Physics 535A – Lecture 4
Physics of Lightning

Comments on the Global Electric Circuit

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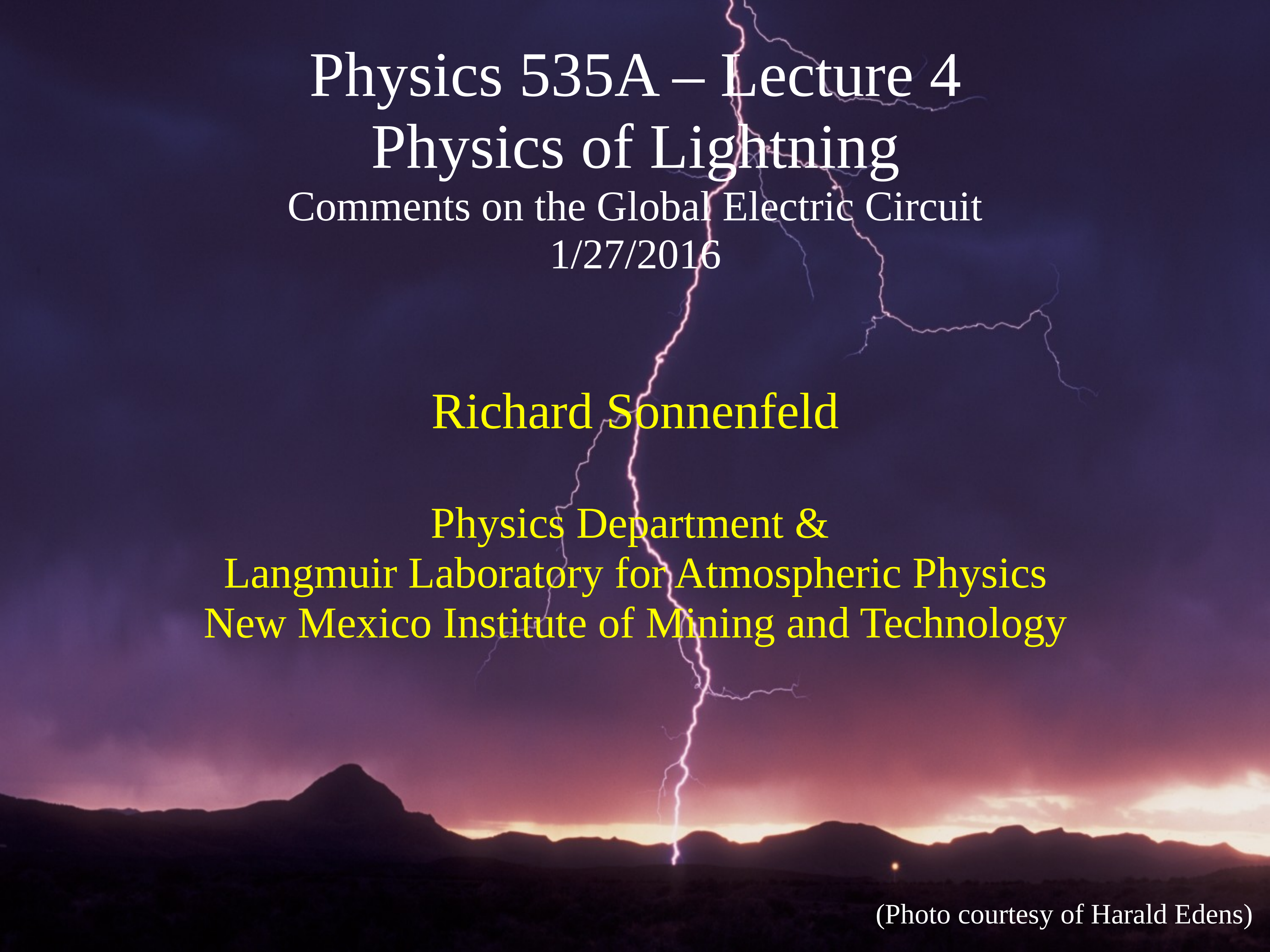


(Photo courtesy of Harald Edens)

Good time to review HW #1/#2

Carnegie Curve linking lightning activity to fair-weather field

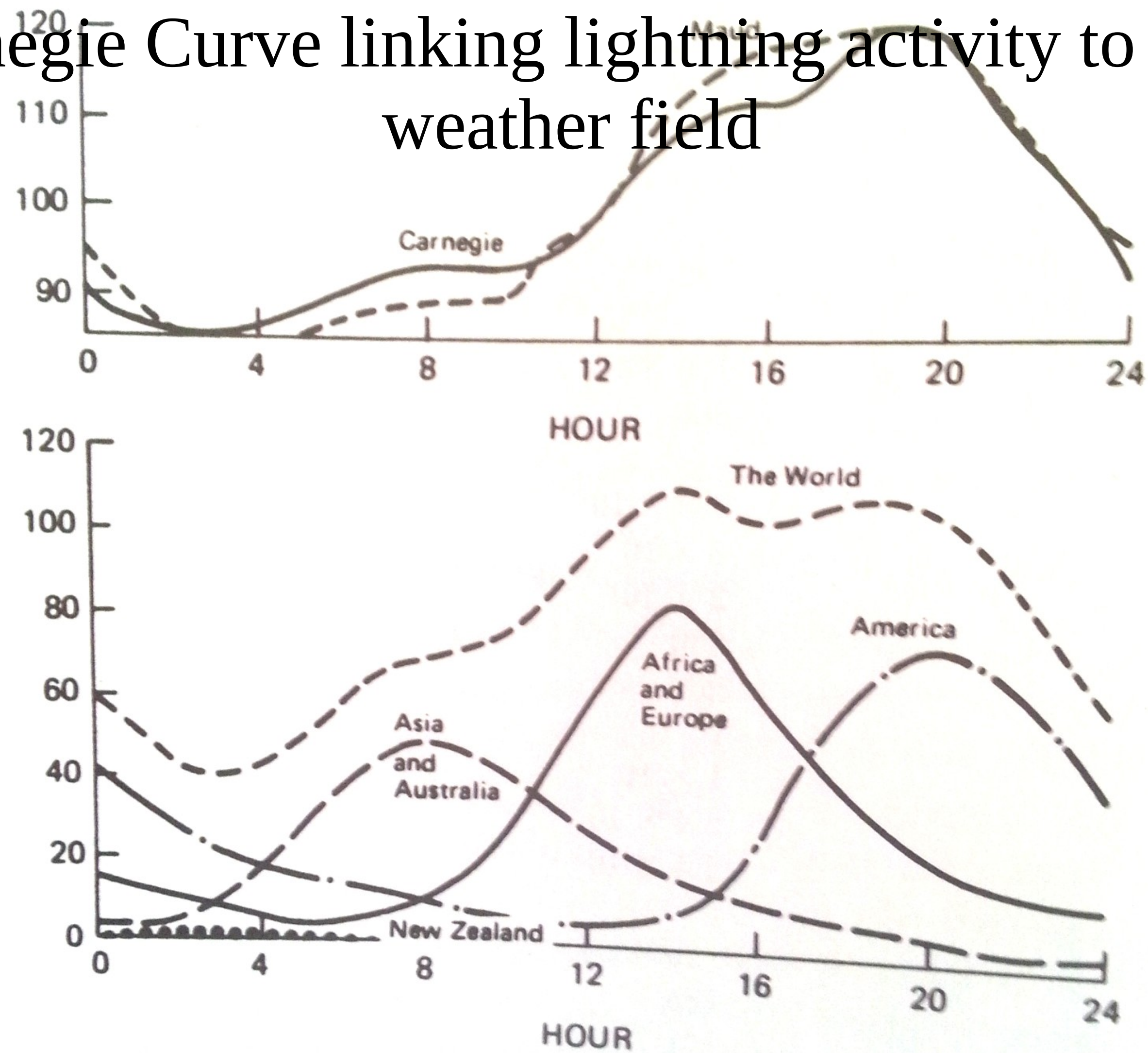


FIGURE 15.3 (a) Annual curve of the diurnal variation of the atmo-spheric electric field on the oceans (volts per meter) as measured by the *Carnegie* and *Maud* expeditions (Parkinson and Torrenson, 1931) and (b) annual curve of the diurnal variations of global thunderstorm ac-tivity according to Whipple and Scrase (1936).

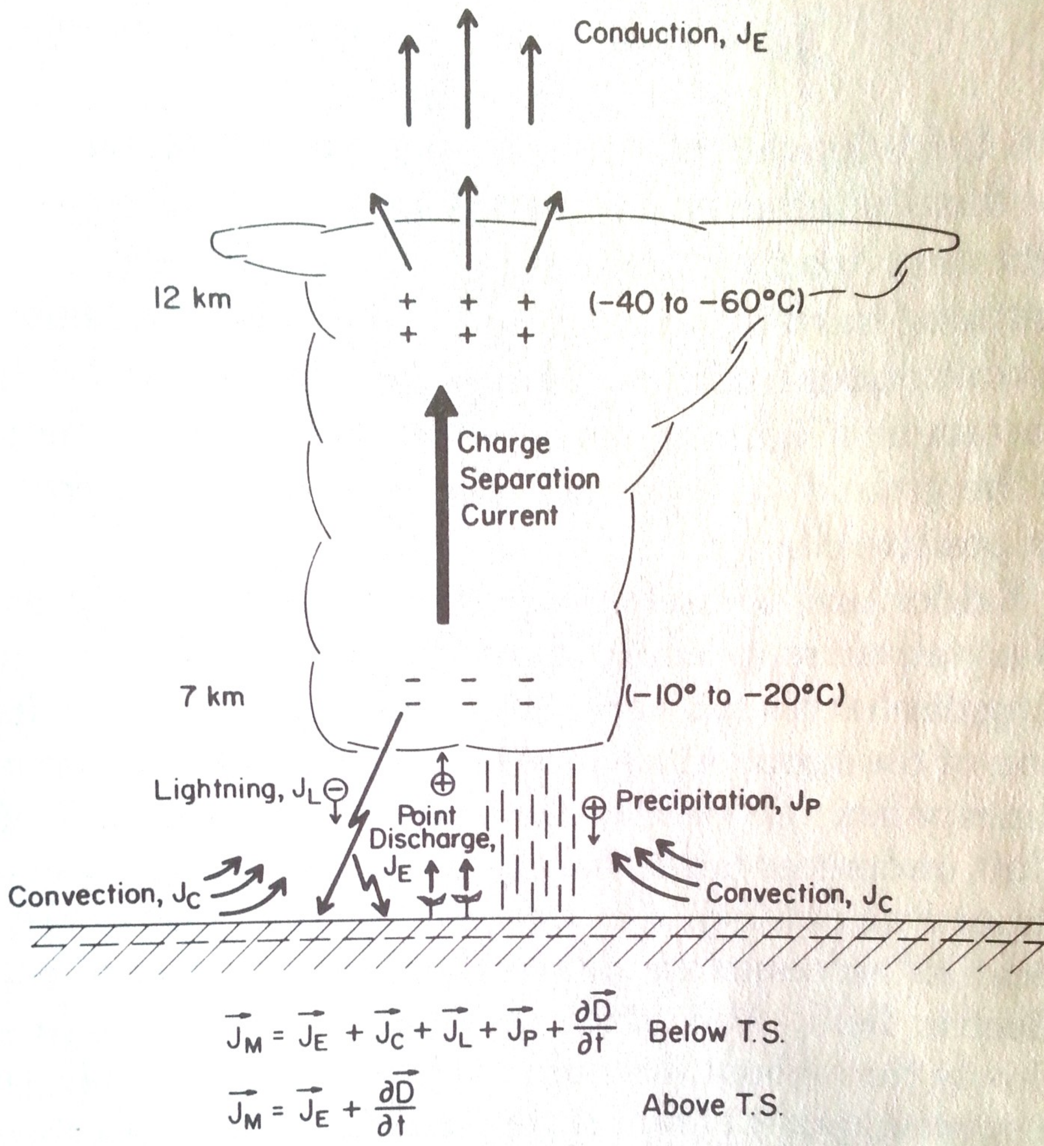
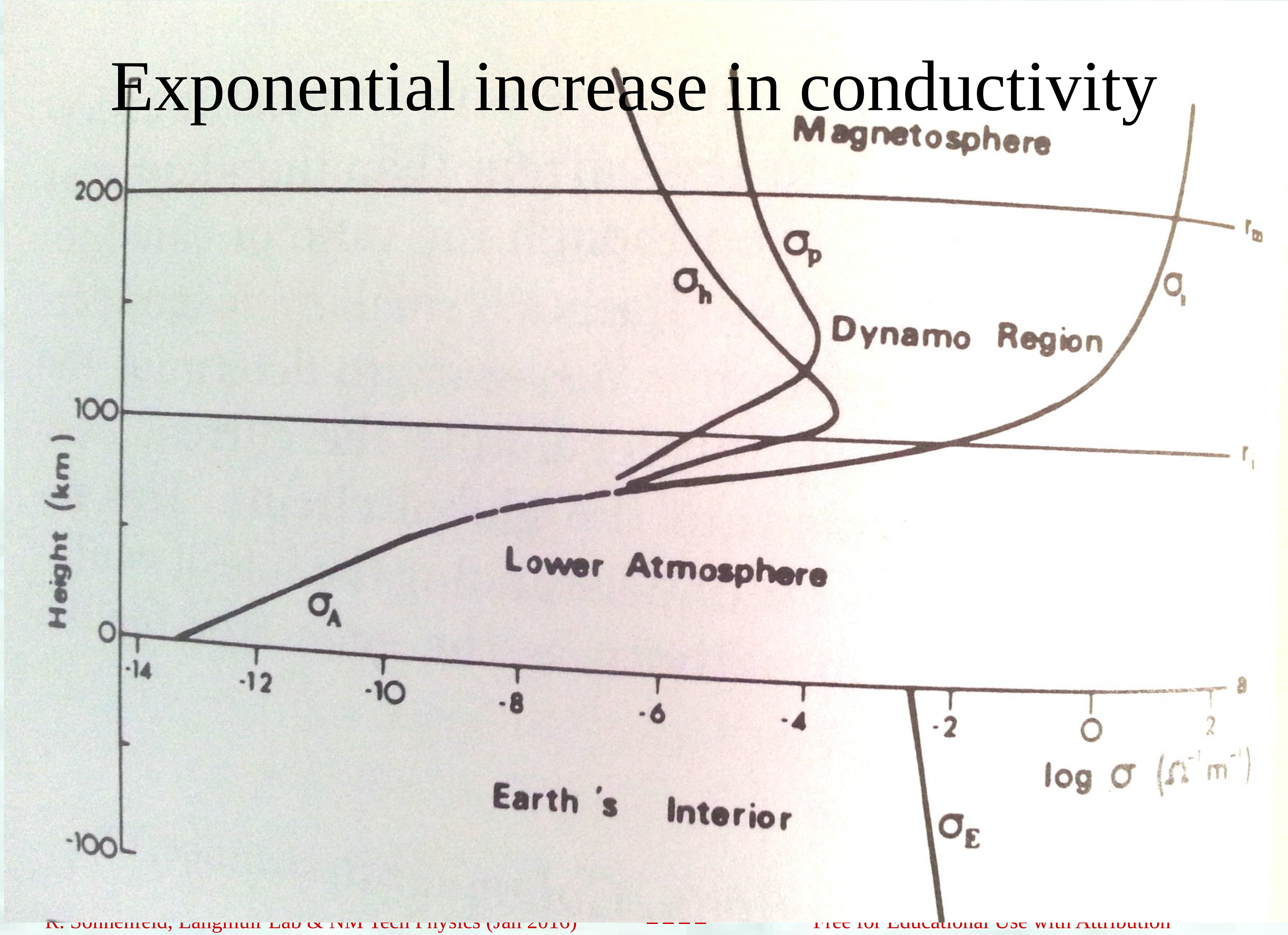


FIGURE 15.2 Schematic illustrating the various currents that flow within and in the vicinity of thunderstorms: $\mathbf{J}_E$ is the conduction current, $\mathbf{J}_c$ is a convection current, $\mathbf{J}_L$ is the lightning current, $\mathbf{J}_p$ is the precipitation current, $\partial D/\partial t$ is the displacement current, and $\mathbf{J}_M$ is the total Maxwell current.

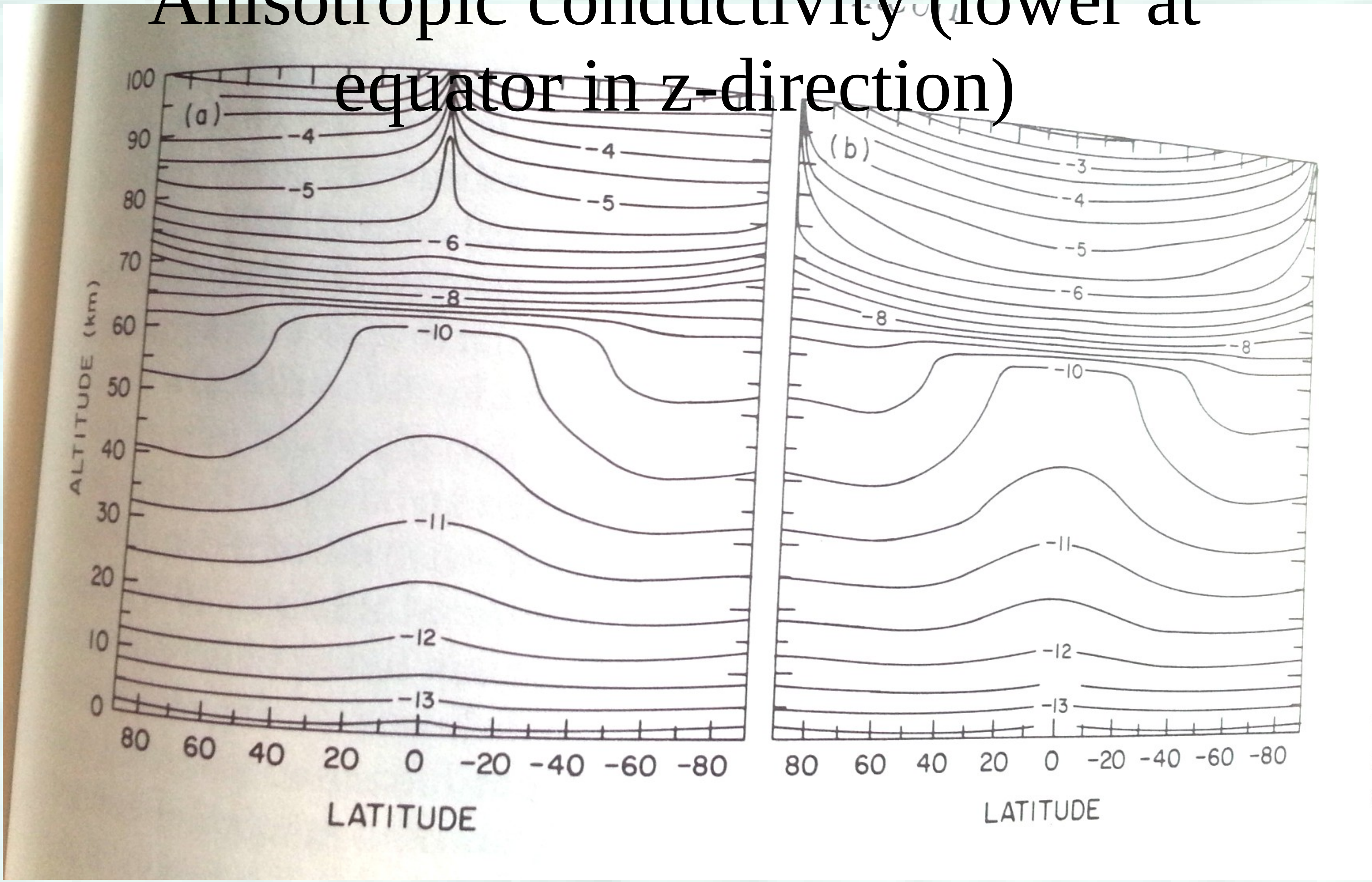
Exponential increase in conductivity



Explain anisotropic conductivity

Explain the “nose” in the conductivity contours in next slide

Anisotropic conductivity (lower at equator in z-direction)



(Photo courtesy of Harald Edens)