

Effect of Weather Conditions on Muon Detection Frequency

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The relationships between ground-level muon detection frequency and meteorological factors such as temperature, atmospheric pressure, and humidity have been discussed in previous studies. If water molecules slightly attenuate muons, it is possible that clouds, which contain large amounts of water vapor and droplets, may also have a slight shielding effect. Therefore, in addition to temperature, atmospheric pressure, and humidity, I investigated the relationship between cloud cover and muon detection frequency.

I used two Cosmic Watch detectors, stacked vertically, and counted only particles that simultaneously passed through both detectors.

The observation period was from November 10, 2025, to March 14, 2026. Although there were some missing data, I obtained a total of 87 days of data. Measurements were conducted daily for nine hours, from 8:00 a.m. to 5:00 p.m. The observation site was near a window on the 7th floor of an apartment building in Tokyo.

Meteorological data at Tokyo, including atmospheric pressure, humidity, and cloud cover, were obtained from the website of the Japan Meteorological Agency. In this study, cloud cover is defined according to the Japan Meteorological Agency and is expressed on a scale from 0 to 10. Temperature data at Mt.Fuji data were used, as they are considered to better represent the overall state of the atmosphere.

The results of the observations are as follows. First, the muon detection frequency showed a tendency to decrease with increasing temperature. A weak negative correlation was also observed between muon detection frequency and cloud cover. However, since correlations were also found between humidity and cloud cover, temperature and humidity, and temperature and cloud cover, I cannot conclude that cloud cover independently affects the muon detection frequency.

In other words, under conditions of higher temperature, humidity and cloud cover also tend to increase, and it is possible that the overall meteorological conditions are related to the decrease in muon detection. Although the possibility that clouds themselves or water vapor affect muons cannot be completely ruled out, the present results do not establish a causal relationship.

Keywords: Muon, Cosmic Rays, Cosmic Watch, Cloud Cover