GELATICA NETWORK PHYSICAL PROBLEM:
INVESTIGATIONS OF THE REMOTE EAS PAIRS
(with possible singling out of congenetic showers)

Investigations of properties of Primary Cosmic Radiation (PCR) have led to the need of research of properties of pairs of remote Extensive Air Showers (EAS or simply "showers") generated by the PCR particles in the Earth atmosphere and observed by mutually spaced installations. This new requirement is caused by the fact that some fraction of these EAS pairs (not necessarily the showers of very high energy) can be produced by PCR particles originated in some single interaction in the space. For instance, they could be some interactions of primary protons with interplanetary matter, or disintegration of CR nuclei by solar photon. These particles could produce a set of detectable EAS within a short time interval, separated by large distances and possessing some close arrival directions (**figure 1**). That is why these historically related pairs of PCR particles (the EAS ancestors) and consequently the induced showers can yield additional information on properties of PCR, such as e.g. the PCR chemical composition, interplanetary and interstellar medium properties (e.g. the medium density distribution), and can possibly provide insight into the Dark Matter properties. However, only a few shower-pair examples are known so far. This does not allow determination of phenomenological properties of the flux of such pairs, let alone the properties of their source.

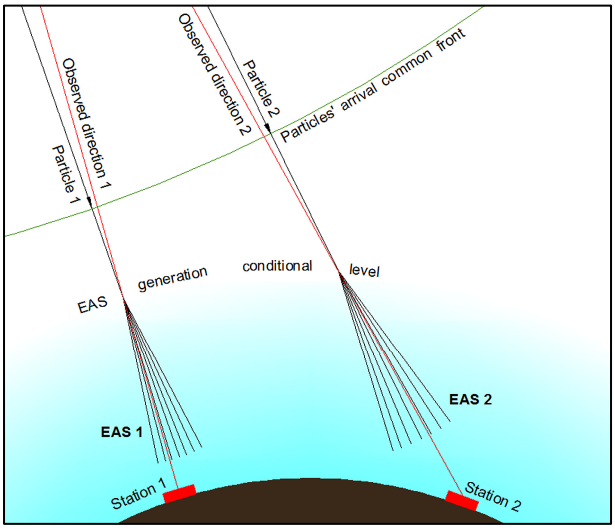

Figure 1. Stations' arrangement upon the Earth surface for the correlated showers' detection is shown.

So long as the observation rate of the historically related EAS pairs is low the big total area of the remote Cosmic Ray (CR) stations for the detection of EAS events is necessary to investigate the problem. That is why some widespread national networks of small-scale, simple and inexpensive CR stations are executing the respective investigations (e.g. shown in «COSMIC RADIATION PHYSICS»). A new international association investigating the problem, i.e. Cosmic-Ray Extremely Distributed Observatory (CREDO), has been organized recently.

The correct investigation needs to establish a selection method for EAS pairs initiated by the PCR particles, possibly spatially proximal in their past. In this case the separated shower pairs can be considered as the desired congenetic EAS couples.

For this purpose the special relativistic invariant kinematic quantities are designed on the basis of available data from two EAS motion characteristics estimated by two remote goniometers, as is described in the part «TWO SHOWERS' PROXIMITY ASCERTAINMENT». These quantities can be used to ascertain the historical proximity of the ancestors of both showers in the pair.

The **G**eorgian **L**arge-area **A**ngle and **Ti**me **C**oincidence **A**rray (GELATICA) network in Georgia is devoted to the problem of ***investigation of the remote EAS pairs***. It has acceded to the CREDO association along with some of the national networks. The CR stations of the GELATICA networks have a capability to detect the arrival direction of the shower in addition to the shower's occurrence time. The ground-based installations with such capabilities hereinafter are referred to as "EAS goniometers" or simply "goniometers".