



Thunderstorms and Elementary Particle Acceleration (TEPA-2019)

GENERAL INFORMATION:

TIME: October 14-17, 2019

LOCATION: Nor Amberd International Conference Centre of the Yerevan Physics Institute, Byurakan, Aragatsotn Province, Armenia.

SYMPOSIUM WEBSITE:

http://www.crd.yerphi.am/TEPA_2019

ORGANIZERS:

Cosmic Ray Division of Yerevan Physics Institute, Armenia

Skobeltsyn Institute of Nuclear Physics of Moscow State University, Russia

INTERNATIONAL ADVISORY COMMITTEE:

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BACKGROUND:

The new emerging field of high-energy atmospheric physics (HEAP) has been enriched recently by important observations of particle fluxes on Earth's surface, in troposphere and in space. HEAP presently includes 3 main types of measurements: Terrestrial Gamma Ray Flashes (TGFs) - brief burst of gamma radiation (sometimes also electrons and positrons) registered by orbiting gamma ray observatories in the space, Thunderstorm ground enhancements (TGEs) - prolonged electron and gamma ray fluxes (also neutrons) registered on the earth's surface, and gamma glows - gamma ray bursts observed in the thunderclouds by facilities on balloons and aircraft.

The central engine initiating the TGE is believed to be the Relativistic Runaway Electron avalanches (RREA), that accelerates seed electrons from an ambient population of cosmic rays (CR) in the large-scale thundercloud electric fields. Observation of numerous TGEs by Japanese, Russian, Armenian, Chinese, and Slovakian groups prove that RREA is a robust and realistic mechanism for electron acceleration and multiplication leaving no doubts about the correctness of the RREA model for the TGE initiation. Precisely recovered particle energy spectra gives new clues for testing models of electron acceleration in atmosphere, as well as, for scrutinizing the structure of the electric field in thunderclouds. Models using GEANT4 and CORSIKA codes support in situ measurements of electron and gamma ray energy spectra at Aragats. Numerous observations of TGEs made on Aragats during past 11 years can be widely used for the validation of models aimed to explain TGF phenomena.

The relationship of lightning and elementary particle fluxes in the thunderclouds was established on microsecond timescales. The particle flux data, well synchronized with the information on atmospheric discharges give valuable information on the structure of the atmospheric fields in the upper and lower parts of the thunderclouds. Many questions about thundercloud electrification and discharge mechanisms, lightning initiation, propagation and attachment processes, the global electrical circuit, and transient luminous events do not have yet a commonly accepted explanation. The new view of thunderclouds as media full of radiation can help to establish a comprehensive theory of cloud electrification and estimate the possible role of cloud radiation on the climate change. The influence of the electrified atmosphere on the fluxes of electrons and other charged

particles can be important for experiments registering very-high energy photons (Systems of Imaging Cherenkov telescopes) and hadrons (Surface arrays registering Extensive Air Showers. The TEPA meeting is a great opportunity for the scientists to meet, discuss, invent new ideas and make new bridges for collaborative works.

STRUCTURE OF THE SYMPOSIUM:

We anticipate the following sessions:

1. Models of atmosphere electrification and electron acceleration;
Multivariate observations of particles and fields from the Earth's surface, in atmosphere and from space (TGEs, gamma glows and TGFs);
2. Registration of atmospheric discharges by lightning mapping arrays and interferometers;
3. Influence of the atmospheric electric field on measurements of experiments using atmosphere as a target (Surface Arrays and Cherenkov Imaging Telescopes)
4. Instrumentation

We plan also discussions on the most intriguing problems of high-energy physics in the atmosphere and on possible directions for the advancement of the collaborative studies.

Topics to be covered during oral and poster sessions:

- Energy spectra of electrons and gamma rays measured on the earth's surface, in the atmosphere and in the space; their relation to the electron acceleration models;
- Possible relations of the Solar activity and space weather to high-energy physics processes in the atmosphere;
- Registration of wide- and narrowband radio emissions produced by atmospheric discharges and particle fluxes;
- Lightning initiation and its relation to particle fluxes originated in thundercloud;
- Neutron and positron production during thunderstorms;
- SEVAN particle detector network as a tool for the TGE research;
- Methods of remote sensing of thundercloud structure and atmospheric electric fields;
- Lightning monitoring with fast cameras;
- Millisecond length X- and gamma ray emissions from lightning;
- Abrupt termination of the particle flux by the lightning flash;
- Precise electronics for the high-energy atmospheric research;
- Relations to the climate and space weather issues;
- Influence of the atmospheric electric fields on Extensive Air Shower (EAS) and Cherenkov light.
- The possibility of joint observations by space borne and ground-based facilities.
- The global electrical circuit.

ATTENDANCE LIMITATION:

Due to the size of the venue, the number of participants is limited to 40. Therefore, participation in the Symposium is by invitation only. Please, submit an abstract of presentation to apply.

ABSTRACT SUBMISSION:

Abstracts should be submitted electronically on the Symposium website. The deadline for abstract submission is 1 August 2019

REGISTRATION:

Registration to **TEPA 2019** should be done online via the Symposium website. We will provide

participants with their own account on the Symposium website. These accounts will serve for the submission of abstracts, papers for Symposium proceedings and for providing information about accompanying persons.

Registration fees:

- Regular Attendees [300 Euro]
- Undergraduate and Graduate Students [150 Eur]

The fee covers the cost of transportation from and to airport, coffee breaks, as well as the Reception, the Banquet, and excursions.

Accommodation and full board costs:

60 euro per day for single occupation; 40 Euro per day for double occupation.

Payment of the registration fee will be accepted at the Symposium desk upon arrival.

CONFERENCE DEADLINES:

- 1 September 2019 Abstract submission deadline
- 15 September 2019 Contributed presentations selected and participants notified
- 5 October 2019 Symposium program in the Conference site

TRANSPORTATION AND LODGING:

The organizers will provide transportation from/to the Yerevan Airport “Zvartnots”. Information on the arrival date, time and flight number should be sent to the Local Organizing Committee. During the Symposium, the participants will be accommodated at the hotels in Nor Amberd International Conference Center of Yerevan Physics Institute, located on the slopes of Mount Aragats, near the village of Byurakan, Aragatsotn District, Armenia. The Center has a rich tradition of hosting high-energy physics schools and is well equipped for international forums.

CORRESPONDENCE:

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