universität wien

Fakultät für Physik

Isotopenforschung und Kernphysik

E I N L A D U N G

zum

V E R A - S E M I N A R

von

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Exploring High-Energy Phenomena in Earth's Atmosphere

In the beginning of last century C.T.R. Wilson proposed that the strong electric field of thunderclouds might accelerate electrons to very high energies. However, this and many other electromagnetic processes in our atmosphere are poorly understood till now; the key questions about the thundercloud electrification and lightning initiation remain unanswered. During recent decades several observations of gamma ray, electron and neutron fluxes correlated with thunderstorms were reported. Nonetheless, the origin of these fluxes is under debate till now. According to our model the electron acceleration downward becomes possible after creation of the Lower Positive Charged Region below the main negative charged layer in the middle of the thundercloud. Our analysis is based on the vast thunderstorm data from the Aragats Mountain in Armenia, 3200 m above sea level. Varieties of particle detectors located at Aragats Space Environmental Center are registering neutral and charged particle fluxes correlated with thunderstorms, so-called Thunderstorm Ground Enhancements. Simultaneously the electric mills and lightning detectors are monitoring the near-surface electric field and lightning flashes. Study of Thunderstorm Ground Enhancements provides unique information about particle acceleration and multiplication in the atmosphere during thunderstorms. Generation and propagation of large fluxes of electrons, positrons, gamma rays, and neutrons in the atmosphere and in near space are related to the development of thunderstorms and may be used for monitoring dangerous consequences of extreme weather. Electromagnetic emissions connected with thunderstorms trigger various dynamic processes in the Earth's magnetosphere, causing global geomagnetic storms and changing electrodynamics properties of the ionosphere.

Donnerstag, 12. Juni 2014, 16:30 Uhr

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