



www.crd.yerphi.am

MODULATION EFFECTS POSED BY STRONG ATMOSPHERIC ELECTRIC FIELDS OF THE FLUXES OF SECONDARY COSMIC RAYS

A. Chilingarian

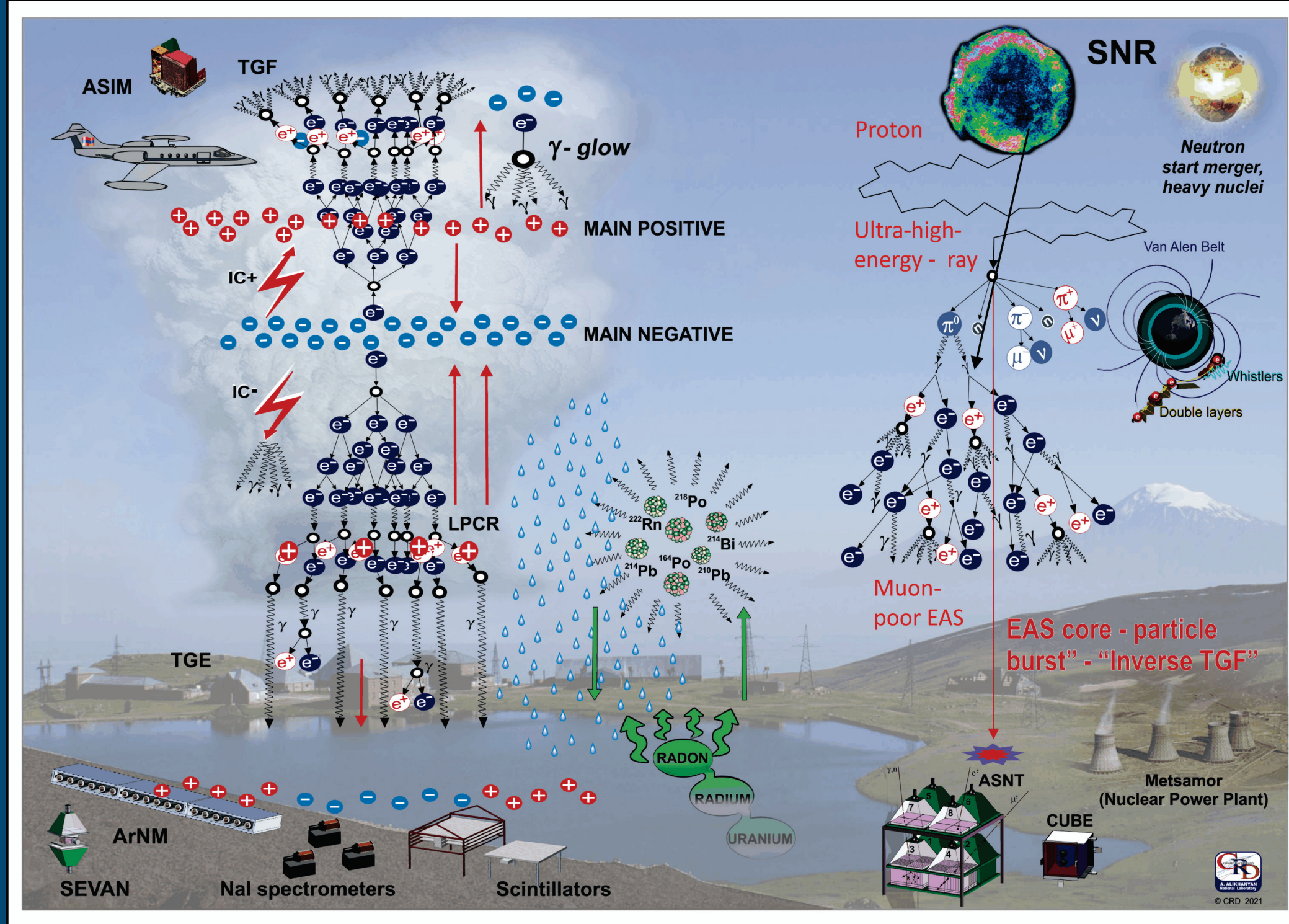
Yerevan Physics Institute, Armenia, Alikhanyan Brothers 2, 0036



37 ВСЕРОССИЙСКАЯ КОНФЕРЕНЦИЯ ПО КОСМИЧЕСКИМ ЛУЧАМ

SCIENCE GOALS AND OBJECTIVES

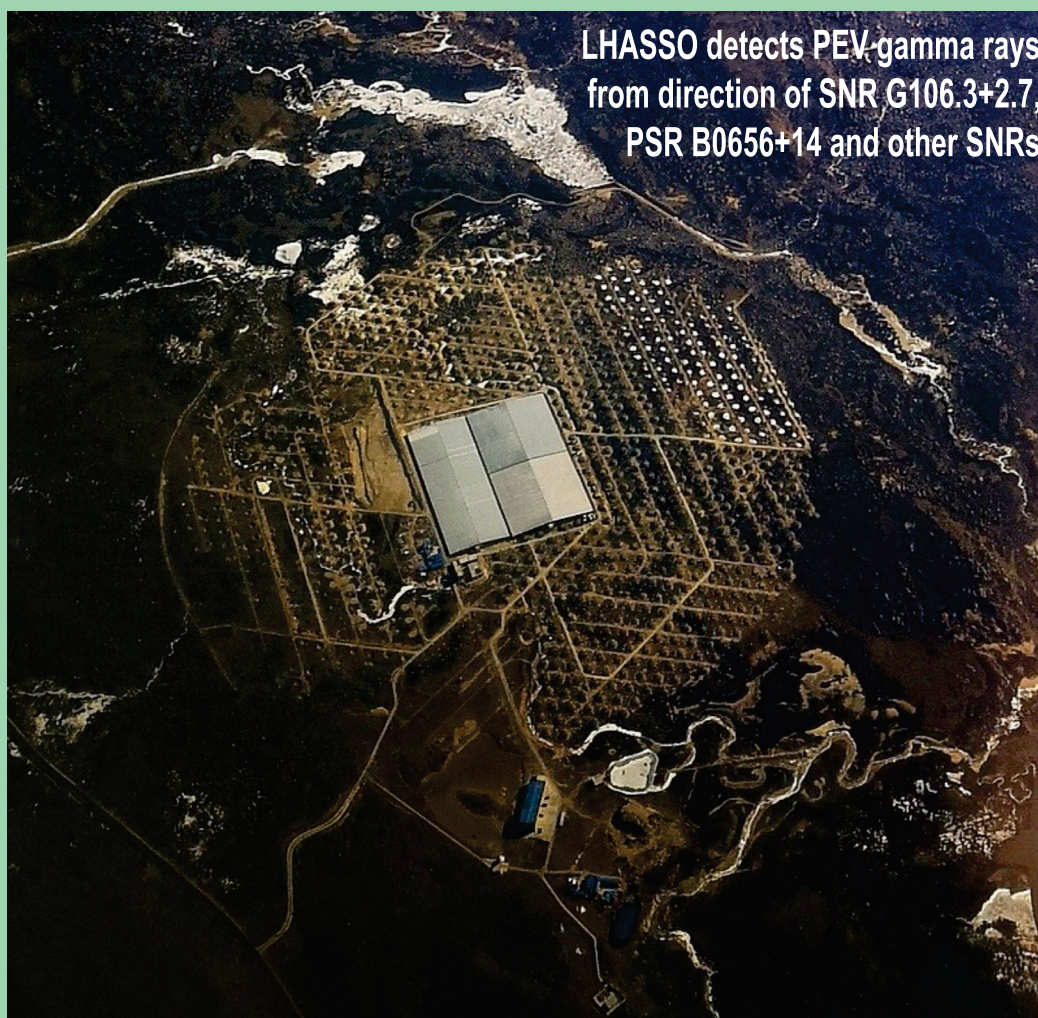
- Models of secondary cosmic ray modulation by strong atmospheric electric fields;
- Vertical and horizontal profiles of the atmospheric electric fields;
- Charge structures in atmosphere supporting the emergence of TGEs;
- Origination of particle bursts measured on the earth's surface;
- Lightning flashes of different energies and types and TLEs and their relation to TGEs;
- Muon stopping effect;
- Influence of electric fields on EASs: ACTs (MAGIC, HESS, CTA) and high-altitude large particle arrays (HAWC LHASO).



Aragats Cosmic Ray station: research of planetary, solar and galactic particle accelerators. Year-round operation from 1943. Coordinates: 40.47N, 44.18E, 3200m a.s.l. Located on highland near Kare lake in the vicinity of Aragsats south peak \approx (3700m), the highest North peak is \approx 4000 m.

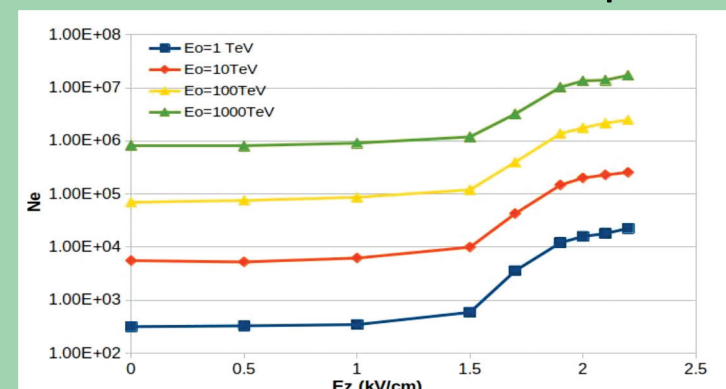
INVESTIGATION STRATEGY/TECHNIQUES

- The synergy of Cosmic Ray physics and Atmospheric physics;
- Continuous monitoring of different species of cosmic rays, electric and geomagnetic fields, lightning locations, meteorological parameters, cloud movements, and TLEs;
- Worldwide networks of identical particle detectors and field meters allowing precise synchronization and mutual analysis of data (Armenian network, East European SEVAN network);
- Possibilities of the online visualization and analysis of the stream of multivariate DATA from hundreds of measuring channels data by the advanced data extraction infrastructure (ADEI platform);
- Electron and gamma ray energy spectra recovering by the scintillation and the Nal crystal spectrometers.

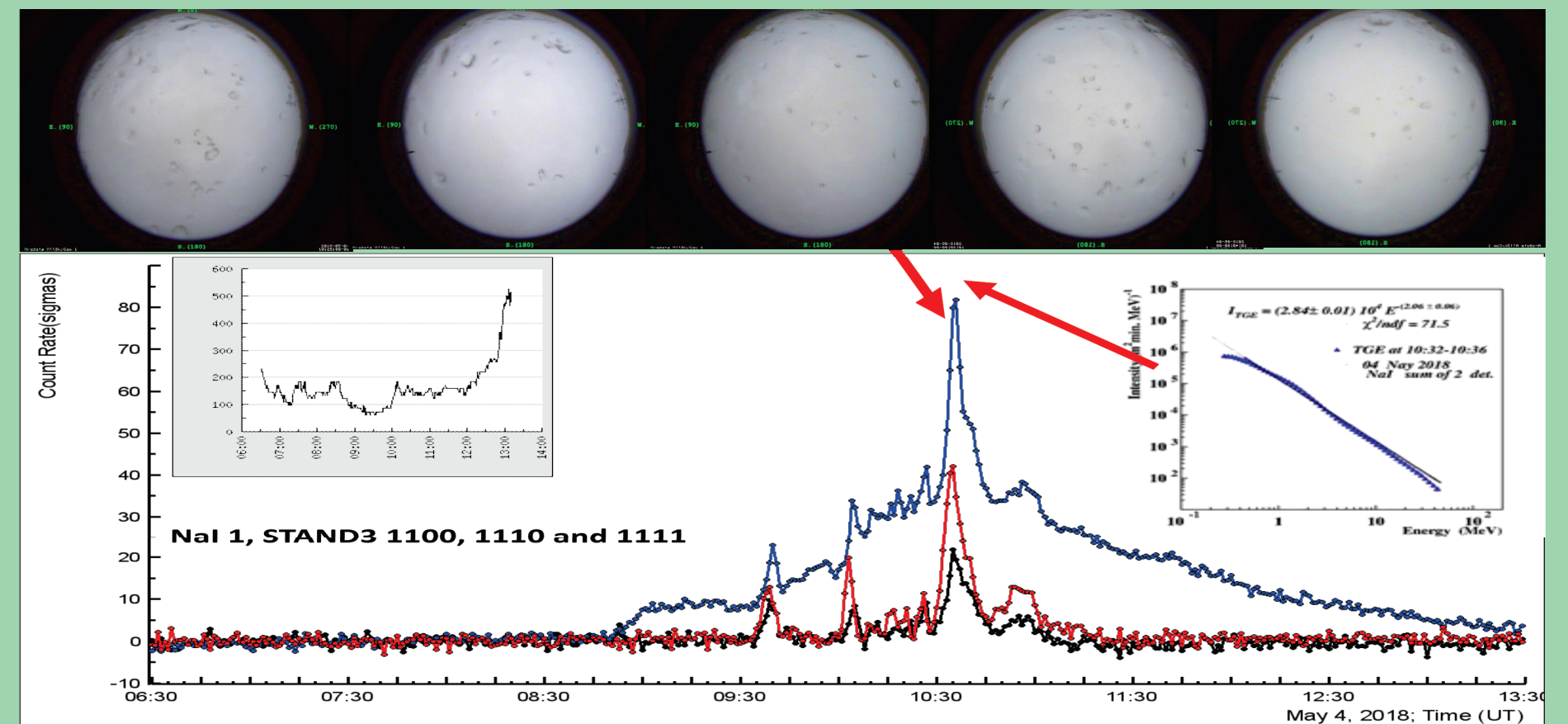


LHASO detects PEV-gamma rays from direction of SNR G106.3+2.7, PSR B0656+14 and other SNRs

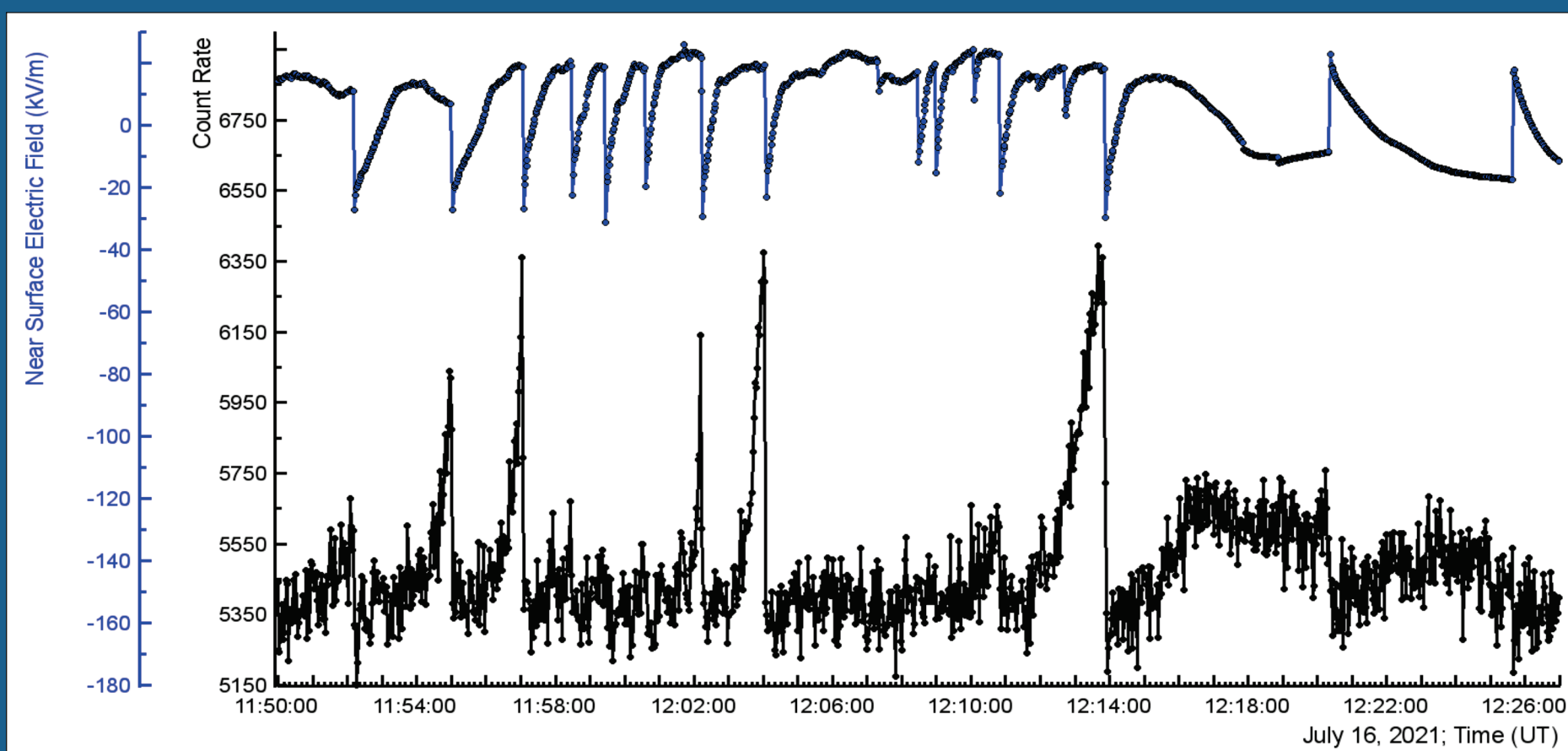
PEVatron detection by LHASO: possible overestimation of primary gamma ray energies if observations were done during thunderstorms often in Tibetan plateau.



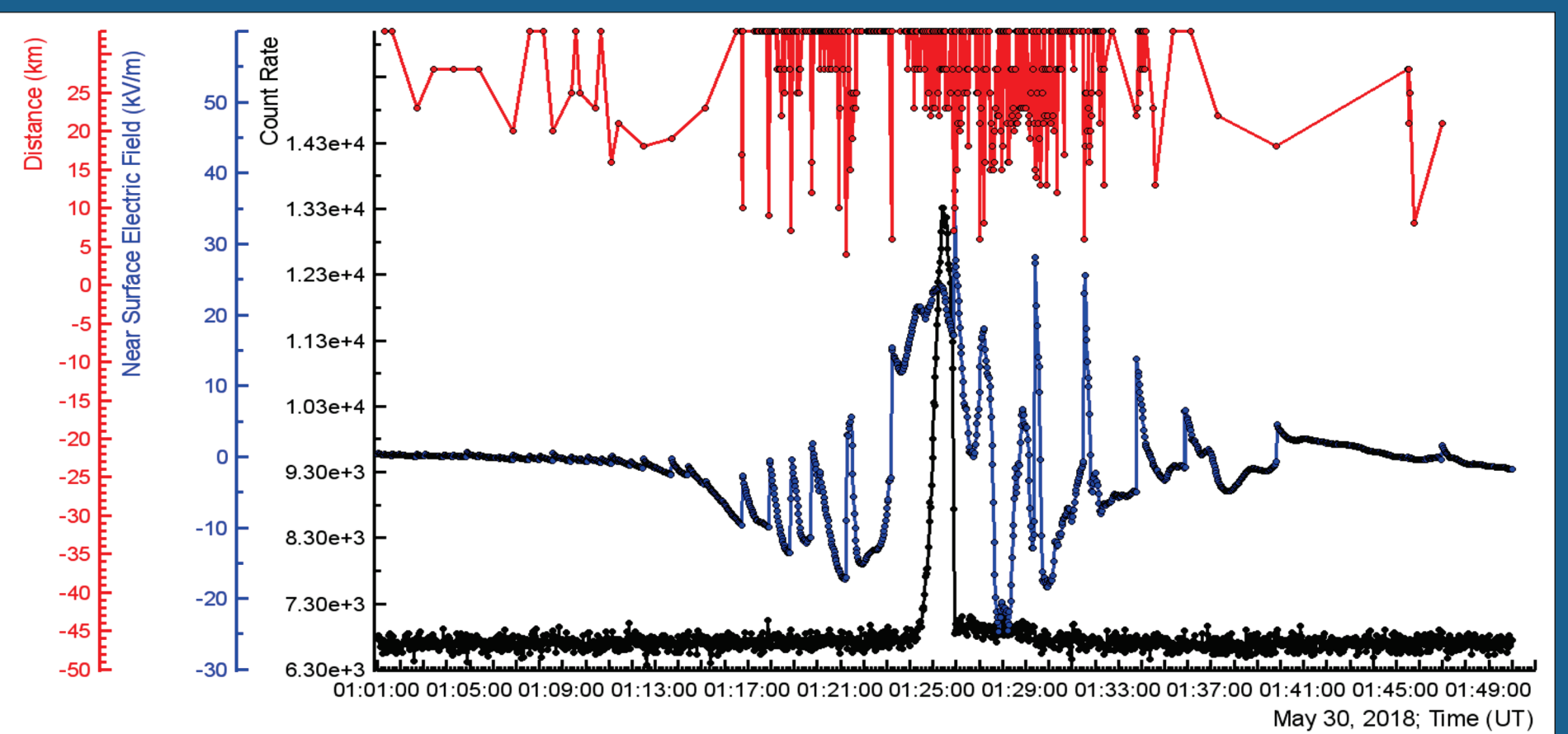
E0 (GeV)	Eest (GeV)
1.00E+03	2.23E+04
1.00E+04	1.34E+05
1.00E+05	6.50E+05
1.00E+06	2.42E+06



Long duration TGEs observed by spectrometers with low energy threshold (\approx 0.3 MeV). Radon progeny gamma radiation: mostly ^{214}Pb and ^{214}Bi : Radon isotopes circulation. Graupel detection.

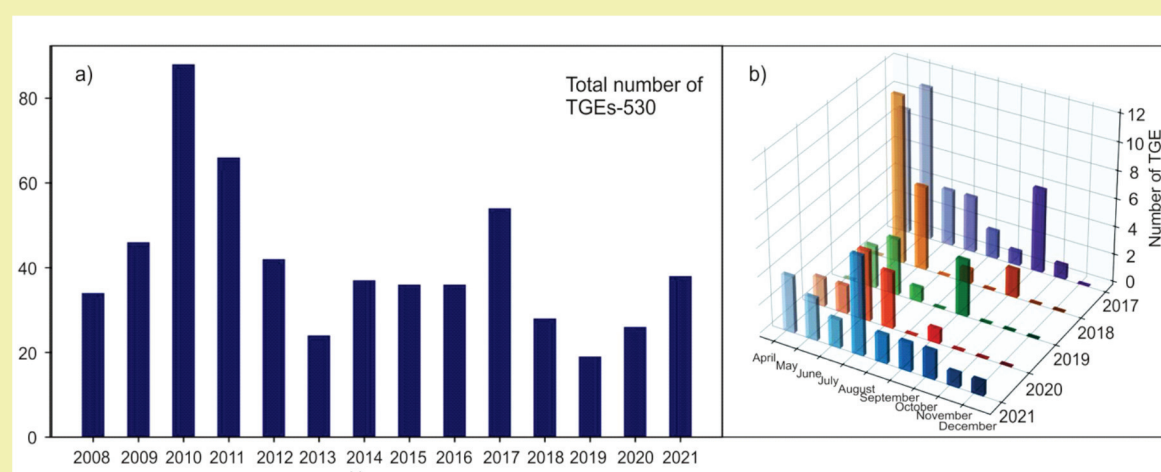


TGE terminations by nearby (distance <10 km) lightning flashes: NSEF disturbances and particle detector count rates

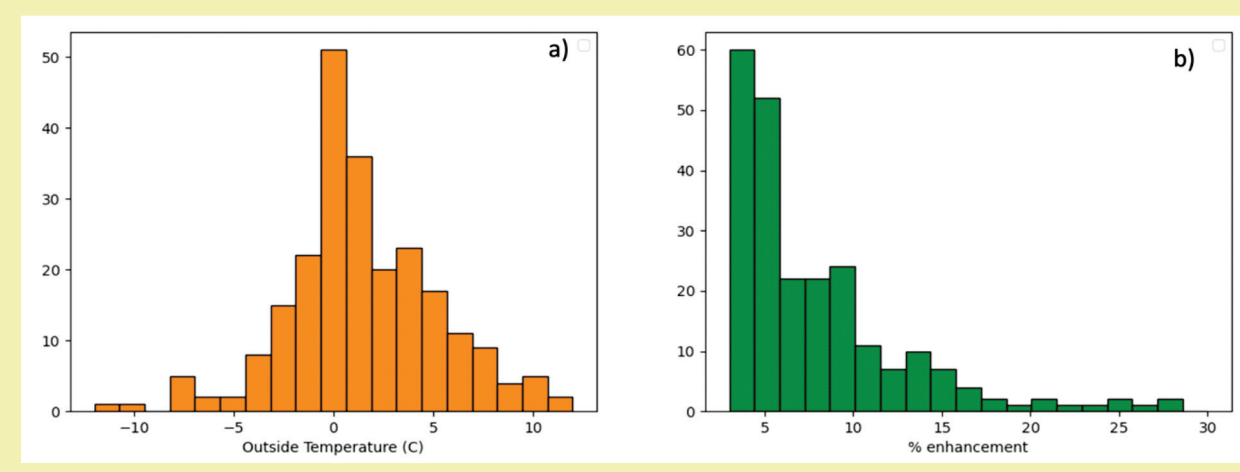


15 years of monitoring of Lightning location, Near-surface electric field (NSEF) and particle fluxes measured by multiple spectrometers...

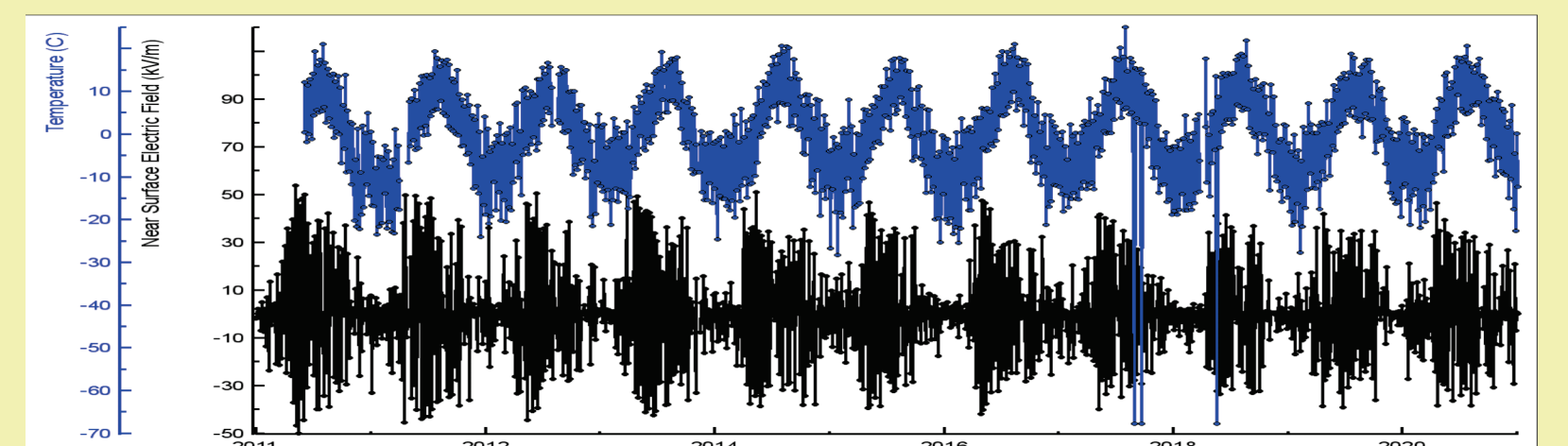
TGE STATISTICS \approx 550 TGES REGISTERED IN 2009-2021



TGE yearly and monthly statistics



a) The distribution of outside temperatures during TGEs; b) distribution of TGE significances by 3 cm thick plastic scintillator of STAND3 detector.



Time series of the NSEF (electric mill EFM-100 by BOLTEK firm, black), and outside temperature (DAVIS weather station, blue)