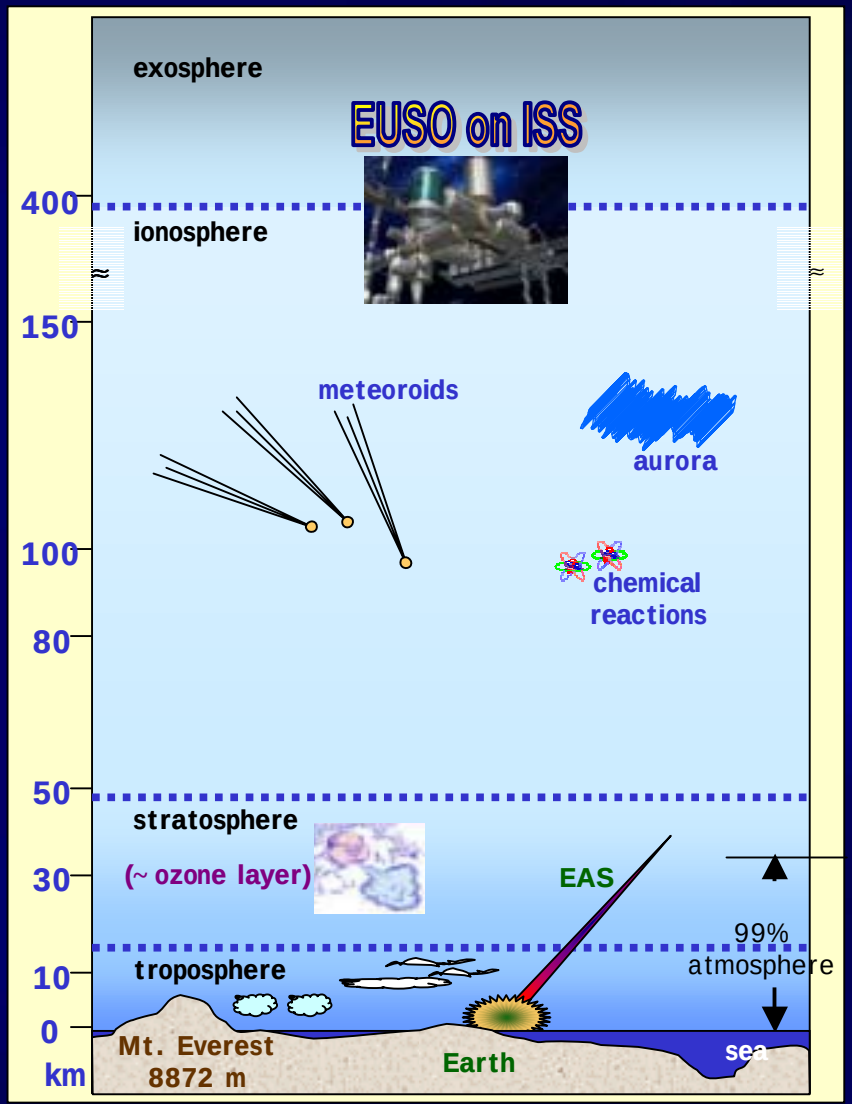
Scientific Data Analysis: data content, s/w environment

Housekeeping

Scientific data

Ancillary

Scientific Data Analysis: data content



"Certifying" *EUSO* events

⇓

Instrument calibration

EUSO lab environment

⇕

Earth's atmosphere

-- not modifiable! --

Instrumental response

⇑

Environmental parameters

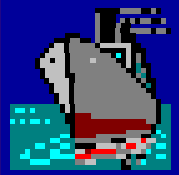
- ✓ **Ozone layer** *(UV absorption)*
- ✓ **Clouds** *(hiding UV and/or Cherenkov signal)*
- ✓ **Earth surface** *(Cherenkov)*
- ✓ **Temperature and pressure** *(fluorescence yield)*
- ✓ **Winds** *(dusts, aerosol, microparticles transport)*

variable with the seasons and with the geographical coordinates

Scientific Data Analysis: data content

"**Certifying**" ***EUSO*** events ⟷ background discrimination

Man-made sources



Ships

Airplanes

very slow moving sources

City Lights

attitude ISS information, geographical databases and maps

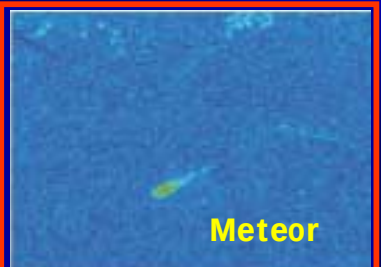
Transient natural phenomena

Lightning

meteorological conditions

Aurora

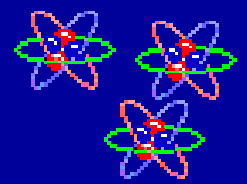
direct or scattered



Meteor

different duration and propagation speed

Constant sources



Chemical reactions

depend on the local oxygen density

Starlight & Moonlight

reflecting surface, moon phases

Scientific Data Analysis: data content

Part of the information needed for the calibration and scientific data analysis will be measured on-board ("scientific and housekeeping data").

External distributed information ("ancillary data") will be necessary to complete the knowledge of the observation conditions and to "certify" *EUSO* events.

Main source of "information"

- ***EUSO* data: EECR/ν and atmosphere sounding (Lidar)**
- **ISS data (time, attitude)**
- **geographical maps and databases**
- **moon phases**

As much of this information as possible should be included in the final *EUSO* products for a proper scientific analysis.

Scientific Data Analysis

During *EUSO* Phase A

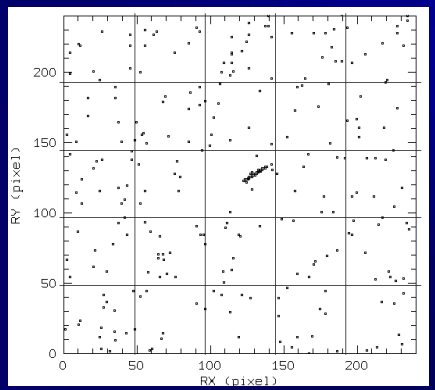
the Data Analysis Subsystem must be mainly devoted to:

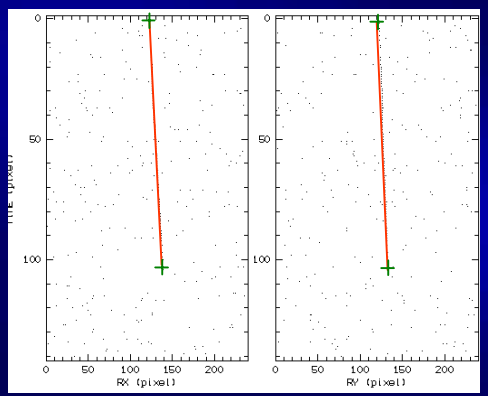
- **definition of data content, size, and telemetry**
  - ***EECR/ν, atmosphere sounding (scientific and housekeeping)***
- **definition - first development of a data analysis package**
  - ***to reconstruct simulated data,***
  - ***to study the EUSO instrumental response, and then***
  - ***to help the optimisation of the instrument design itself***
- **following a time schedule in accordance with the rest of *EUSO* Phase A.**

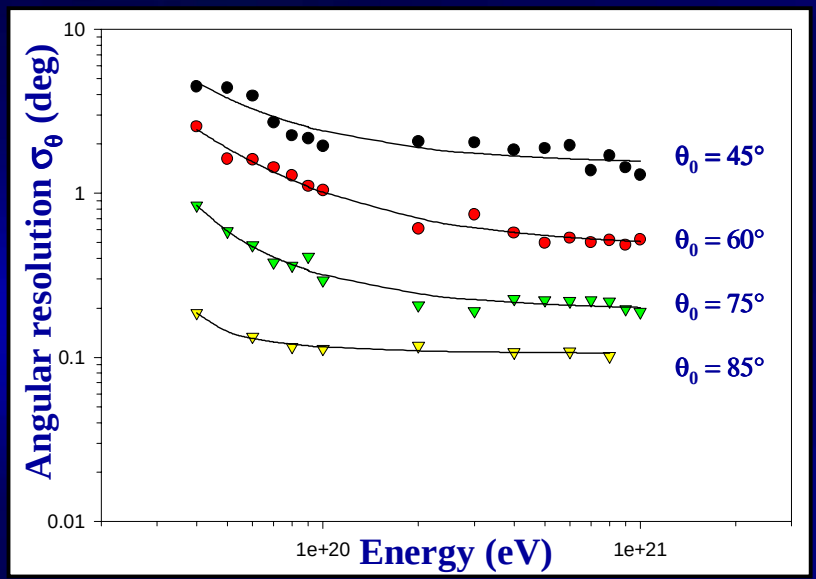
Scientific Data Analysis: track reconstruction

Arrival direction → CARMF algorithm *(Maccarone, 1999)* *under improvement*

Geometrical combination of the slopes of the linear significant tracks along the two projection planes, taking into account the kinematics of the shower.

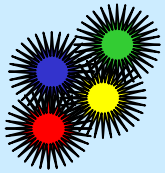






Energy reconstruction → *work in progress (first results during Phase A)*

Scientific Data Analysis: s/w environment



ROOT

suggested as **good candidate** for the

EUSO simulation and analysis software package

both for the file format and the environment features

- **interface to the standard astronomy formats (FITS, IDL)**
- **automatic documentation generation**
- **adopted by ground-based (Hess, Auger, Argo, Borexino) and space-based (Integral, GLAST) observatories as general S/W environment or for some specific tasks**

Scientific Data Analysis: data content, size, telemetry, analysis

Strict correlation with the other *EUSO* Subsystems, mainly:

- **"Trigger & OBDH"**
- **"Atmosphere Sounding"**
- **"Simulations"**
- **"Ground Segment"**

Who is part of the *EUSO* Subsystem 10 on "Scientific Data Analysis"?

EUSO Meeting
Annecy
2-5 October 2001

EUSO Meeting, Annecy, 2-5 October 2001