The Early Faint Sun Paradox

I selected the “early Faint Sun paradox” as this presentation example because it is particularly instructive for undergraduate students.

Concepts that they will learn in this exercise are energy balance modeling, the blackbody radiation law, planetary effective temperatures, positive feedback, greenhouse warming, and the Gaia hypothesis among others.

The Early Faint Sun Paradox

The early Earth had an atmosphere with strong greenhouse warming, and this prevented the Earth from freezing over.

In the previous slide the parameters were adjusted to produce the transition when the Sun increased its output, and to reproduce the present surface temperature. With additional adjustments of the greenhouse factor and the associated initial conditions the transition can be moved to earlier times.