

# Thunderstorms and Elementary Particle Acceleration

## *TEPA-2015*

### SYMPOSIUM GENERAL INFORMATION

**DATES:** October 5-9 2015

**LOCATION:** Nor Amberd International Conference Centre of the Yerevan Physics Institute,  
Byurakan, Aragatsotn District, Armenia;

**SYMPOSIUM WEBSITE:**

<http://crd.yerphi.am/Conferences/tepa2015/home>

**ORGANIZERS:**

*Cosmic Ray Division of Yerevan Physics Institute, Armenia*

*Skobeltsyn Institute of Nuclear Physics of Moscow State University, Russia*



## **INTERNATIONAL ADVISORY COMMITTEE:**

- Ashot Chilingarian, Yerevan Physics Institute, Armenia, co-chair
- *Lev Dorman*, Israel Cosmic Ray Center and Emilio Segre' Observatory, Israel
- *Joe Dwyer*, Florida Institute of Technology, USA
- *Gerald Fishman*, NASA-Marshall Space Flight Center, Huntsville, USA)
- *Hartmut Gemmeke*, Karlsruhe Institute of Technology, Germany
- *Andreas Haungs*, Karlsruhe Institute of Technology, Germany
- *Johannes Knapp*, Leeds University, UK
- *Karel Kudela*, Institute of Experimental Physics, Slovakia
- *Alexandr Lidvanski*, Nuclear Physics Institute, Russian Academy of Science, Russian Federation
- *Jean Lilensten*, Institut de Planétologie et d'Astrophysique de Grenoble, France
- Evgeny Mareev, Institute of Applied Physics, Nizhny Novgorod, Russian Federation
- Razmik Mirzoyan, MPI, Munich, Germany
- *Yasushi Muraki*, STE laboratory, Nagoya University, Japan
- *Michail Panasyuk*, Moscow State University, Russian Federation, co-chair
- *Marco Tavani*, INAF and University of Rome "Tor Vergata", Italy
- *Tatsuo Torii*, Japan Atomic Energy Agency, Tsuruga, Japan
- *Harufumi Tsuchiya*, Cosmic Radiation Laboratory, Riken, Japan.
- *Lev Zeleny*, Space Research Institute, Russian Academy of Sciences, Russian Federation

## **BACKGROUND:**

The problem of the thundercloud electrification and how lightning is initiated inside thunderclouds is one of the biggest unsolved problems in atmospheric sciences. The relationship between thundercloud electrification, lightning activity, wideband radio emission and particle fluxes have not been yet unambiguously established. One of most intriguing opportunities opening by observation of the high-energy processes in the atmosphere is their relation to lightning initiation. C.T.R. Wilson postulated acceleration of electrons in the strong electric fields inside thunderclouds in 1924. In 1992 Gurevich et al. developed the theory of the runaway breakdown, now mostly referred to as relativistic runaway electron avalanches - RREA. The separation of positive and negative charges in thundercloud and existence of a stable ambient population of the cosmic ray MeV electrons in the atmosphere enables acceleration of the electrons in direction of the earth's surface (Thunderstorm ground enhancements, TGEs) and to open space (Terrestrial gamma flashes, TGFs). Thus both TGEs and TGFs precede the lightning activity and can be used for the research of poorly understood lightning initiation processes providing key research instrument – fluxes of electrons, neutrons and gamma rays originated in the thunderclouds. Information acquired from the time series of TGEs and TGFs along with widely used information on the temporal patterns of the radio waveforms will help to develop both reliable model of lightning initiation and detailed mechanism of electron acceleration in thunderclouds.

## STRUCTURE OF THE SYMPOSIUM:

We anticipate following sessions:

1. Lightning initiation: multivariate observations from the earth's surface;
2. Research of the Thunderstorm ground enhancements (TGEs);
3. Research of the Terrestrial gamma-ray flashes (TGF);
4. Extensive air showers, Lightning and RREA process;
5. Atmospheric High-energy phenomena observations by space-borne facilities
6. Instrumentation

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

Following topics will be covered during oral and poster sessions:

- *Research of the Thunderstorm ground enhancements (TGEs), measurements of electrons, gamma rays and neutrons by networks of particle detectors located on Earth's surface;*
- *Research of the Terrestrial gamma-ray flashes (TGFs) observed by the orbiting gamma-ray observatories;*
- *Radio emissions produced by atmospheric discharges and particle fluxes;*
- *Lightning initiation and its relation to the TGE and TGF;*
- *Large Extensive air showers and ambient population of the cosmic ray electrons – influence on lightning initiation and unleashing of the RREA;*
- *Neutron production during thunderstorms (lightning bolt or photonuclear reactions?)*
- *Ultraviolet and infrared emissions during thunderstorms;*
- *Monitoring of thunderclouds from orbit;*
- *Monitoring of the thunderstorms by high speed cameras from the earth's surface;*
- *Monitoring of thunderclouds from orbit;*
- *Methods of the remote sensing of the thundercloud structure and electric field;*
- *Relation of the lightning occurrences to the TGE and TGF initiation;*
- *X-ray emissions from the lightning;*
- *Relations to the climate and space weather issues;*
- *Possibility of joint observations by space-borne and ground-based facilities.*

## **ATTENDANCE LIMITATION:**

Due to the size of the venue and other restrictions, the number of participants will be limited to 40. Therefore, participation in the Symposium is by invitation only. Registered personnel need to submit an abstract to receive an invitation.

## **ABSTRACT SUBMISSION:**

Abstracts should be submitted electronically on the Symposium website. The deadline for abstract submission is 1 August 2015.

## **REGISTRATION:**

Registration to **TEPA 2015** should be done online via the Symposium website. We will provide participants with their own account on 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 [ 250 Euro ]
- Undergraduate and Graduate Students [ 100 Euro ]

The fee covers the cost of transportation from and to airport, coffee breaks, as well as the Reception the Banquet, and excursions. Payment of the registration fee will be accepted at the Symposium desk upon arrival.

## **SYMPOSIUM DEADLINES:**

- 1 August 2015                      Abstract submission deadline
- 1 September 2015      Contributed presentations selected and participants notified
- 15 September 2015      Symposium program will be announced

## **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:**

Mkrtchyan Hripsime

*Symposium coordinator,*

*Yerevan Physics Institute*

*2 Alikhanyan Brothers st.*

*Yerevan 0036, Armenia*

*Phone: 374-10-352041; 37410-359000 (Nor Amberd)*

*Email: hripsime@yerphi.am*