

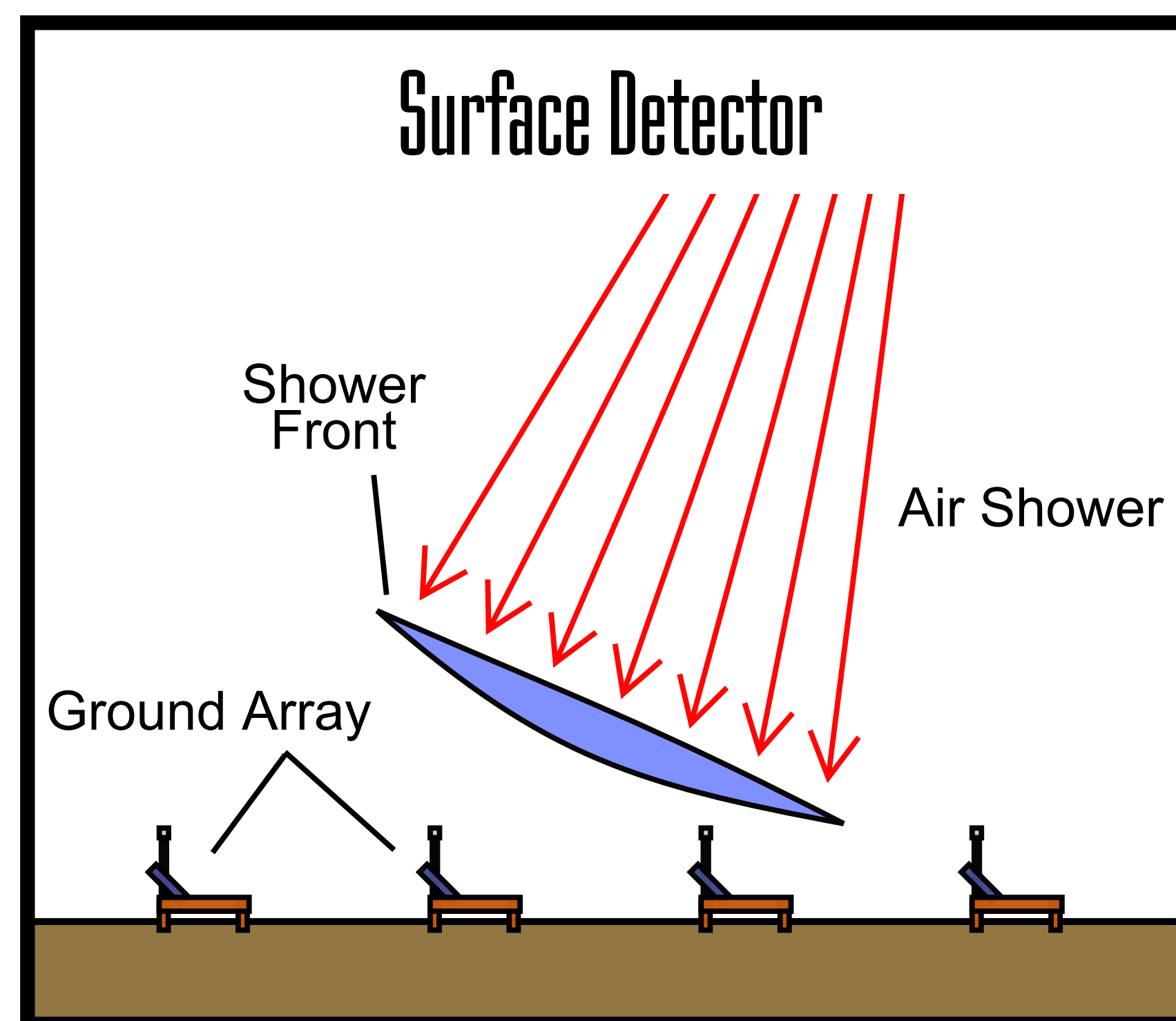
# Surface Detection

When an Extensive Air Shower forms in the atmosphere, a pancake-like layer of secondary particles eventually reaches the ground. The Telescope Array surface detector is composed of more than 500 scintillator devices which sample these secondary particles. This array of detectors cover about 300 square miles (730 square kilometers) west of Delta, Utah.

## Scintillation Detectors

Scintillator detectors measure the density of the secondary particles of an extensive air shower as they pass through it. GPS timing allows us to compare what each detector is seeing at any given instant. By looking at very small differences ( $\sim 1/1,000,000$  second or less) in arrival time, the arrival direction of the cosmic ray can be determined.

The number of detectors hit by a shower and the size of the signals provide information about the energy of the initial cosmic ray. These detectors operate 24 hours a day, 365 days a year.



The Telescope Array surface detector is composed of an array of scintillator detection devices housed inside metal clad containers which are about the size of a ping-pong table. The detecting device consists of sheets of acrylic which have been infused with molecules designed to interact with charged particles. When a secondary air shower particle passes through this material, the scintillating molecules are excited and release ultraviolet light. This light is gathered by optical fibers which direct the light onto a Photomultiplier Tube, which in turn converts the light into an electrical signal. The information is collected for each shower and sent back to a central computer. Each scintillator detector is powered independently by a solar panel and battery and operates around the clock at better than 99% efficiency.

