doppler spectra for various rain types

Note: spectra of snow is more narrow than rain. Why?



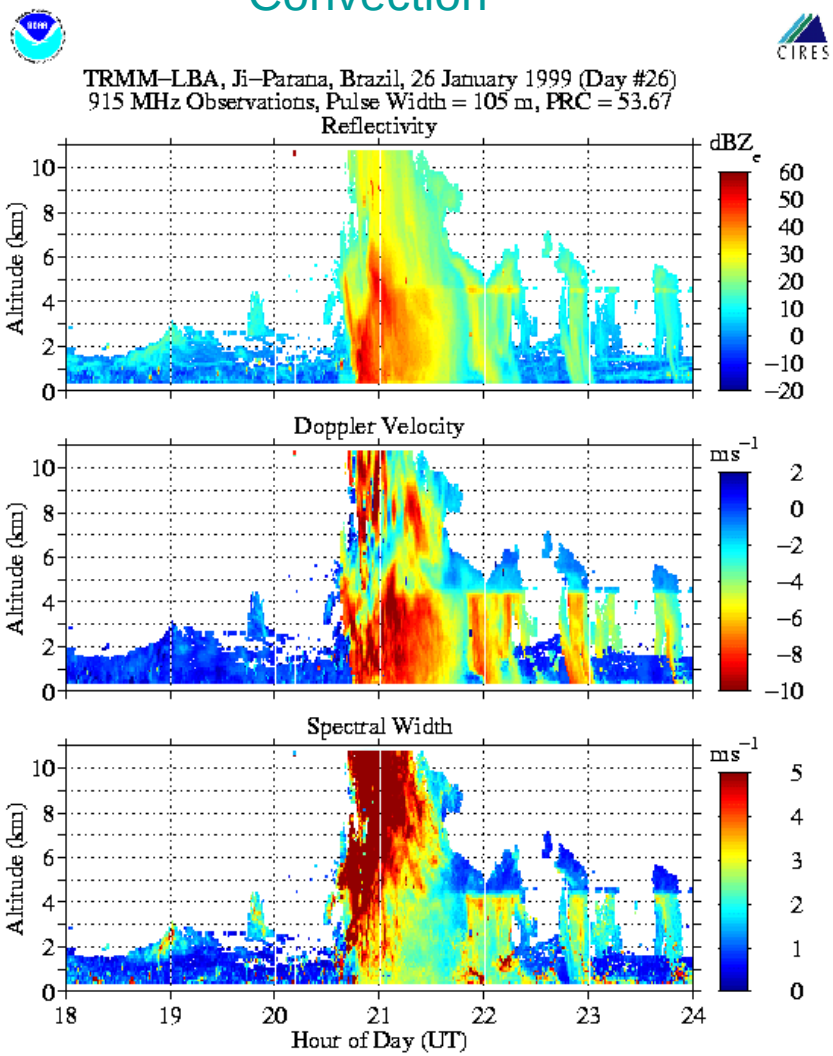
Doppler spectra for snow

Battan (1973)

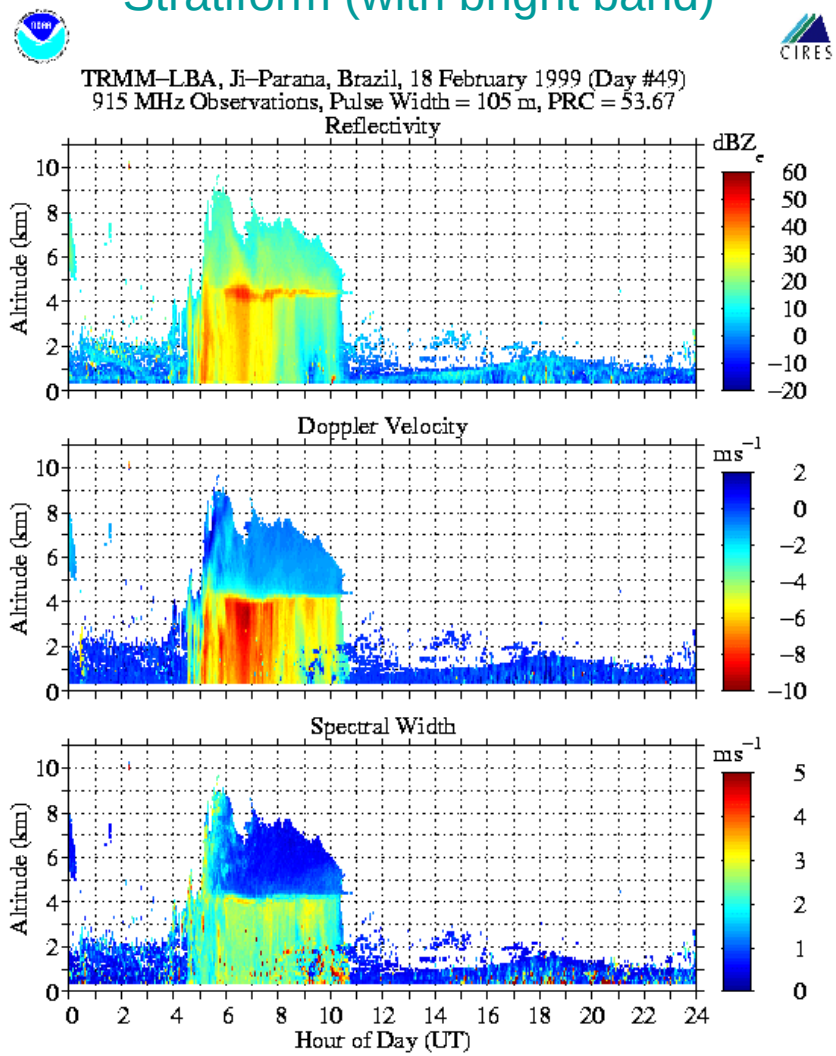
Fig. 8.2. *a*, Doppler spectra of rain where the ordinate is proportional to signal voltage. The quantity $S(V)$ in equation (8.15) is proportional to the square of the signal voltage. *b*, Doppler spectra of snow. Same coordinates as in (*a*). Courtesy of R. M. Lhermitte and D. Atlas, Air Force Cambridge Research Laboratories.

Vertical Structure of Precipitation Systems from Vertically Pointing Radar (or Profiler) at 915 MHz

Convection



Stratiform (with bright band)



Z_e

V_r

σ

Source: NOAA Aeronomy Lab - http://www.al.noaa.gov/tdc/trmm/trmmlba/browse.html