We consider how quintessence models in which the sound speed differs from the speed of light and varies with time affect the cosmic microwave background and the fluctuation power spectrum. Significant modifications occur on length scales related to the Hubble radius during epochs in which the sound speed is near zero and the quintessence contributes a non-negligible fraction of the total energy density. For the microwave background, we find that the usual enhancement of the lowest multipole moments by the integrated Sachs-Wolfe effect can be modified, resulting in suppression or bumps instead. Also, the sound speed can produce oscillations and other effects at wavenumbers $k > 10^{-2}$ h/Mpc in the fluctuation power spectrum.