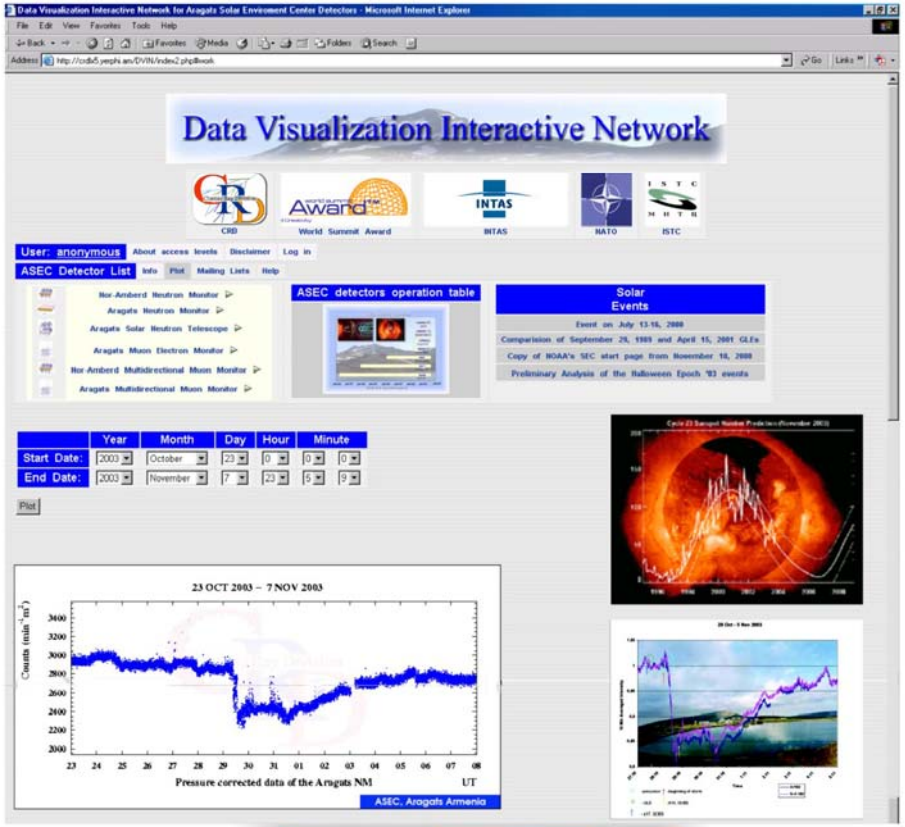
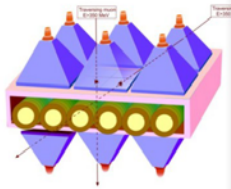
First World Summit on Information Society, December 10, 2003, Geneva

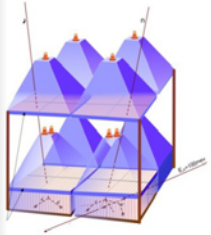
The Data Visualization Interactive Network (DVIN) of the Aragats Space-Environmental Center (ASEC) has been elected by the World Summit Award Grand Jury from 803 nominations presented by 136 countries as one of the 5 best projects in the category of e-Science.



Nor- Amberd Multidirectional Muon Monitor



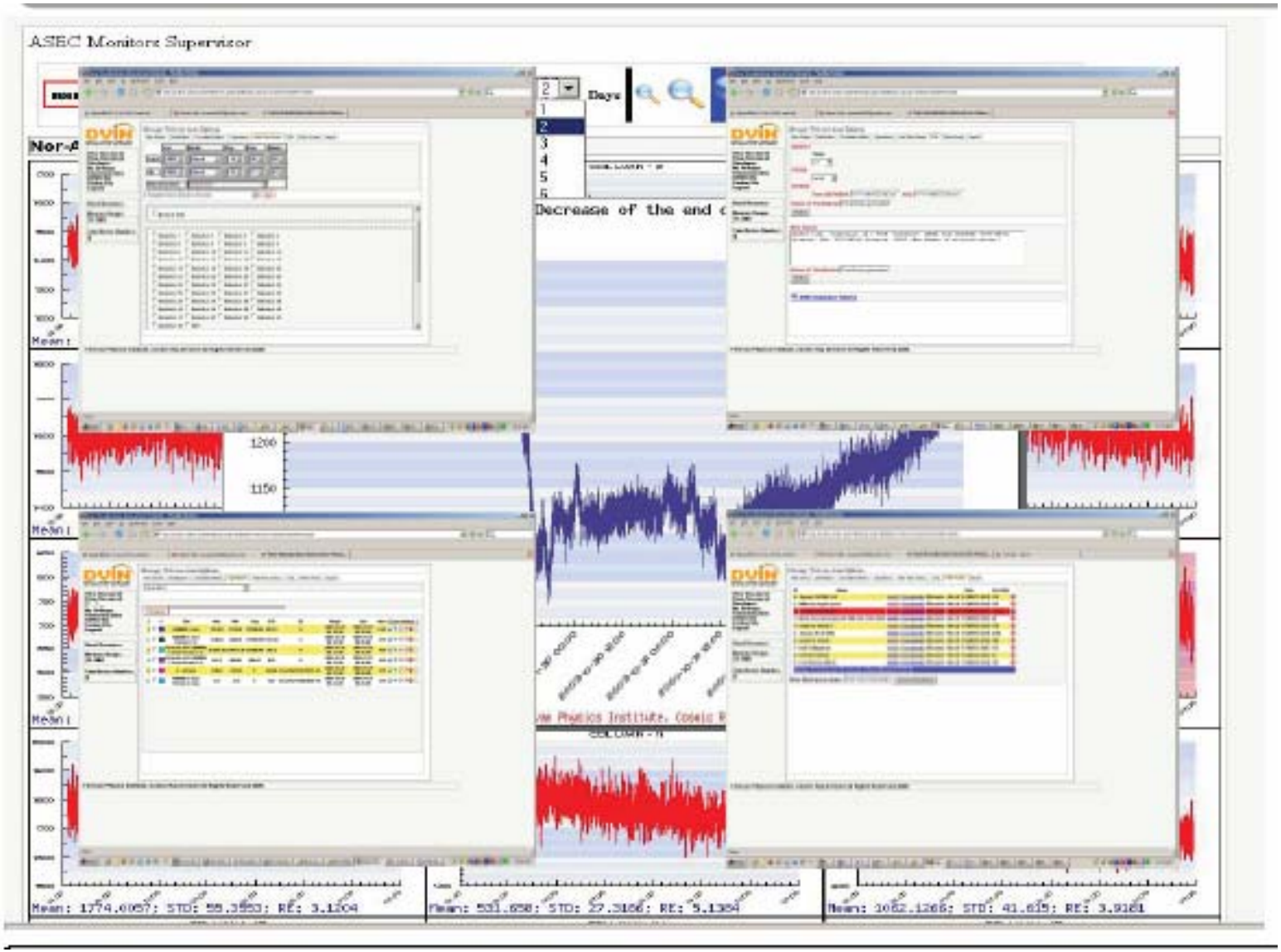
Aragats Solar Neutron Telescope



Cosmic Ray Division of Yerevan Physics Institute, Alikhanian Brothers 2, 375036 Yerevan36, Armenia. Tel. +3741-34-43-77, ASEC@crdlx5.yerphi.am
http://crdlx5.yerphi.am

Second Version of DVIN

DVIN3 – Physical Analysis Station

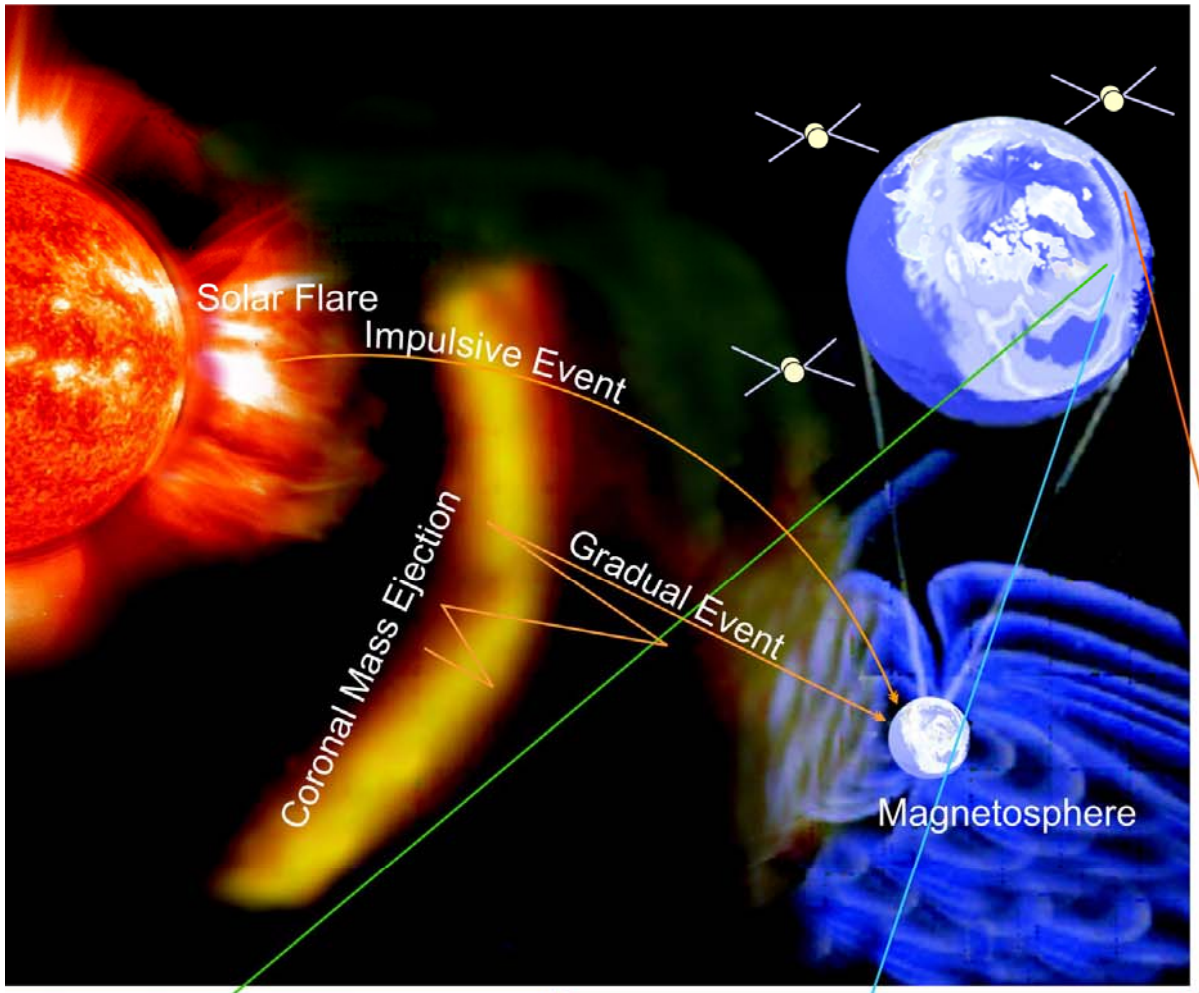


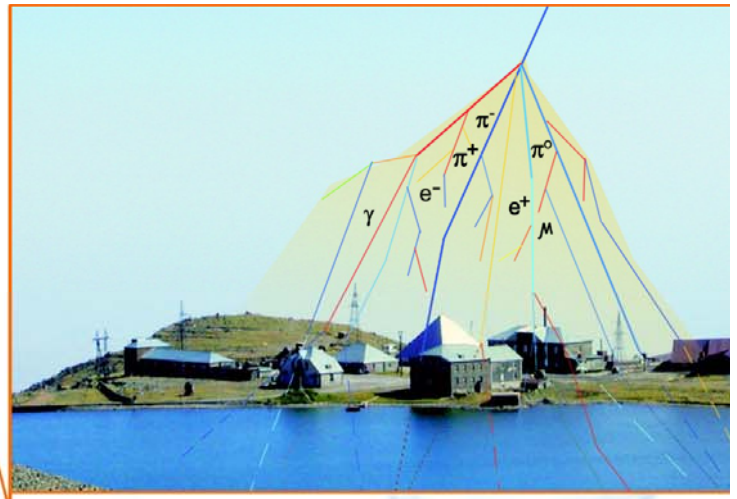
DVIN advantages:

- DVIN is strategically important as a scientific application to help develop space science and to foster global collaboration in forecasting potential hazards of solar storms.
- It precisely fits with the goals of the new evolving information society to provide long-term monitoring and collection of high quality scientific data, and enables adequate dialogue between scientists, decision makers, and civil society.
- The system is highly interactive and exceptional information is easily accessible online. Data can be monitored and analyzed for desired time spans in a fast and reliable manner.
- The ASEC activity is an example of a balance between the scientific independence of fundamental research and the needs of civil society.
- DVIN is also an example of how scientific institutions can apply the newest powerful methods of information technologies, such as multivariate data analysis, to their data and also how information technologies can provide convenient and reliable access to this data and to new knowledge for the world-wide scientific community.
- DVIN provides very wide possibilities for sharing data and sending warnings and alerts to scientists and other entities world-wide, which have fundamental and practical interest in knowing the space weather conditions.

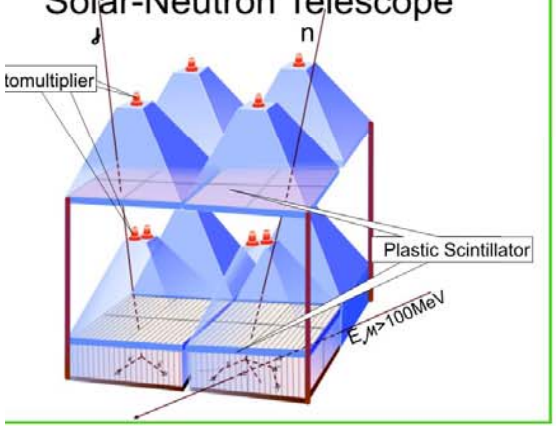
Definition of Space Weather

- Space Weather is a term which has become accepted over the past few years to refer to a collection of physical processes, beginning at the Sun and ultimately affecting human activities on Earth and in space.
- The Sun emits energy, as flares of electromagnetic radiation (radio waves, infra-red, light, ultraviolet, X-rays), and as energetic electrically charged particles through coronal mass ejections and plasma streams.
- The particles travel outwards as the solar wind, carrying parts of the Sun's magnetic field with them. The electromagnetic radiation travels at the speed of light and takes about 8 minutes to move from Sun to Earth, whereas the charged particles travel more slowly, taking from a few hours to several days to move from Sun to Earth.
- The radiation and particles interact with the Earth's (geo)magnetic field and outer atmosphere in complex ways, causing concentrations of energetic particles to collect and electric currents to flow in regions of the outer atmosphere (magnetosphere and ionosphere).
- Space weather phenomena have a variety of effects on technology. Energetic particles thrown out from the sun interact with the earth's magnetic field producing magnetic disturbances and increased ionization in the ionosphere, 100 to 1000 km above the earth.
- The high energy particles affect satellites causing misoperation or equipment damage that can put the satellite out of operation.
- Radio waves used for satellite communications or GPS navigation are affected by the increased ionization with disruption of the communication or navigation systems.
- The magnetic disturbances directly affect operations that use the magnetic field, such as magnetic surveys, directional drilling, or compass use.
- Magnetic disturbances also induce electric currents in long conductors such as power lines and pipelines causing power system outages or pipeline corrosion.

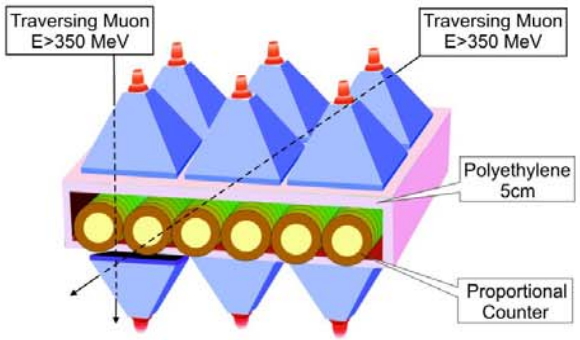




Solar-Neutron Telescope

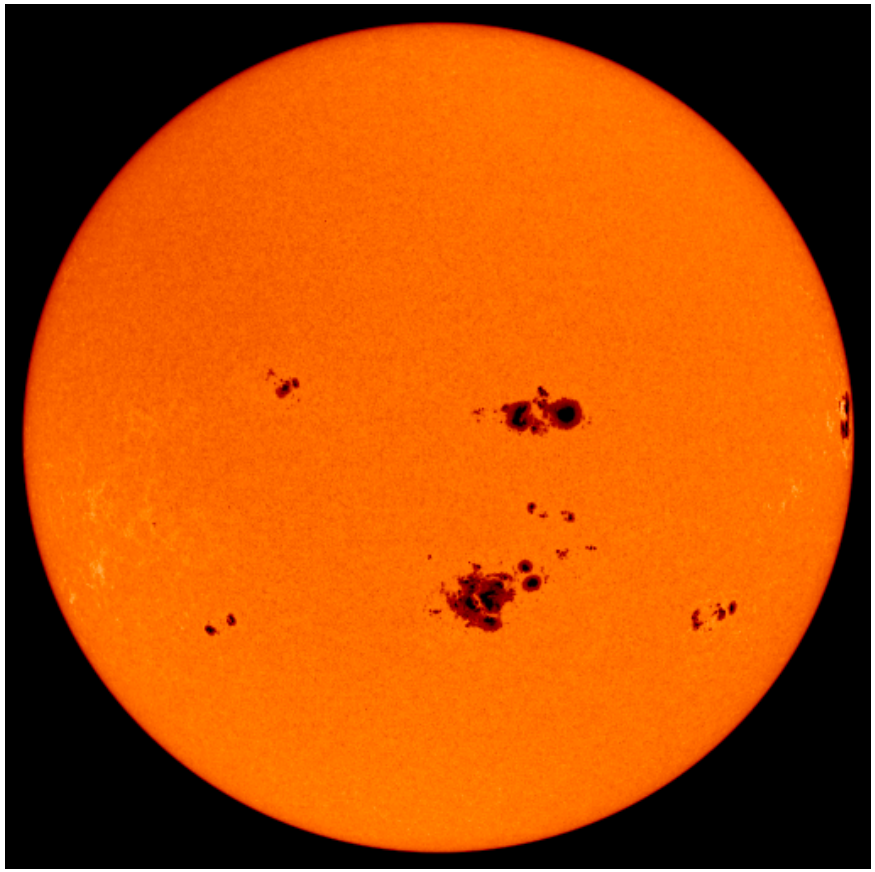


Nor-Amberd Multidirectional Muon Monitor

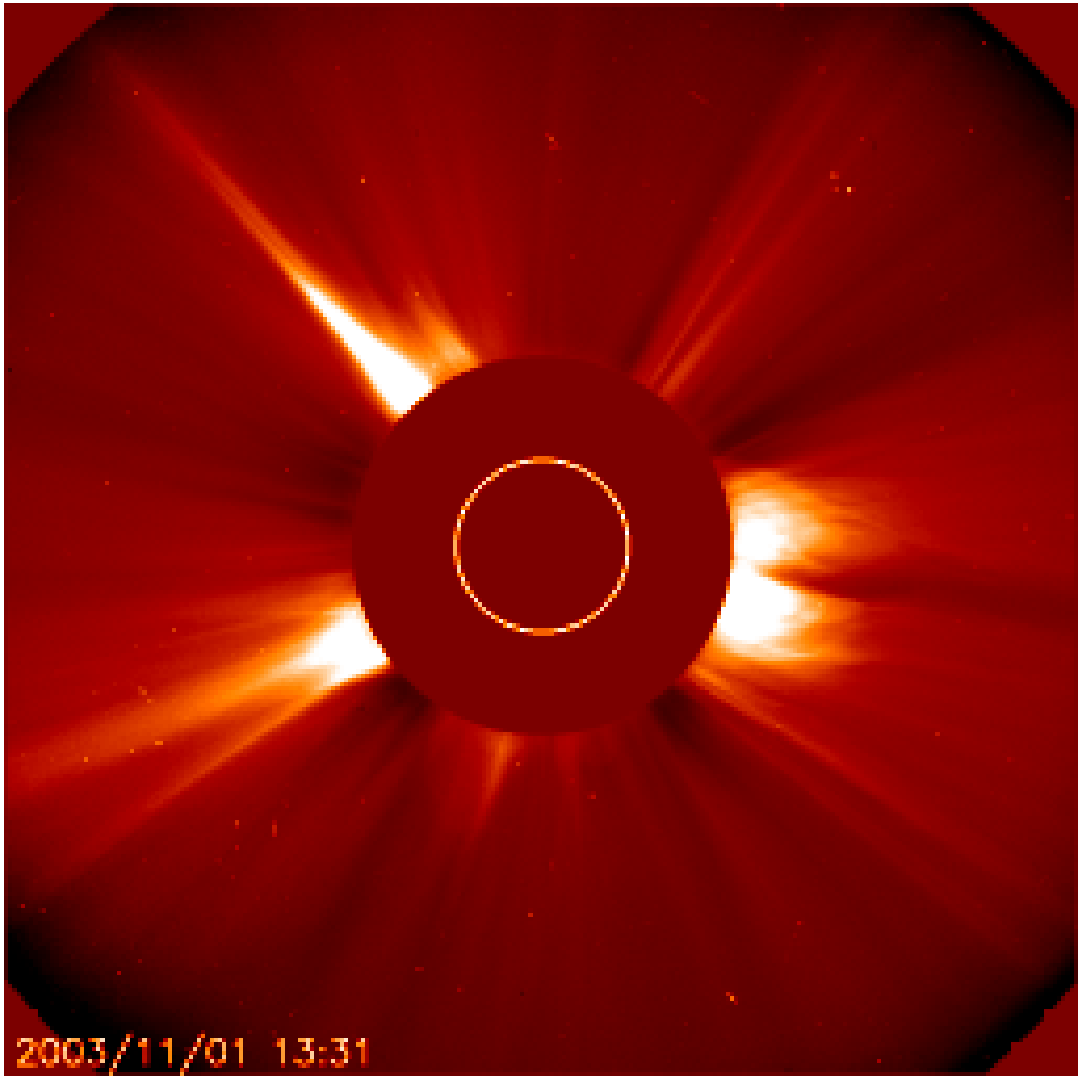


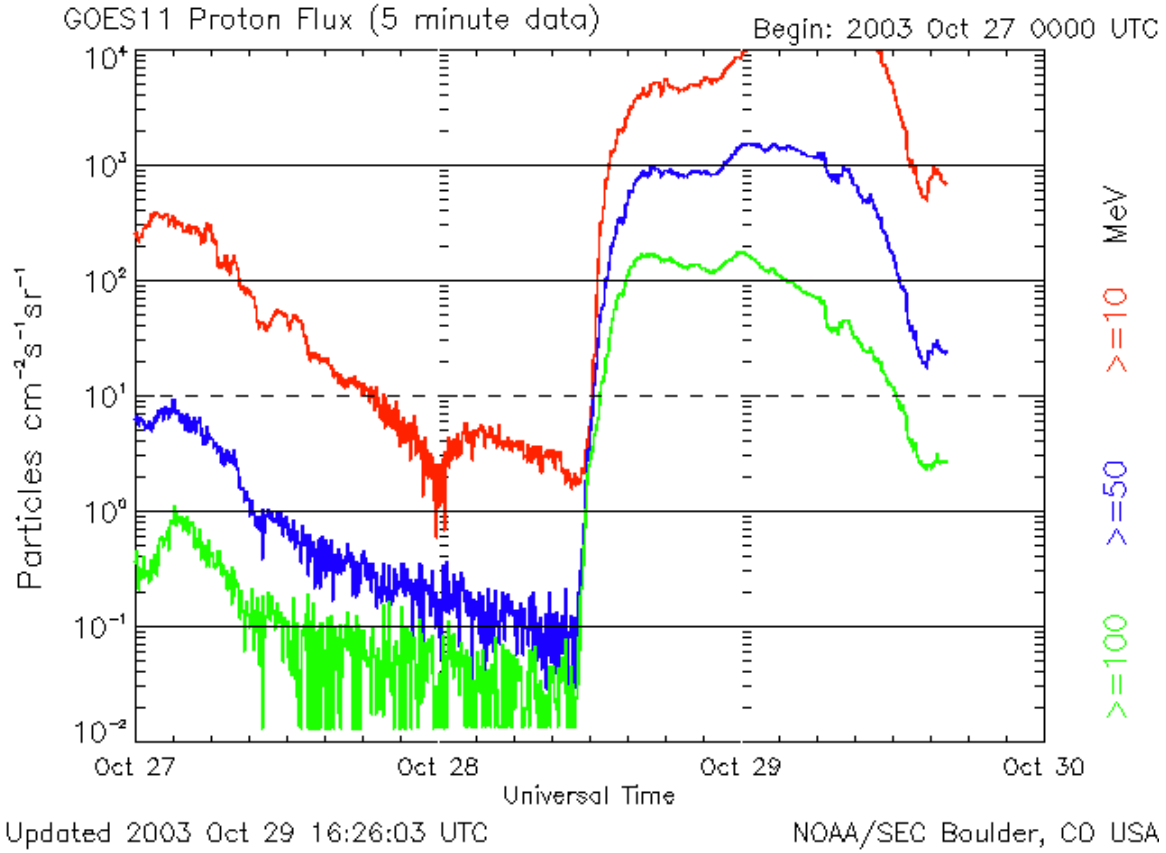
High energy cosmic rays open a window for the exploration of the d
and forceful processes in the far-corners of the universe. The A
Space-Environmental Center (ASEC) of the Cosmic Ray Division in A
http://crdlx5.yerphi.am, conducts research in the field of Galactic Cosmi
and Solar Physics. The two research stations, at 3200m and 2000m el
on Mt. Aragats, are equipped with modern scientific detectors and instr
which allow the scientists to make new discoveries in high energy astrop
The ASEC explores the activity of our own star, the Sun, and is dev
Space Weather forecasting and early warning systems and technique
strategic geographic coordinates of the ASEC research stations and the
based particle detector systems developed by the ASEC scientists, c
with data from detectors in space and on the ground, will allow the interr
community to develop a reliable and global Space Weather forecasting
to protect astronauts and satellites in space and power grids on the grou

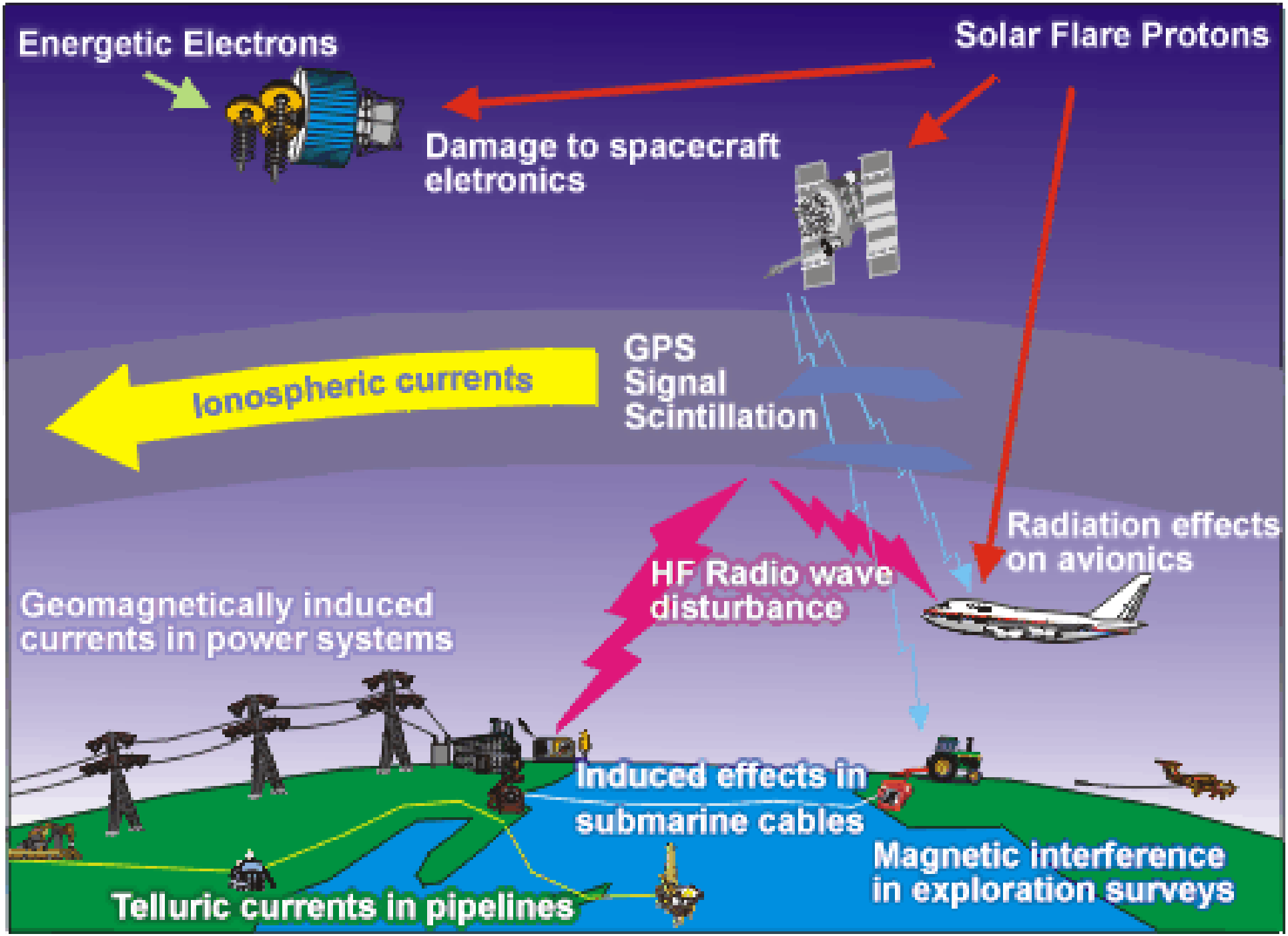
October 30, 486 X11

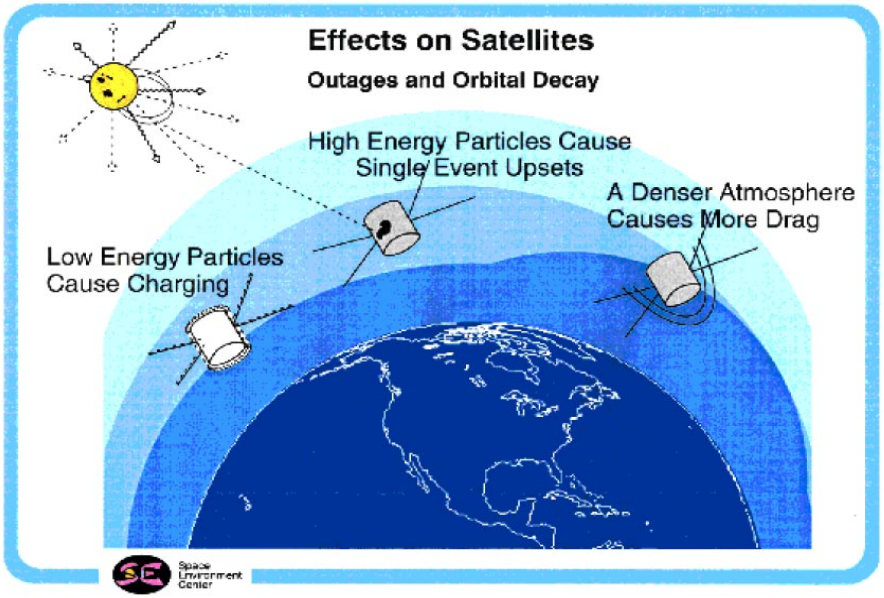


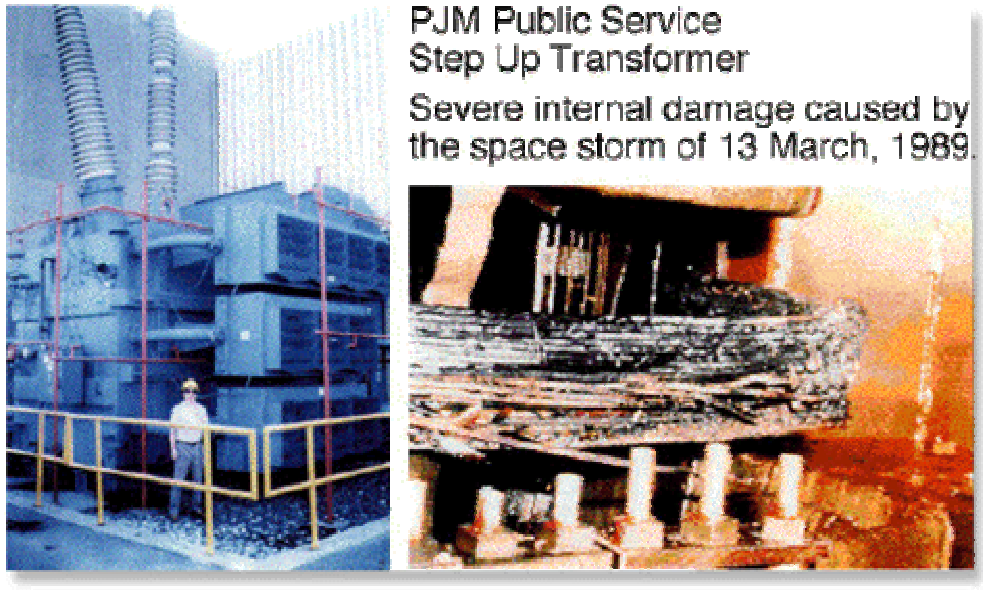
Strongest flare of our era

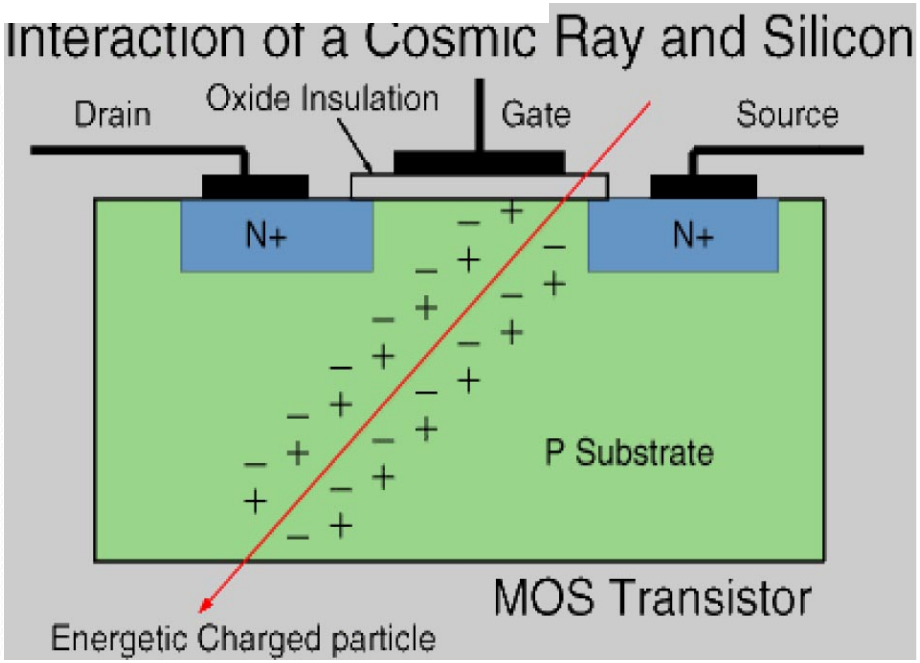



GOES11 Proton Flux (5 minute data)
Begin: 2003 Oct 27 0000 UTC
Particles cm-2s-1sr-1
10⁴
10³
10²
10¹
10⁰
10⁻¹
10⁻²
Oct 27
Oct 28
Oct 29
Oct 30
Universal Time
>=10 MeV
>=50
>=100
Updated 2003 Oct 29 16:26:03 UTC
NOAA/SEC Boulder, CO USA

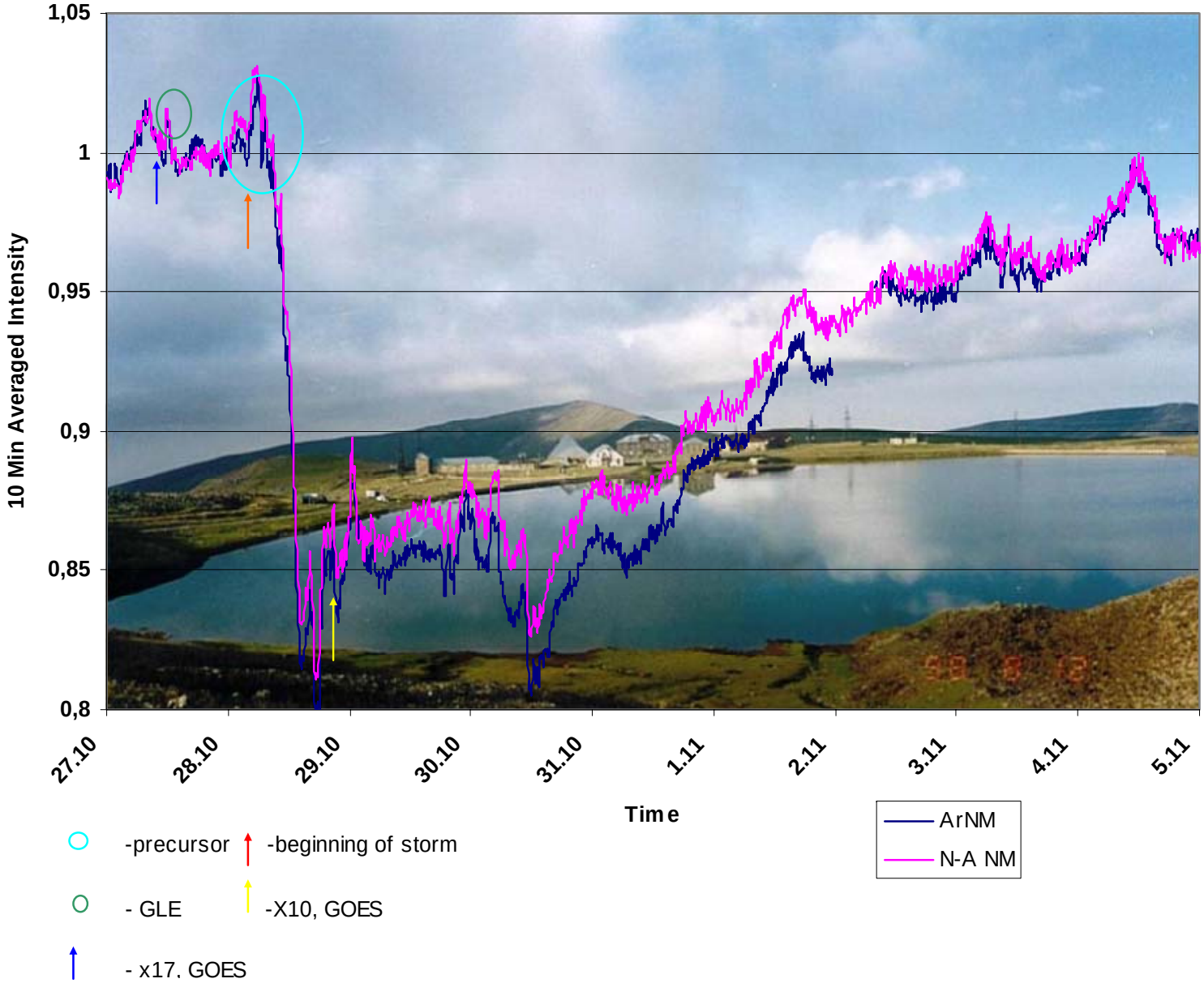

Energetic Electrons
Solar Flare Protons
Damage to spacecraft eletronics
Ionospheric currents
GPS Signal Scintillation
HF Radio wave disturbance
Radiation effects on avionics
Geomagnetically induced currents in power systems
Induced effects in submarine cables
Magnetic interference in exploration surveys
Telluric currents in pipelines


Effects on Satellites
Outages and Orbital Decay
High Energy Particles Cause
Single Event Upsets
A Denser Atmosphere
Causes More Drag
Low Energy Particles
Cause Charging
Space
Environment
Center


PJM Public Service
Step Up Transformer
Severe internal damage caused by
the space storm of 13 March, 1989.


Interaction of a Cosmic Ray and Silicon
Drain
Oxide Insulation
Gate
Source
N+
N+
P Substrate
MOS Transistor
Energetic Charged particle

28 Oct - 5 Nov 2003



Solar Extreme Events: Fundamental Science and applied Aspects (SEE - 2005) International Symposium Nor Amberd, Armenia 26 - 30 September 2005

Topics

- Energetic processes on the Sun during the extreme events
- Propagation of the solar energetic particles and interplanetary CMEs
- Magnetospheric response to the solar extreme events
- Methodologies of forecasting of space weather conditions Effects of Space Weather on technology infrastructure and human environment

Co-sponsored by COSPAR, ISTC, NFSAT, YerPHI, WEB - limited, SCACRD

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Nor Amberd Declaration, September 2005

- Today, when humanity evidenced so many natural disasters, international community should recognize that it is crucial to establish an effective global warnings system to deliver alerting against impending catastrophic events. Available technologies should be put to better use to save lives, health and property.
- People and governments around the world have not only right to get up-to-date information about the state of the environment, earth and the sun, but, taking into account new emerging possibilities of Information Communication Technologies (ICT), should be entitled to receive timely warnings about impending natural disasters to be ready to encounter them.
- Today, advances of science allow effective gathering of large amounts of critical data. Scientific networks monitor environment for natural and man-made hazards, such as the atomic bomb testing monitoring, or solar activity monitoring. These existing networks already have enormous possibilities to warn against such hazards as impending earthquakes or solar storms. Humanity has developed also infrastructure for quick and efficient information delivery.
- What is missing is the global system that will timely deliver to end users information obtained by scientists, informing people and governments about hazards, and allowing them take steps to avoid or minimize their risks. The humanity needs to make this step urgently.
- Realizing that severe outbreaks of solar activity might happen any time, regardless of the solar cycle phase, signatories of this declaration urge world governments to take immediate steps to create the global network of solar detectors registering the solar activity and providing with the real-time monitoring of our star.


INTERNATIONAL HELIOPHYSICAL YEAR
IGY
1957
IHY
2007


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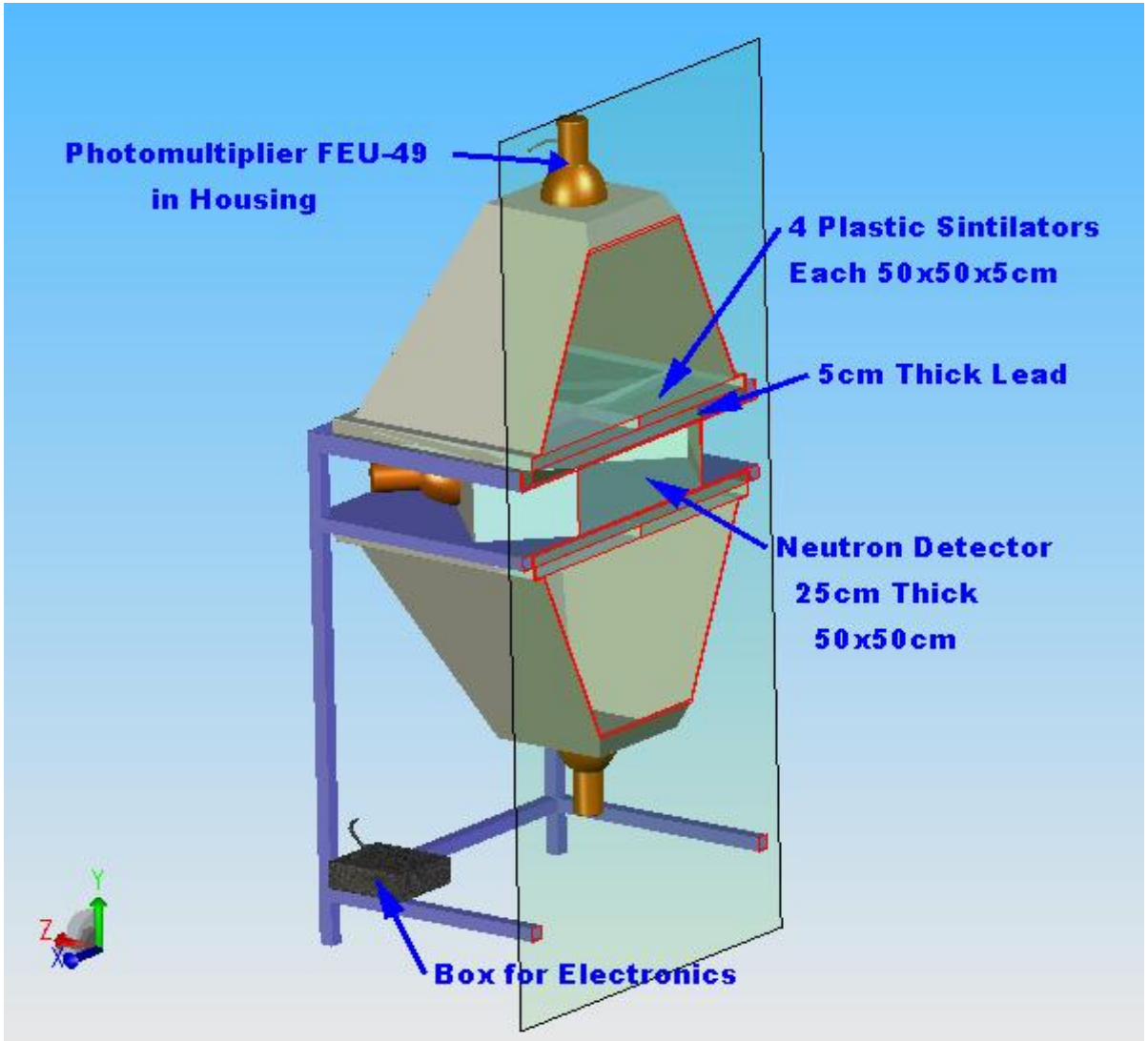
Space Environment Viewing and Analysis Network (SEVAN)

Sevan Detector



Conclusion: Network expansion

- Networks for data exchange for professionals;
- Networks for creating new knowledge and for education purposes;
- Networks for informing society about crucial scientific results on changing environments;
- Global warnings systems to deliver alerting against catastrophic events.