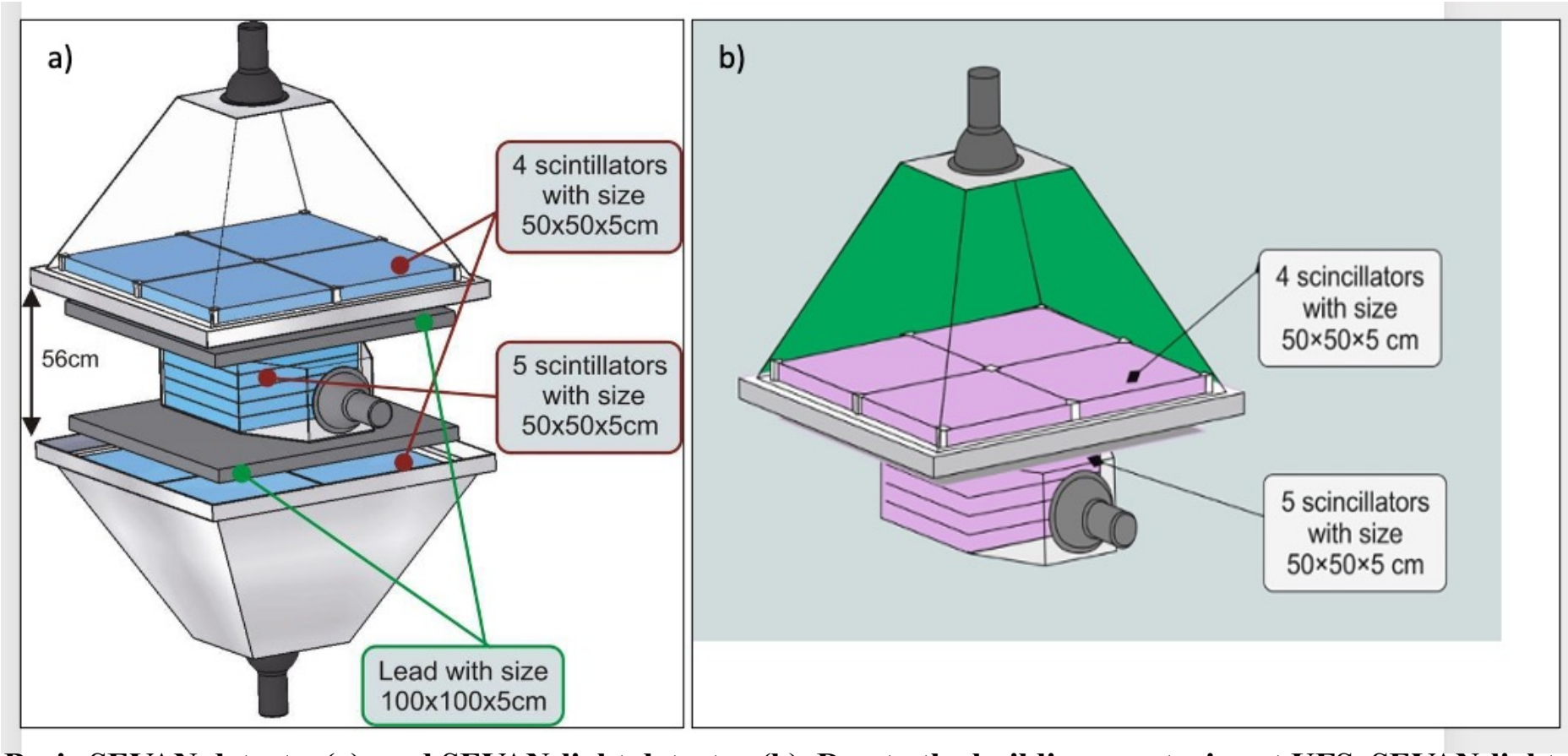
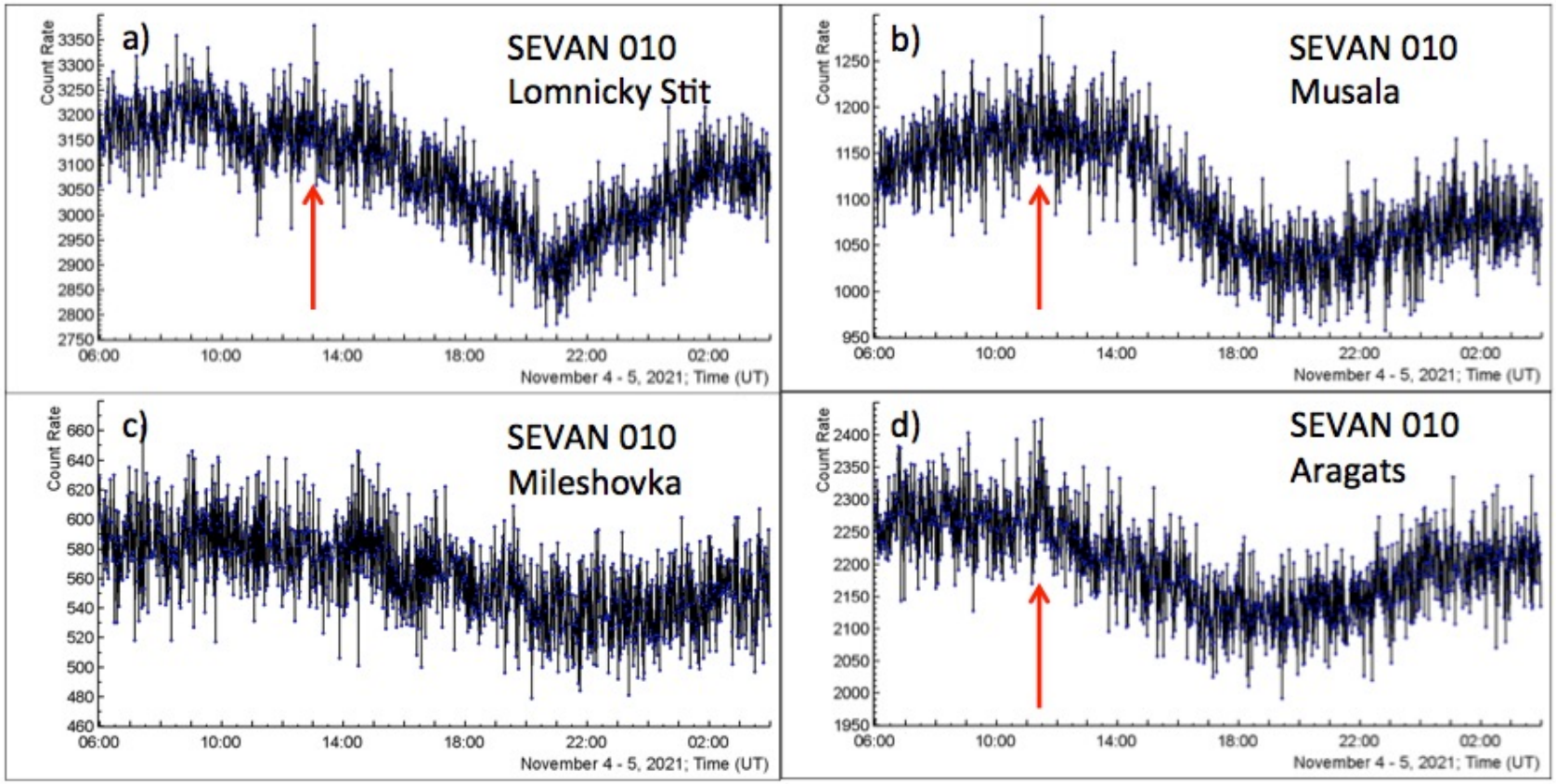
10 SEVAN units expands to 6 countries: in 2023 to be installed on Zugspitse in Bavarian Alps, shown by a big asterisk

Next SEVAN unit will be installed near the top of the Zugspitze (2962 m), a site with a long history of atmospheric research.



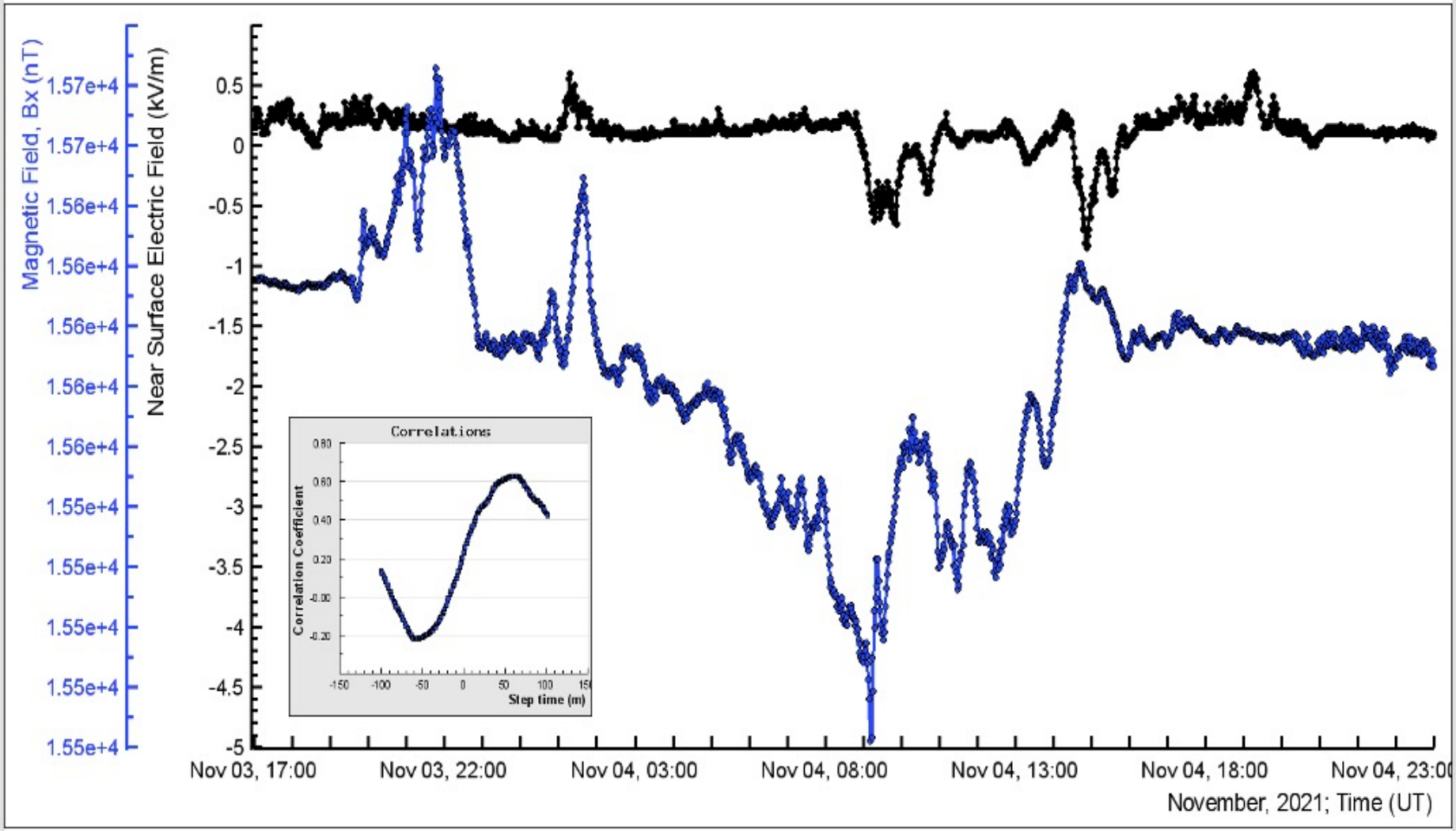
Basic SEVAN detector(a), and SEVAN-light detector (b). Due to the building constrains at UFS, SEVAN-light should be compact, shorter, and much lighter than the basic SEVAN. Thus, SEVAN-light consists only of 2 layers and the lead absorber also is not included (total weight ≈150 kg). However, we add a modernized electronics board with a logarithmic amplitude-to-digit-converter (LADC), which will provide the particle energy spectrum recovery in the range of 0.3-100 MeV. The SEVAN-light will be fully operational for high-energy atmospheric physics research, with the additional feature of measuring the energy spectrum of TGE particles. The cosmic ray variation studies, related to research in solar physics, and space weather domains will be also continued with low-energy charged and neutral particles, and their energy spectra.

1-minute time series of count rates of “010” coincidence of SEVAN layers (mostly neutrons), by arrows we show the “pre-Forbush” count rate enhancement followed by FD at



On 3-5 November 2021, occurred the largest of the current 25th solar activity cycle FD; corresponding GMS unleashed auroras as far low latitude as New Mexico (39N)! SOHO coronagraphs caught the storm cloud leaving the Sun on Nov. 2, following and overtaking a slow-motion solar flare (M1.7) in the magnetic canopy of sunspot AR2891. All coincidences of the SEVAN network registered this FD by its detectors located in Aragats, Lomnicky Stit, Musala, Mileshovka, Berlin, and Hamburg. In Fig. 3 we show FD in 1-minute time series of count rates of the “010” coincidence (mostly neutrons). The FDs at mountain altitudes (Aragats, Musala, Lomnicky Stit, all above 2500 m) are pronounced rather well, better than at lower altitude (Mileshovka, ≈800 m) and at see level (Hamburg and Berlin).

Disturbances of the X component of the geomagnetic field (blue) and near-surface electric field (NSEF, black) during FD. In the inset we show the delayed correlations histogram: NSEF disturbances are late relative to geomagnetic field disturbances by ≈50 minutes.



Last papers from SEVAN network

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- [2]Chilingarian, A., Karapetyan, T., Zazyan, M., Hovsepyan, G., Sargsyan, B., Nikolova, N., et al. (2021c). Maximum strength of the atmos- pheric electric field. *Physical Review D*, *103*, 043021. https://doi.org/10.1103/physrevd.103.043021
- [3] Chilingarian, A., Hovsepyan, G., Karapetyan, G., and Zazyan, M. (2021). Stopping Muon Effect and Estimation of Intracloud Electric Field. Astroparticle Phys. 124, 102505. doi:10.1016/j.astropartphys.2020.102505
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- [5] Chum J, Kollárik M, Kolmasˇová I, Langer R, Rusz J, Saxonbergová D and Strhárský I (2021) Influence of Solar Wind on Secondary Cosmic Rays and Atmospheric Electricity. Front. Earth Sci. 9:671801. doi: 10.3389/feart.2021.671801
- [6] A.Chilingarian, Progress of High-Energy Physics in Atmosphere (HEPA) achieved with the implementation of particle physics and nuclear spectroscopy methods, 2021, 37th International Cosmic Ray Conference, DOI: 10.22323/1.395.0366

Conclusions

- The big advantage of the SEVAN network is that FD is measured in the fluxes of different particles with various energy thresholds. The collaborative efforts of SEVAN network hosts in the measurements of the solar modulation of the GCR on mountain tops in Armenia, Slovakia, Chechia, Croatia, Bulgaria, and now also in Germany were granted by new important discoveries. The 24/7 monitoring of particle fluxes with synchronized networks of identical sensors is supported by the ADEI data analysis that stores the multivariate data in databases with open, fast, and reliable access. The visualization and online correlation analysis of the big data coming from the SEVAN network highly improved the nowcasting and forecasting of violent solar events.

- Calculated purities of the secondary cosmic ray registration for the SEVAN coincidences demonstrate the SEVAN detector's capacity to measure charged and neutral secondary cosmic ray fluxes separately, which is extremely important both for solar and atmospheric physics research. Modernization of SEVAN electronics, allowing measurement of energy spectra of neutral and charged fluxes on a minute time scale, will highly improve network abilities in research of solar modulation and atmospheric effects.

Published in 2022

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- Chilingarian, G. Hovsepyan, T. Karapetyan, B. Sarsyan, and S. Chilingaryan, Measurements of energy spectra of relativistic electrons and gamma-rays avalanches developed in the thunderous atmosphere with Aragats Solar Neutron Telescope, Journal of Instrumentation, 17 P03002 (2022), https://doi.org/10.1088/1748-0221/17/03/P03002.
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