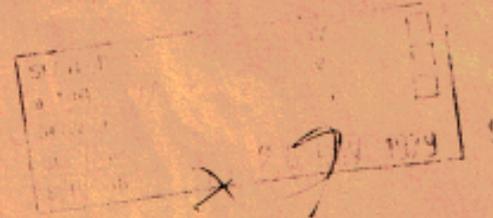


Usi pratici dei RC ?

Sydney, Australia.
October 29th, 1979.



Sir/Gentlemen,

Recently, a lot has been reported in the media about cosmic rays' particles. Being very interested in this fascinating subject, I'd appreciate it very much if you were kind enough to answer the following questions:

1. Is it possible to collect effectively and use practically cosmic rays' particles in the form as they come from the space and galaxies and, if the answer is "yes", for what purposes?
2. Is there in existence any portable equipment capable of collecting these cosmic rays' particles in the form as they come from the space and galaxies?

If possible, I's also appreciate very much if you could refer me to most recent (and understandable to a layman) information on cosmic rays in general. Thank you.

Sincerely yours,

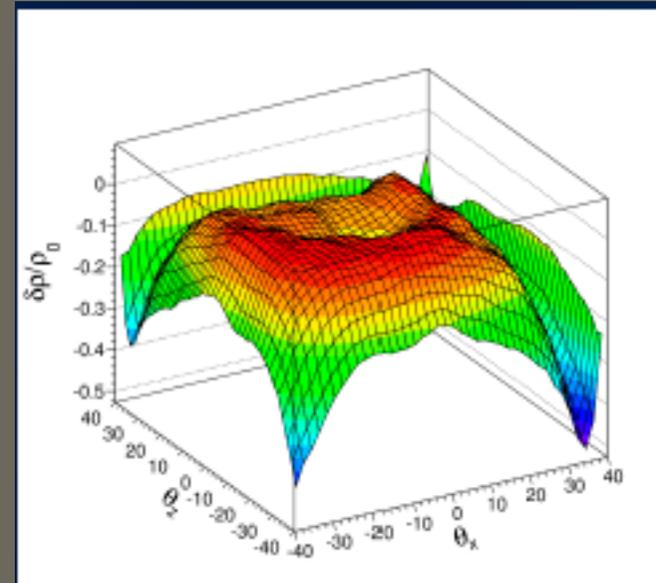
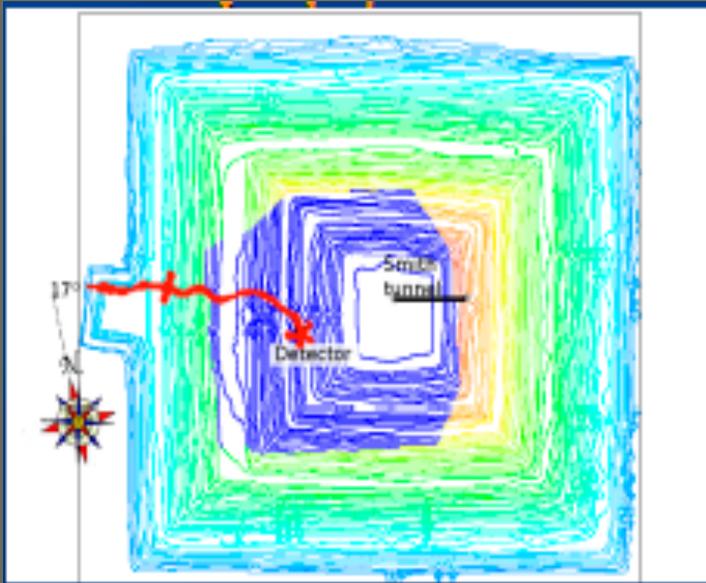
J. GRAY
P.O. Box 313
DARLINGHURST, 2010
N.S.W. Australia.
Tel: SYDNEY (02) 334774

Stanze nascoste nelle piramidi

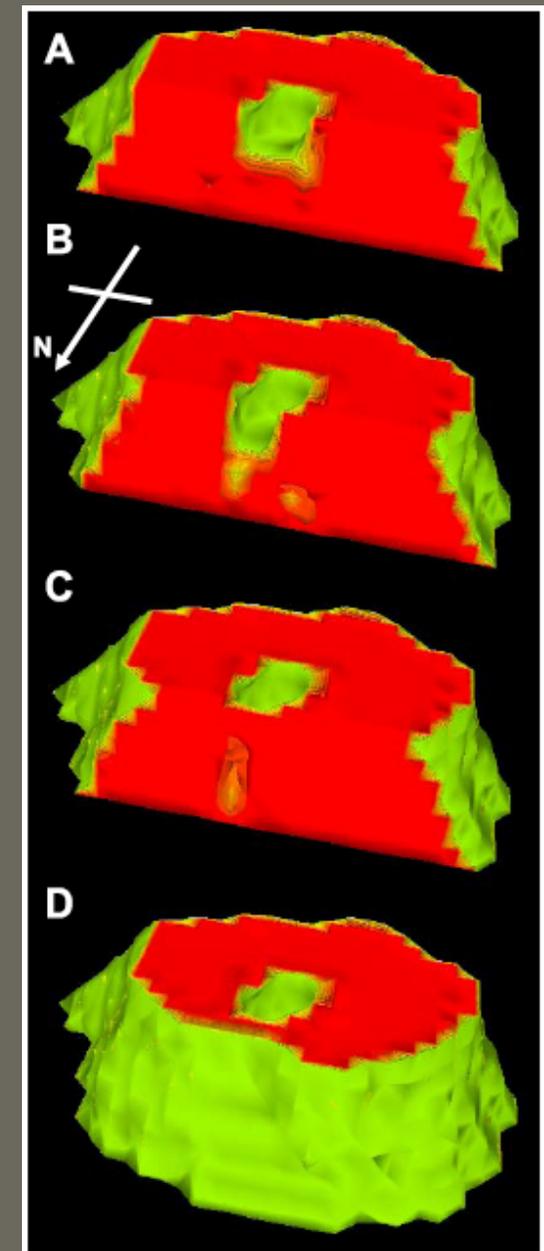
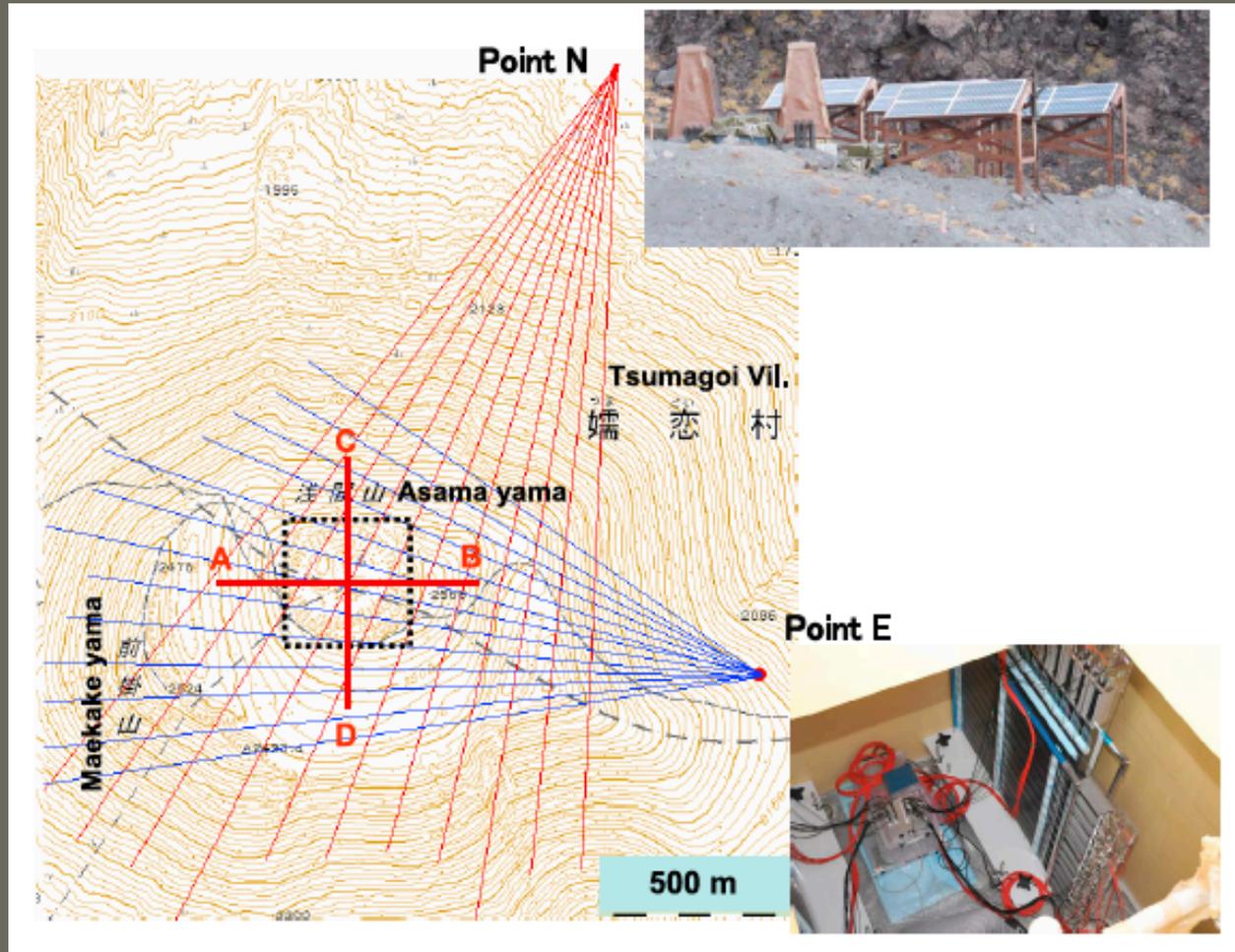
(Alvarez, piramide di Chephren, Egitto, 1970)

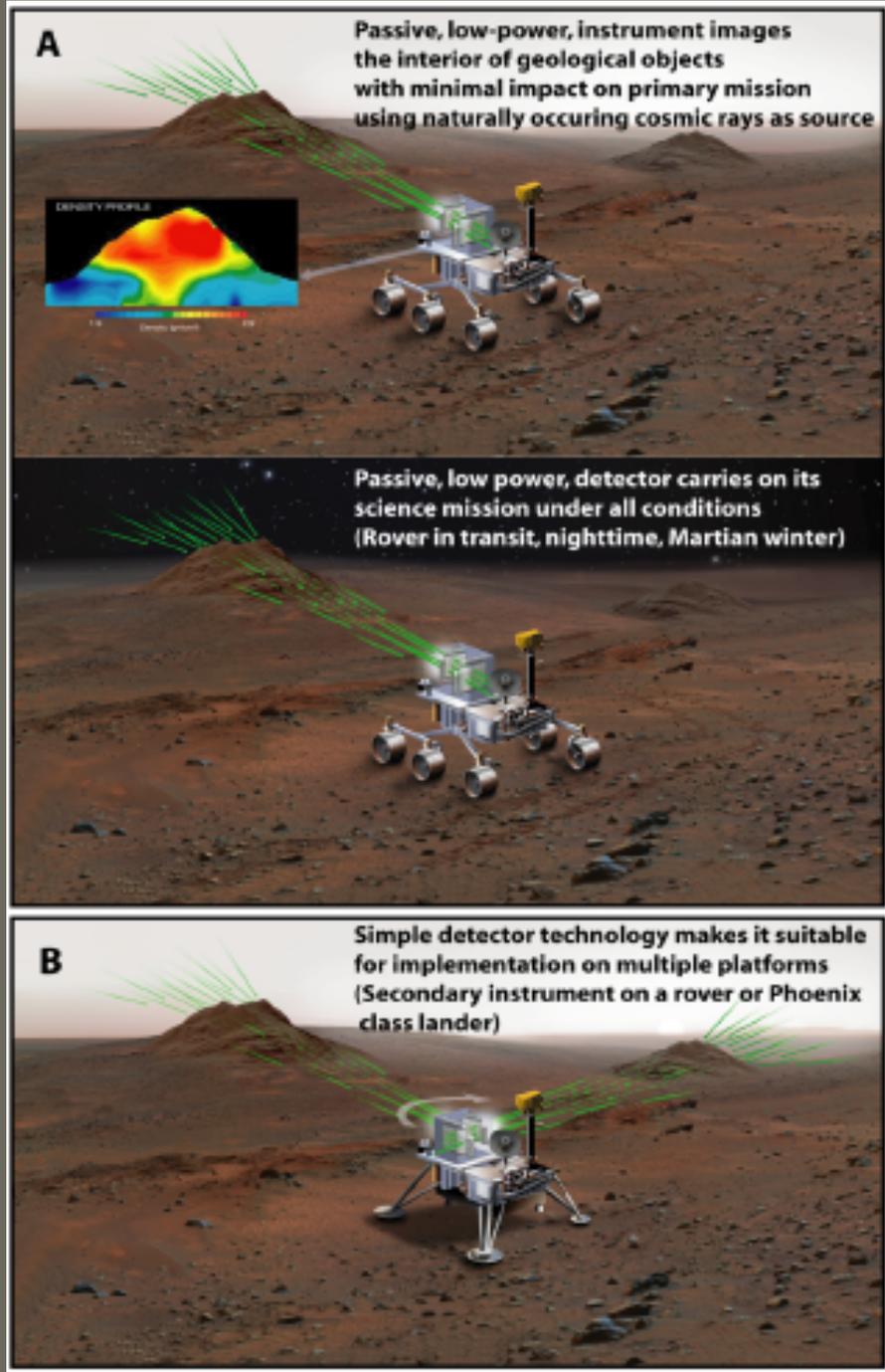


piramide del Sole
Mexico



Sorveglianza dei vulcani





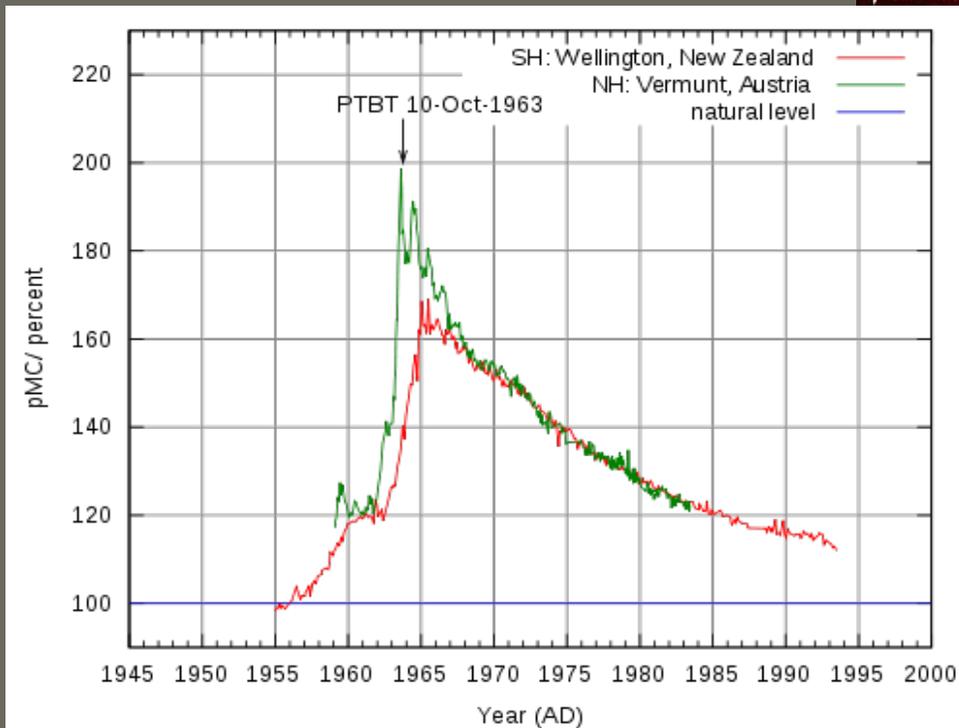
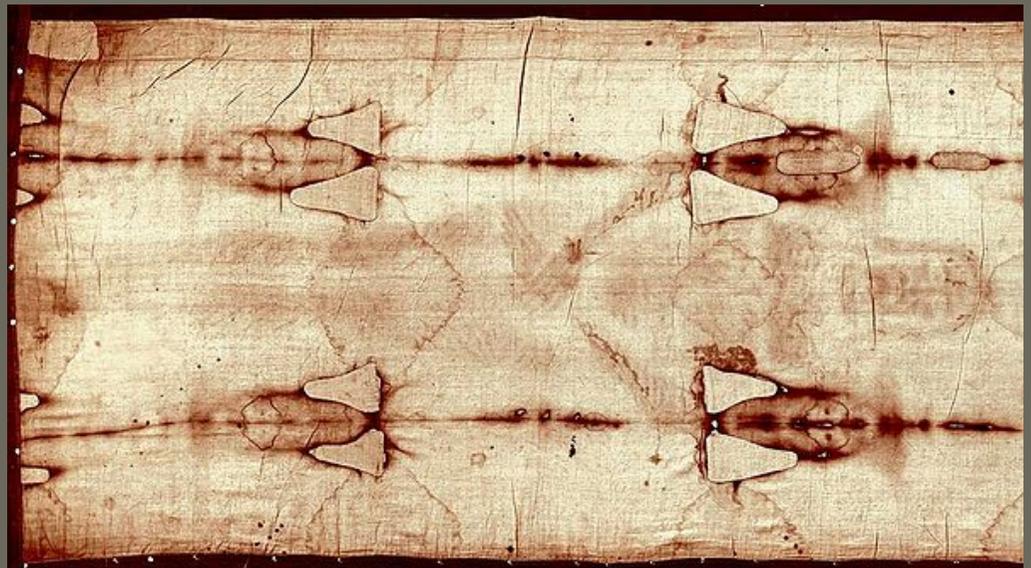
Prospezione geologica su Marte

Opportunity
arrivato 25/01/2004
33 km in 7 anni

Curiosity
arrivato 6/08/2012
6 km in 2 anni
 $V = 90 \text{ m/h}$

Datazione ^{14}C

Sindone di Torino

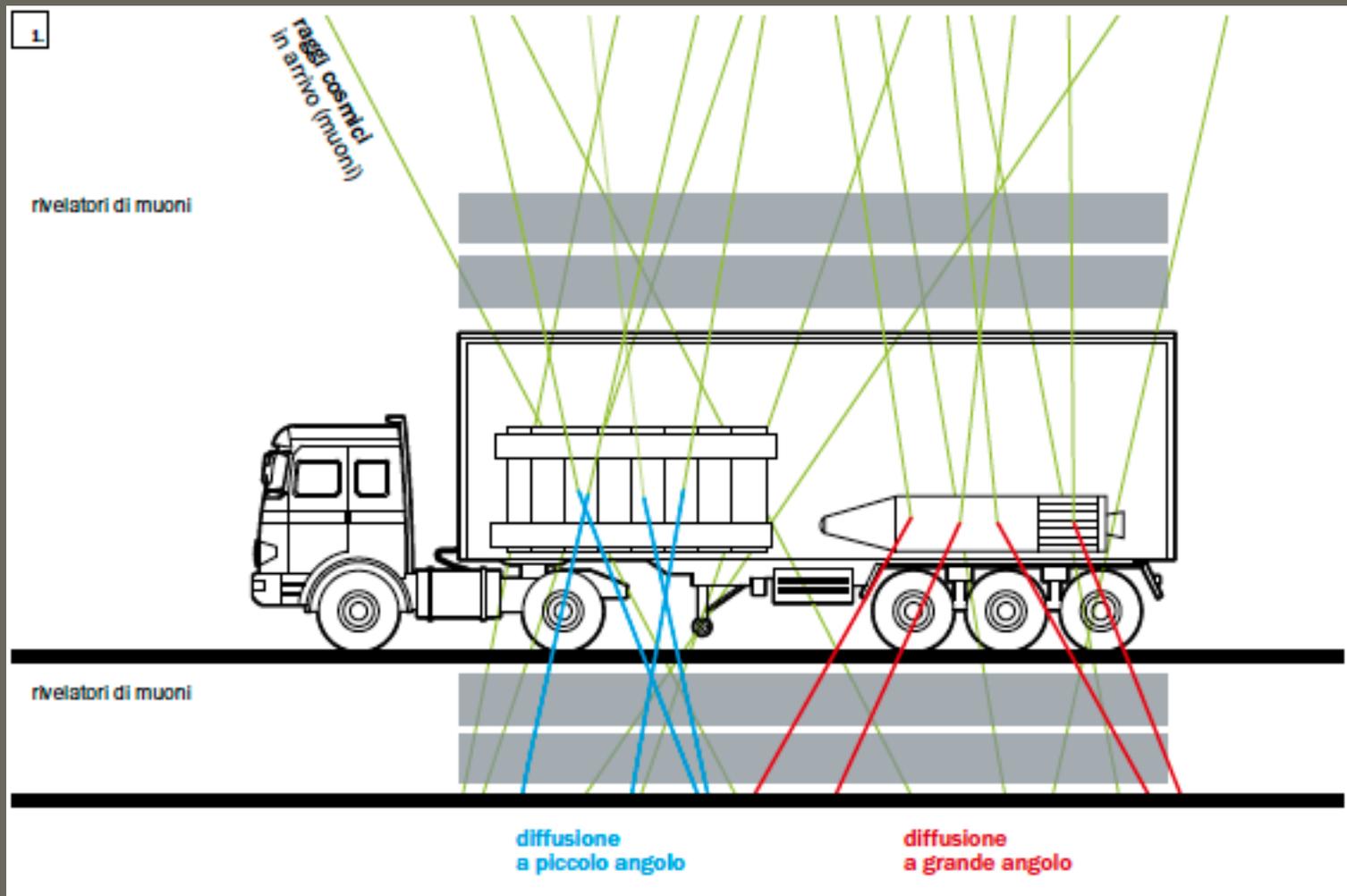


Identificazione
avorio
illegale (<1989)



Picco di ^{14}C per bombe atomiche

Antiterrorismo



Misura spessori acqua e neve - COSMOS

(Cosmic-ray Soil Moisture Observing System)

- Vincitori del
4° Premio Internazionale per l' Acqua
Principe Sultano Abdulaziz (Arabia Saudita)
- Sezione Creatività (2006)
- 266000 US\$

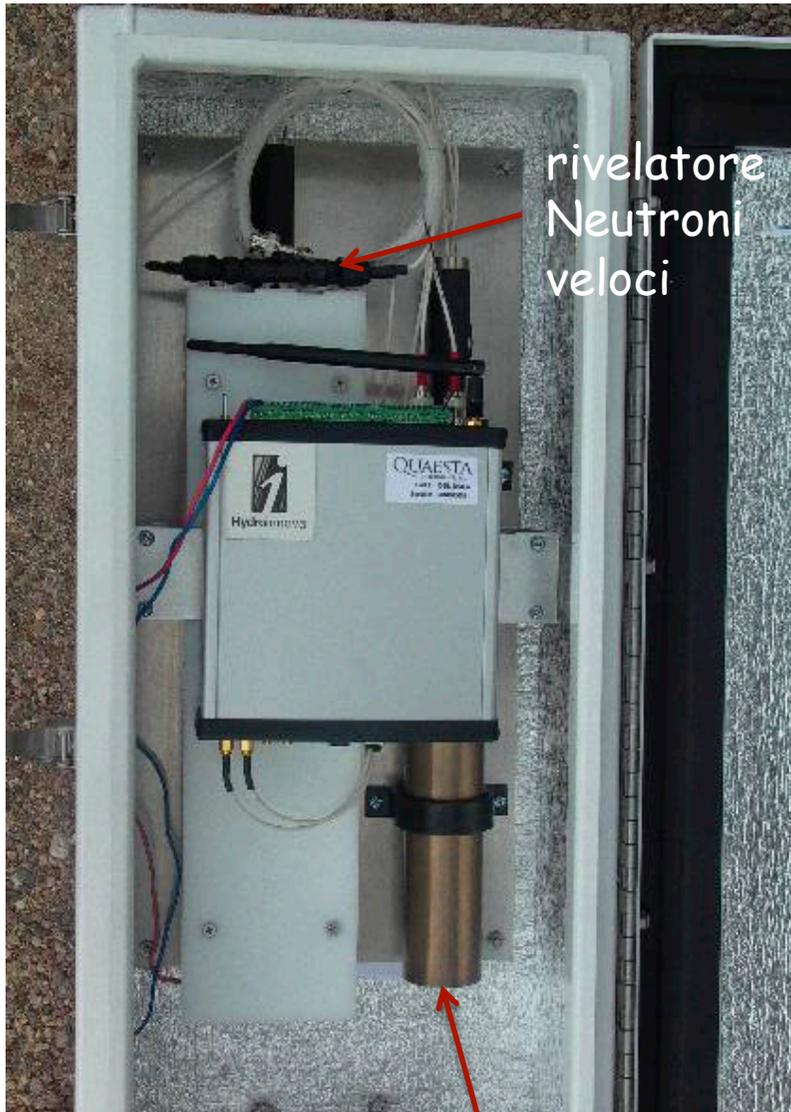


Dr. Marek Zreda



Dr. Darin Desilets

Kodama (1979, 1985)



rivelatore
Neutroni
veloci

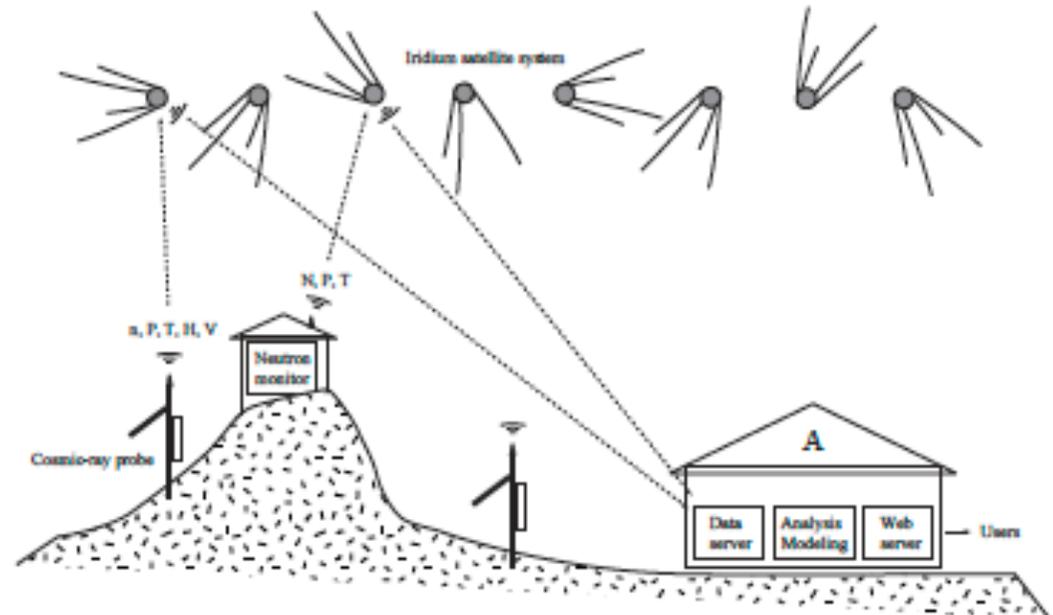
rivelatore
Neutroni
termici



Copre area $R = 350 \text{ m}$

Profondità = 70 cm

Al 2012
61 in USA
42 in altri paesi

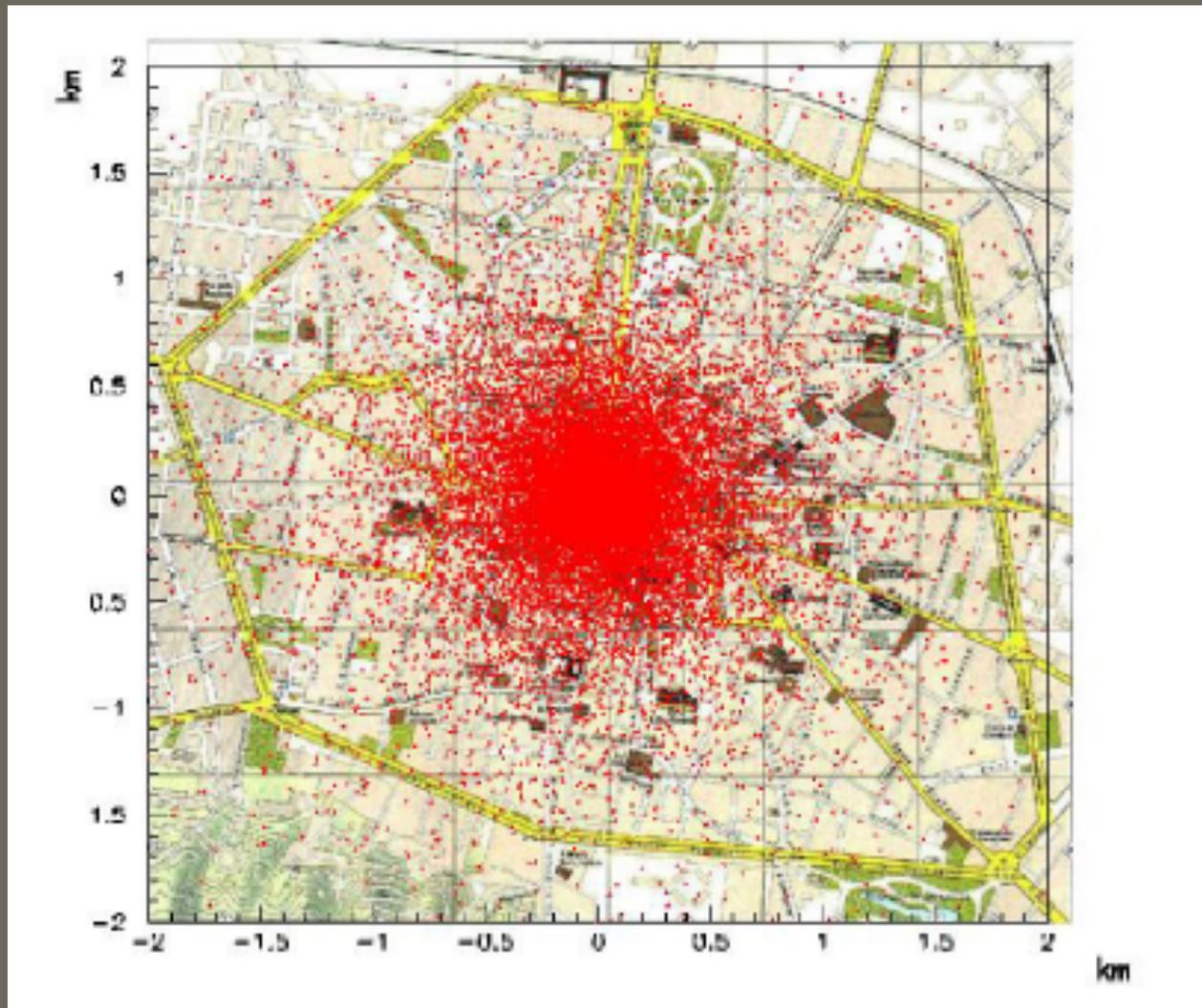


Avvio alla Ricerca

Sistemi di rivelatori sviluppati/usati
per/da studenti di High Schools/Licei

$$E_p = 10^{17} \text{ eV}$$

$$N_\mu \sim 10^6$$



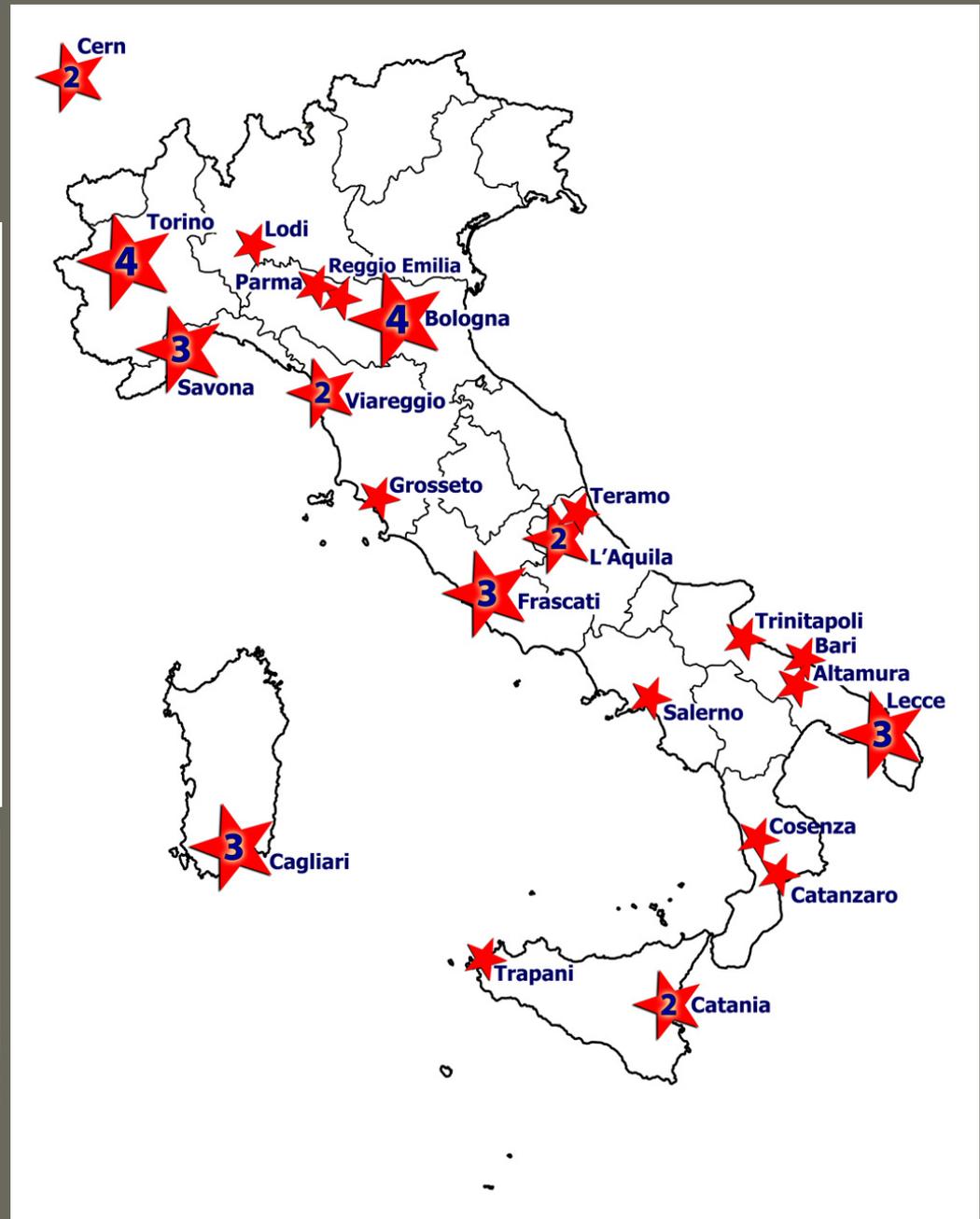
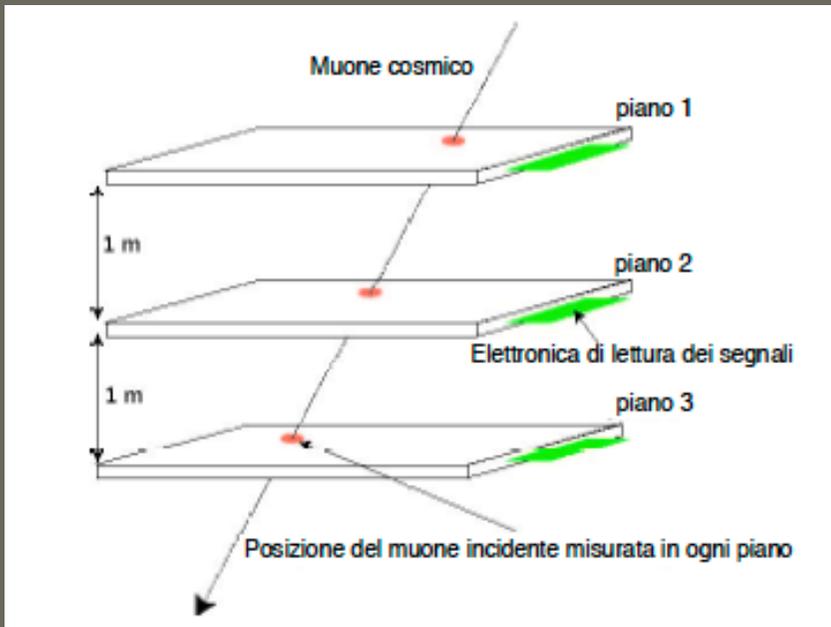
La distribuzione geografica dei progetti di RC in Nord America parte della rete NALTA



I progetti Europei di apparati per Sciami operati da studenti di liceo

EEE

Extreme Energy Events



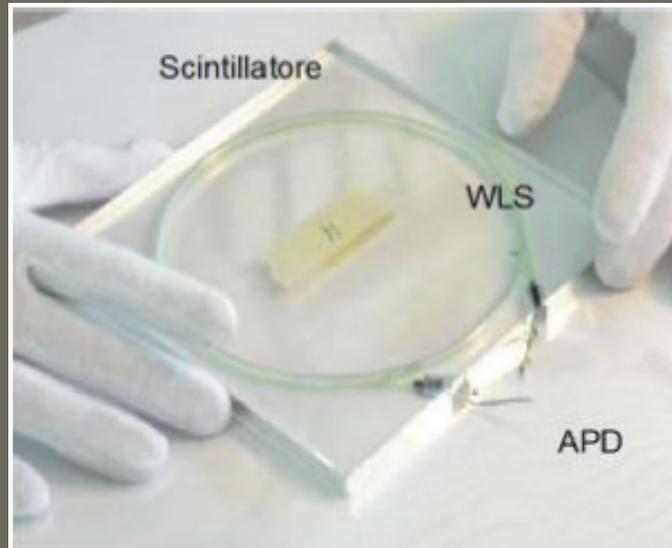
Altre idee per gli Studenti

- CosMO (Cosmic Muon Observer) - Germania
- KACST Program
(King Abdulaziz City for Sci. and Tech.) - Arabia Saudita
- CRITE (Cosmic ray Interaction in Terrestrial Environment) - Taiwan
- **CORAM (COsmic RAY Mission) - Lecce**

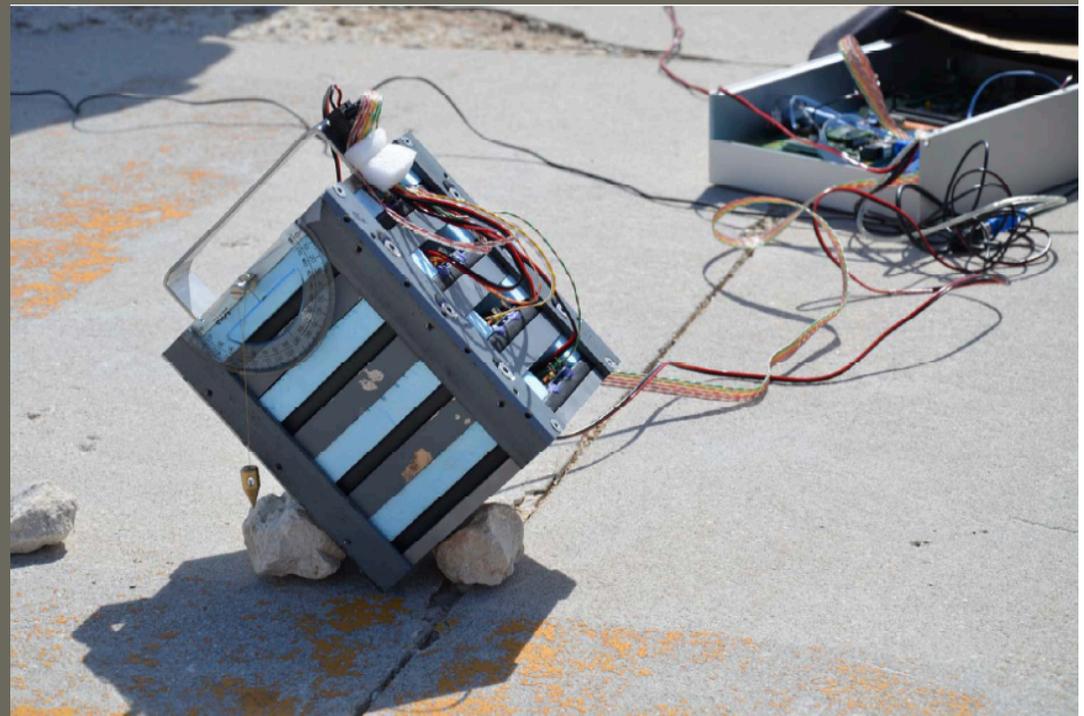
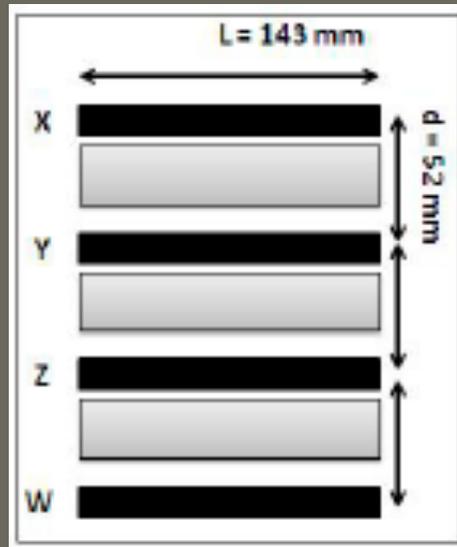
....e per il pubblico

- La Porta Cosmica - Taiwan
- **La Doccia Cosmica - Mostra Estremo INFN (2011)**

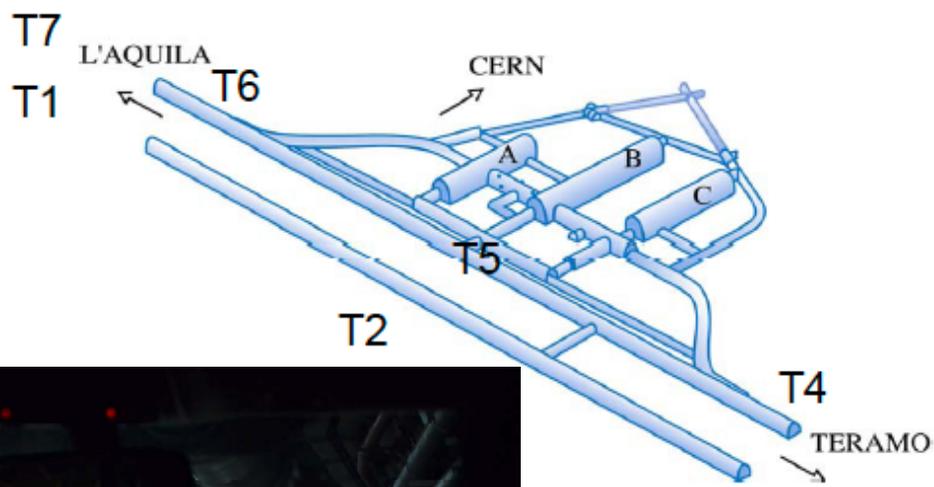
CORAM



Fe



Sotto
...



Al Gran Sasso



Per i monti ...



In funivia

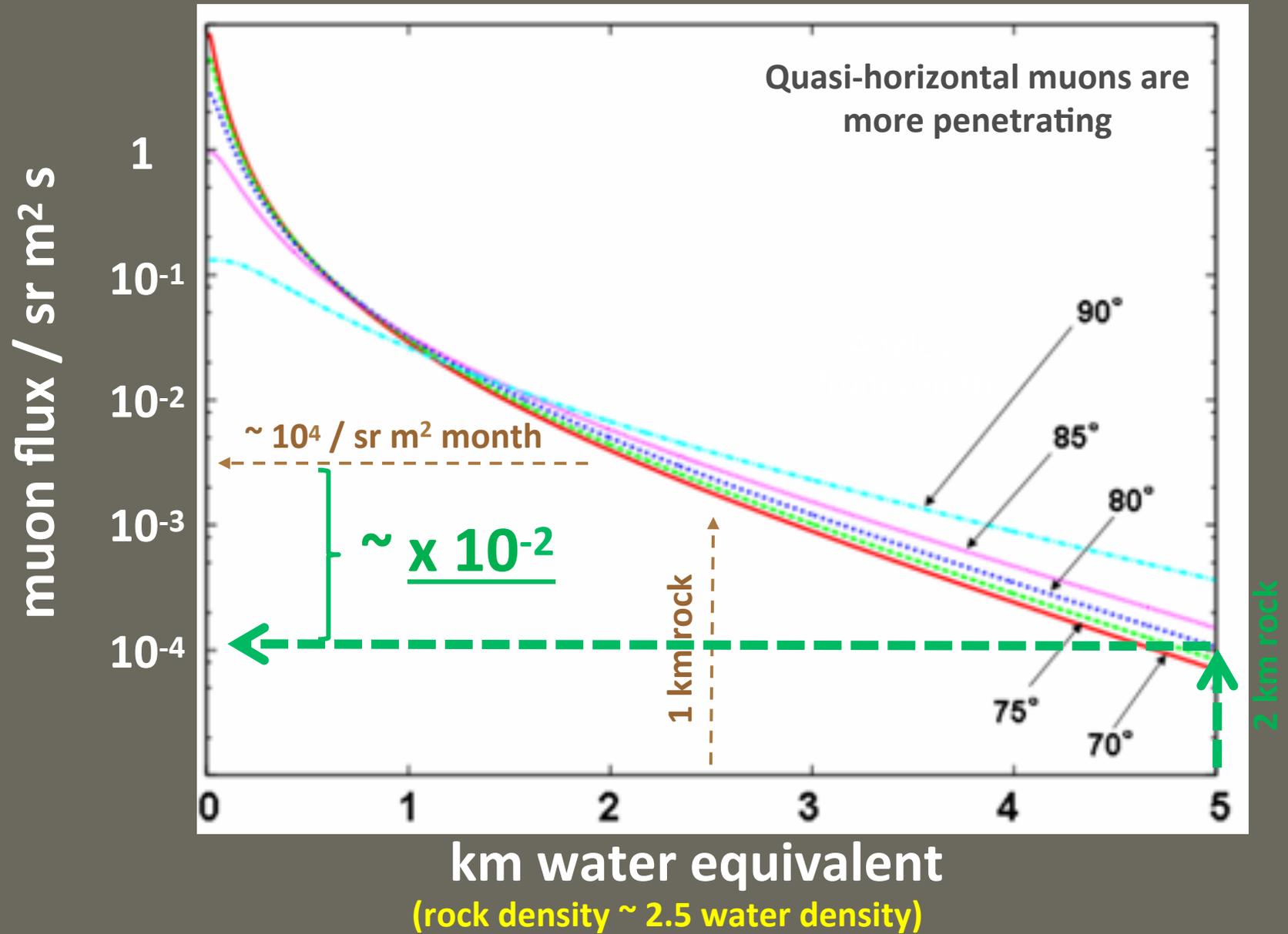
La Doccia Cosmica - Mostra Estremo INFN

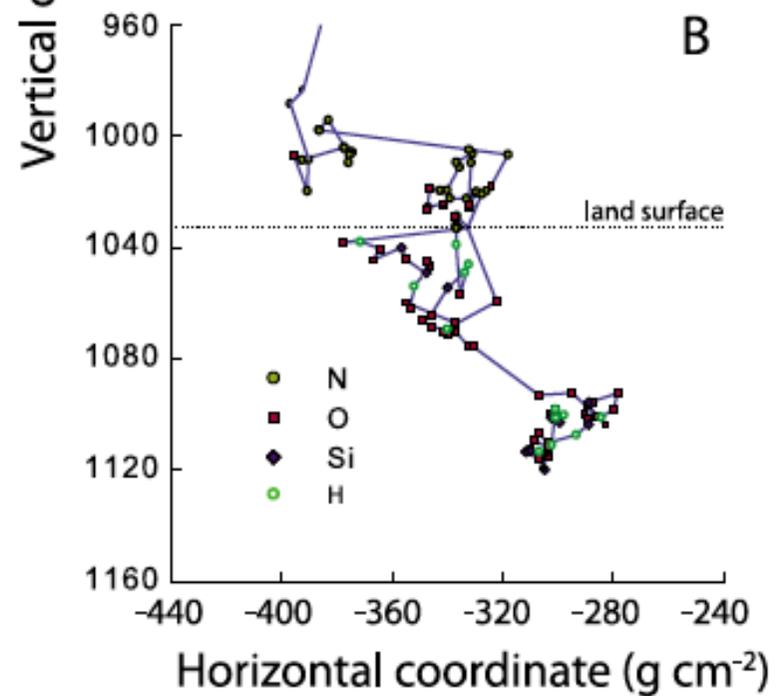
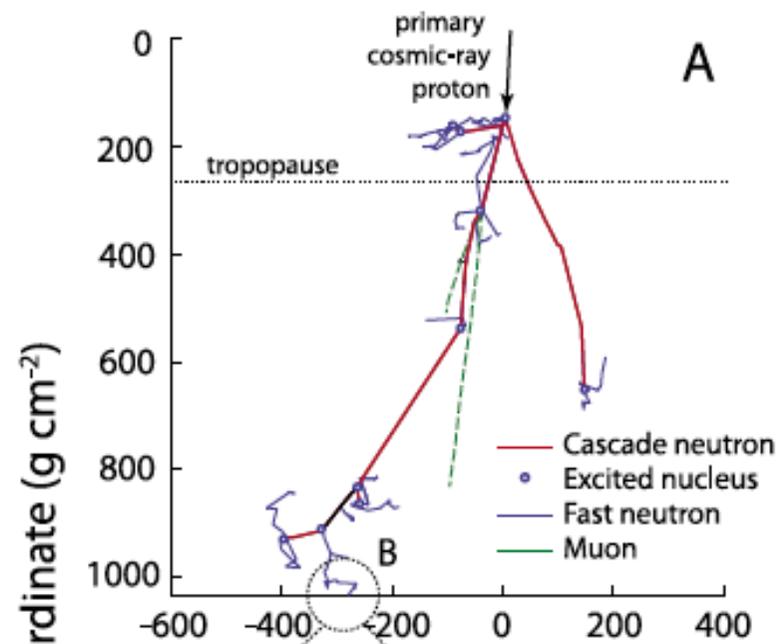




L' utilità dell' inutile

SPARES





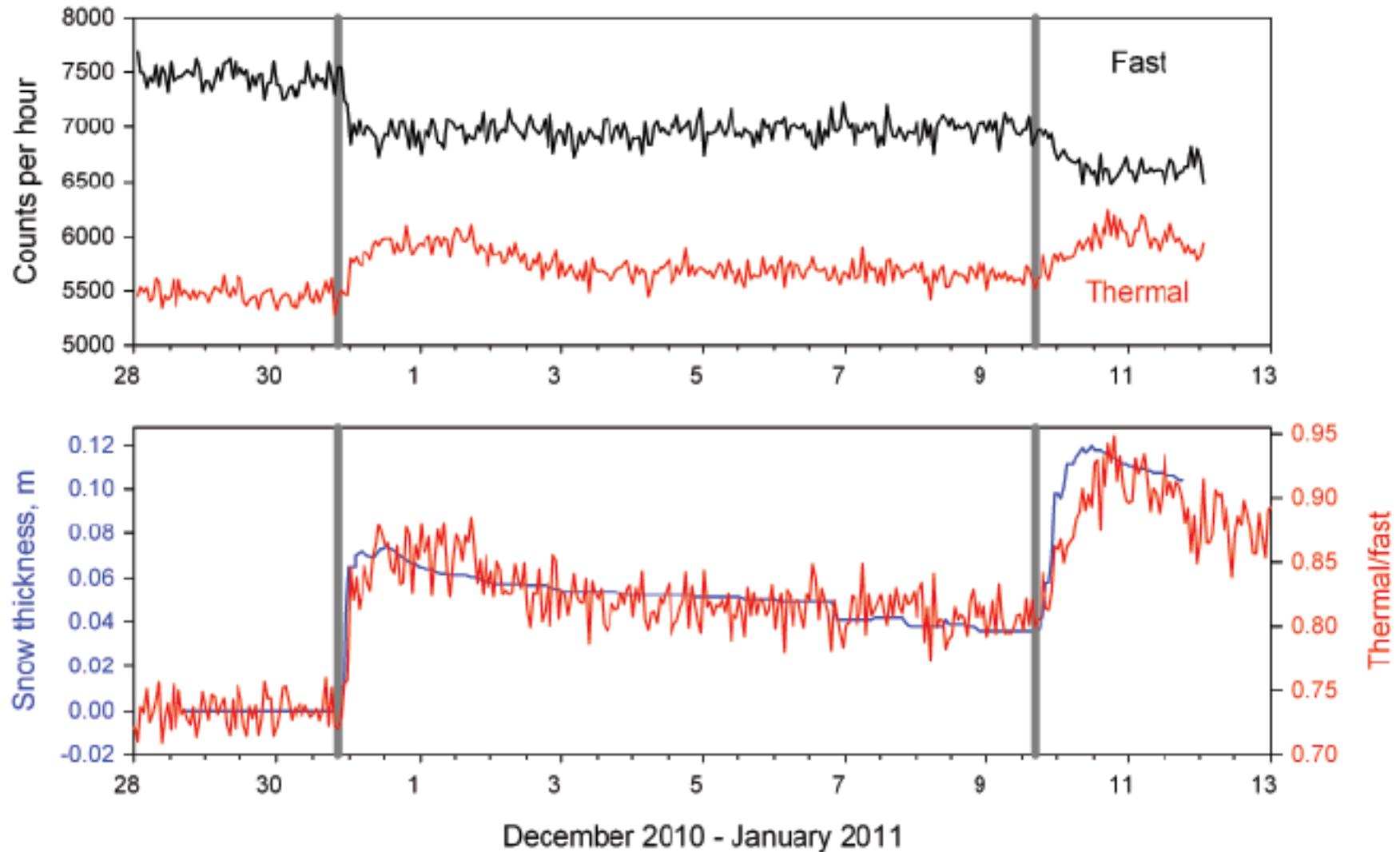


Figure 4. Snow detection with the cosmic-ray probe. Vertical bars indicate the onset of two snow events. Snow thickness in the bottom panel is from laser measurements (courtesy of Dave Gochis, NCAR).

COSMOS probes



US 48 states	54
Other locations	7
TOTAL	61
Ordered	10

2012

Cosmic-ray probes - global



COSMOS	61	
CosmOz	13	
TERENO	17	
Other	12	2012
Ordered	20	
TOTAL	123	

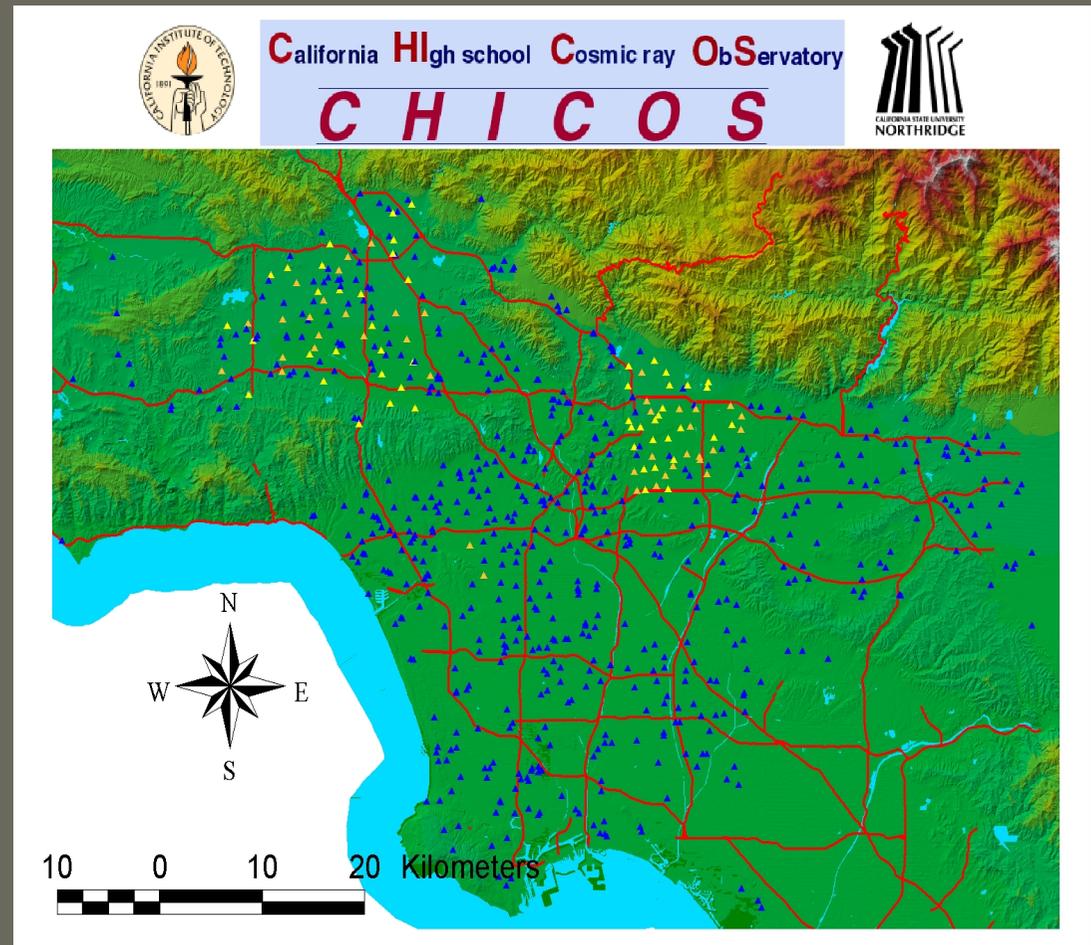
Alcuni esempi di grandi strutture

- CHICOS (California High School COsmic ray Observatory)
- ALTA (University of Alberta Large Time Coincidence Array)
=> NALTA (North American Large-Area Time Coincidence Array)
=> CANLACT (Canada Wide Network of Large-Area Time Coincidence Array Telescope)
- CROP (Cosmic Ray Observatory Project, University of Nebraska)
- SALTA (Snowmass Area Large-scale Time-coincidence Array)
- WALTA (Washington Large Area Time Array)
- SEASA (Stockholm Educational Air Shower Array)
- SCROD (School Cosmic Ray Outreach Detector)
- SkyView (NL)
- EEE (Extreme Energy Events) - Centro Fermi Roma

CHICOS

(California high school cosmic ray observatory)

- Fatto funzionare da Caltech il suo scopo è lo studio dei RC con energie comprese tra 10^{18} to 10^{21} eV
- usa rivelatori dismessi da un esperimento per studiare i neutrini e scintillatori da 1 m^2
- Attualmente 51 siti sono stati messi in funzione
- www.chicos.caltech.edu



NALTA

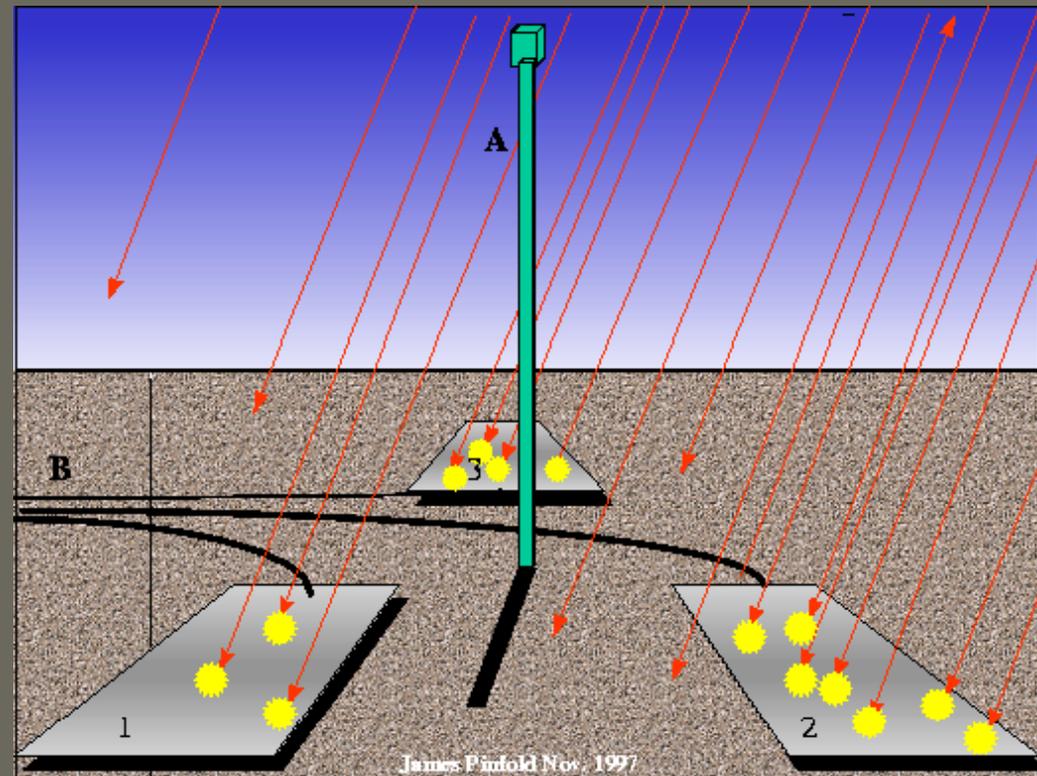
University of Alberta (Calgary- Canada)



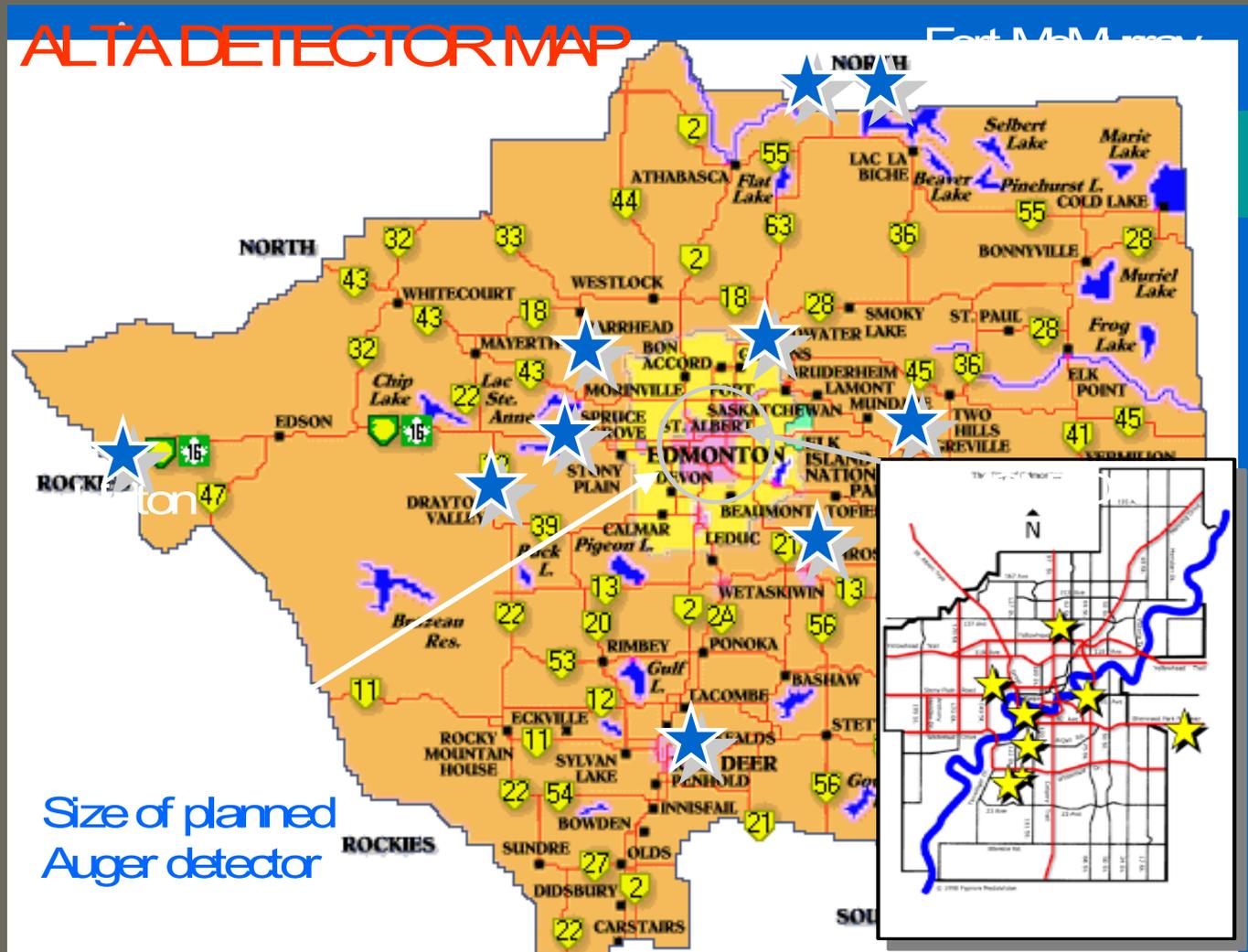
ALTA

(University of Alberta Large Time Coincidence Array)

- Lo scopo del progetto ALTA è la ricerca di correlazioni temporali tra EAS's.
- 16 licei sono stati coinvolti nel progetto
- Il progetto fa parte dei programmi base del sistema di educazione Canadese con cui gli studenti conseguono crediti
- www.physics.ubs.ca



Mappa di ALTA

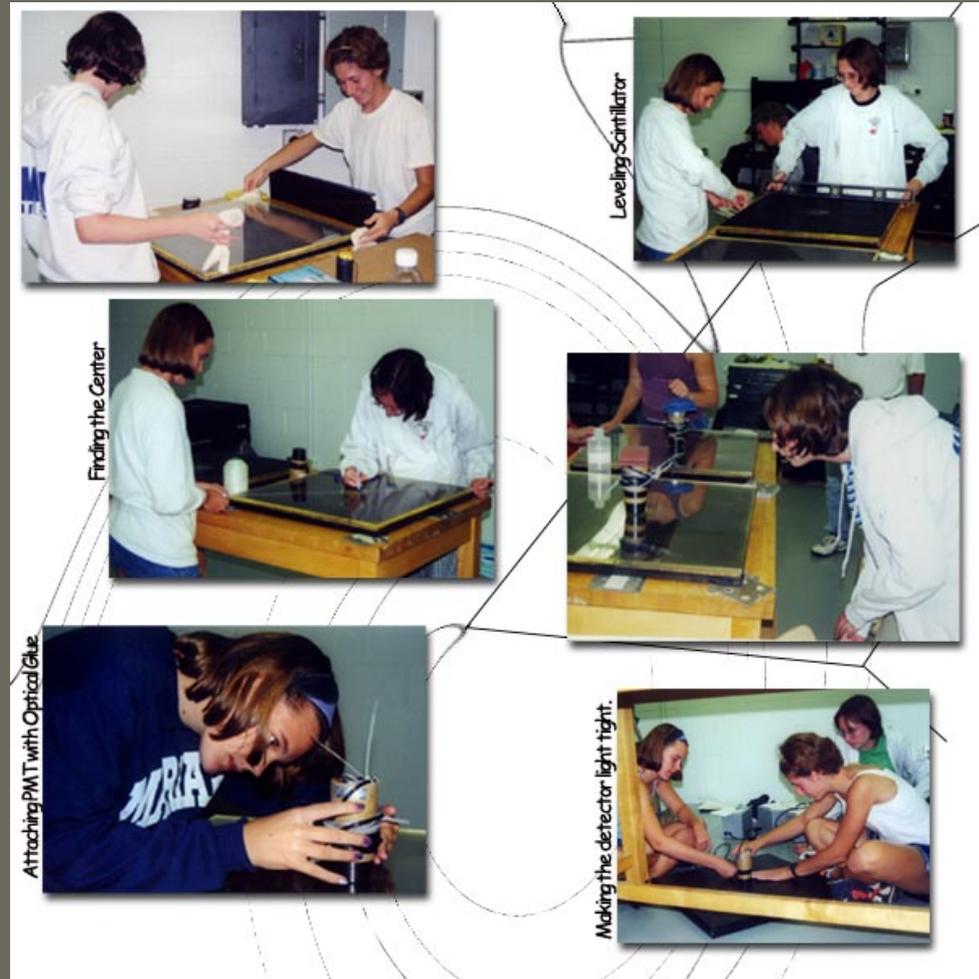


CROP

(Cosmic Ray Observatory Project, Univ. of Nebraska)

- Progetto per studiare EAS da RC con energia $> 10^{18}$ eV
- Lo scopo del progetto è di coinvolgere circa 30 scuole sparse su 75000 miglia²
- I rivelatori sono scintillatori plastici di 1 m² donati dal Chicago Air Shower Array

<http://marian.creighton.edu>



SALTA

(Snowmass Area Large-scale Time-coincidence Array)

- Un progetto che prevede di mettere in funzione diversi rivelatori in Colorado
- I licei vengono interconnessi via Internet a formare un grande apparato per rivelare grandi sciami atmosferici

Nel 2001 hanno ripetuto il volo di Hess del 1912 con un moderno pallone ad aria calda

<http://faculty.washington.edu/~wilkes>



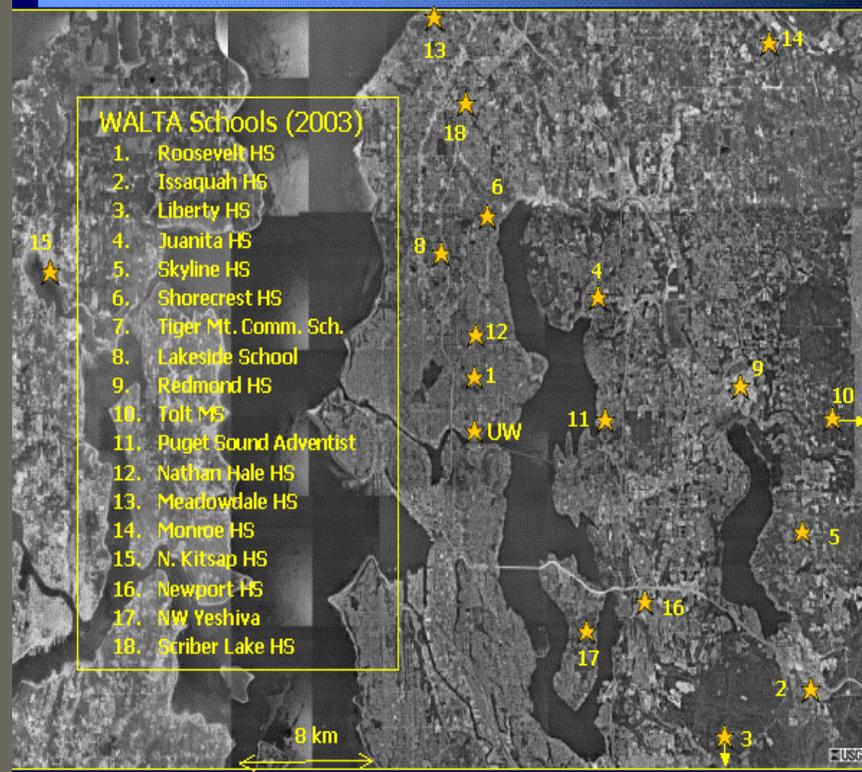
WALTA

(Washington Large Area Time Array)

- Alla fine del 2002
18 licei dell'area attorno
a Seattle erano parte
del progetto

<http://www.phys.washington.edu>

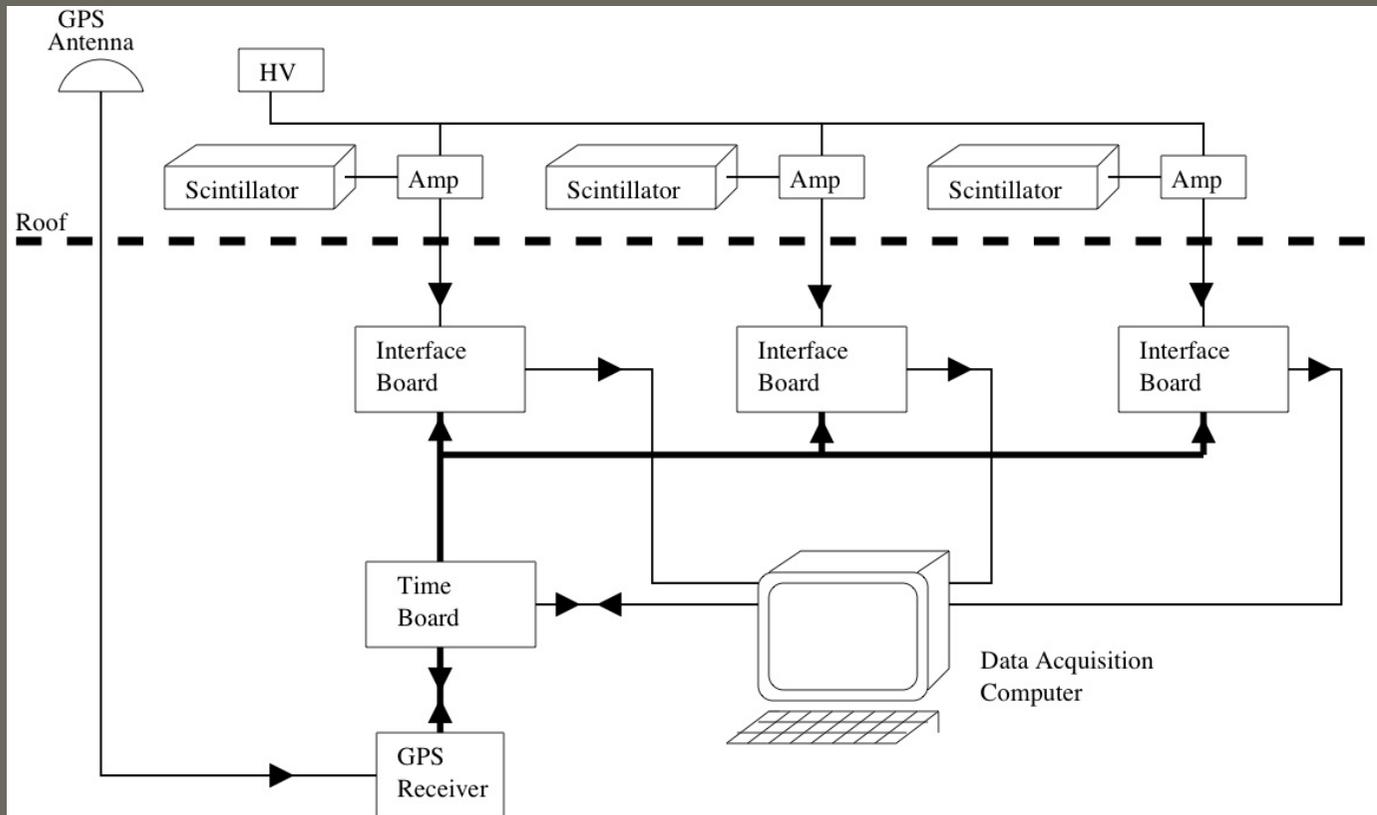
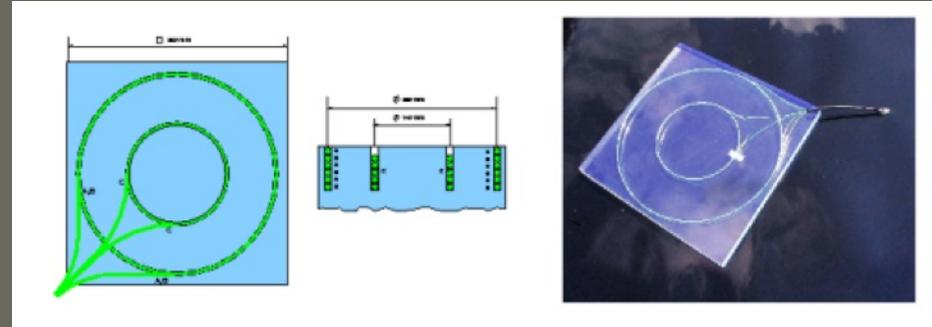
WALTA: participating schools (as of 8/2002)



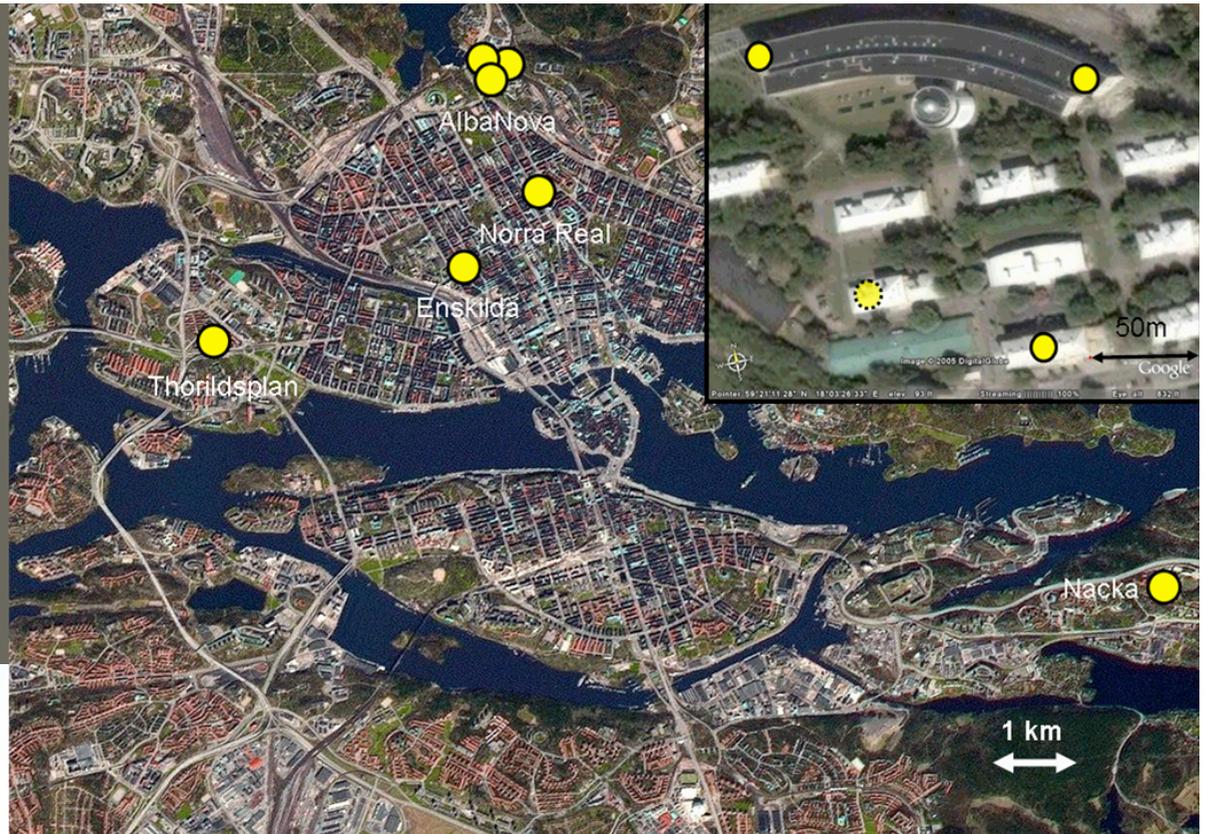
SCROD

School Cosmic Ray Outreach Detector

- Sfrutta tecnologie sviluppate per LHCb



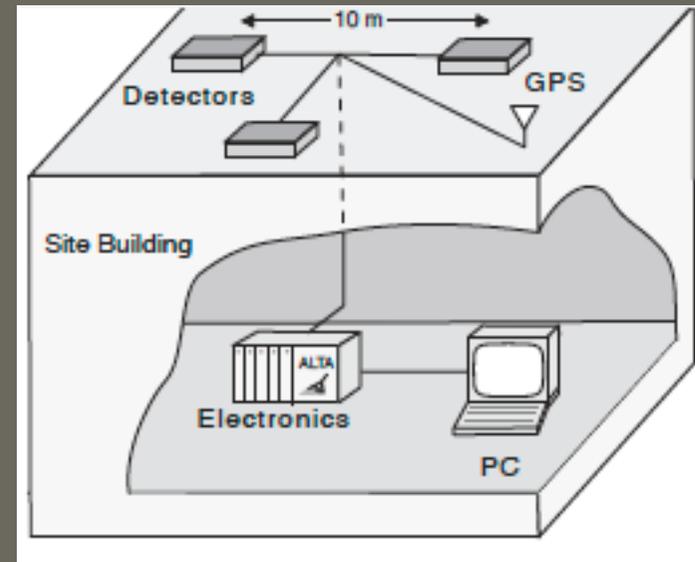
SEASA



Stockholm Educational
Air Shower Array

SKALTA

(SlovaKiAn Large-area coincidence Time Array)



7 Istituti

SkyView

Univ. Wuppertal - Germania

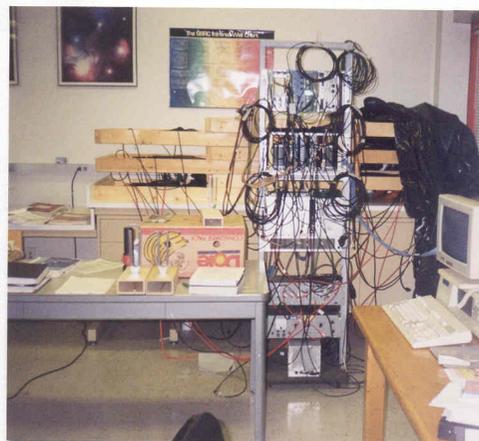


Rivelatori di muoni

Un progetto QuarkNet di Univ. of Pittsburg e Univ. of Missouri a St. Louis

Coinvolge insegnanti e studenti di liceo nella costruzione e messa in funzione di rivelatori di muoni

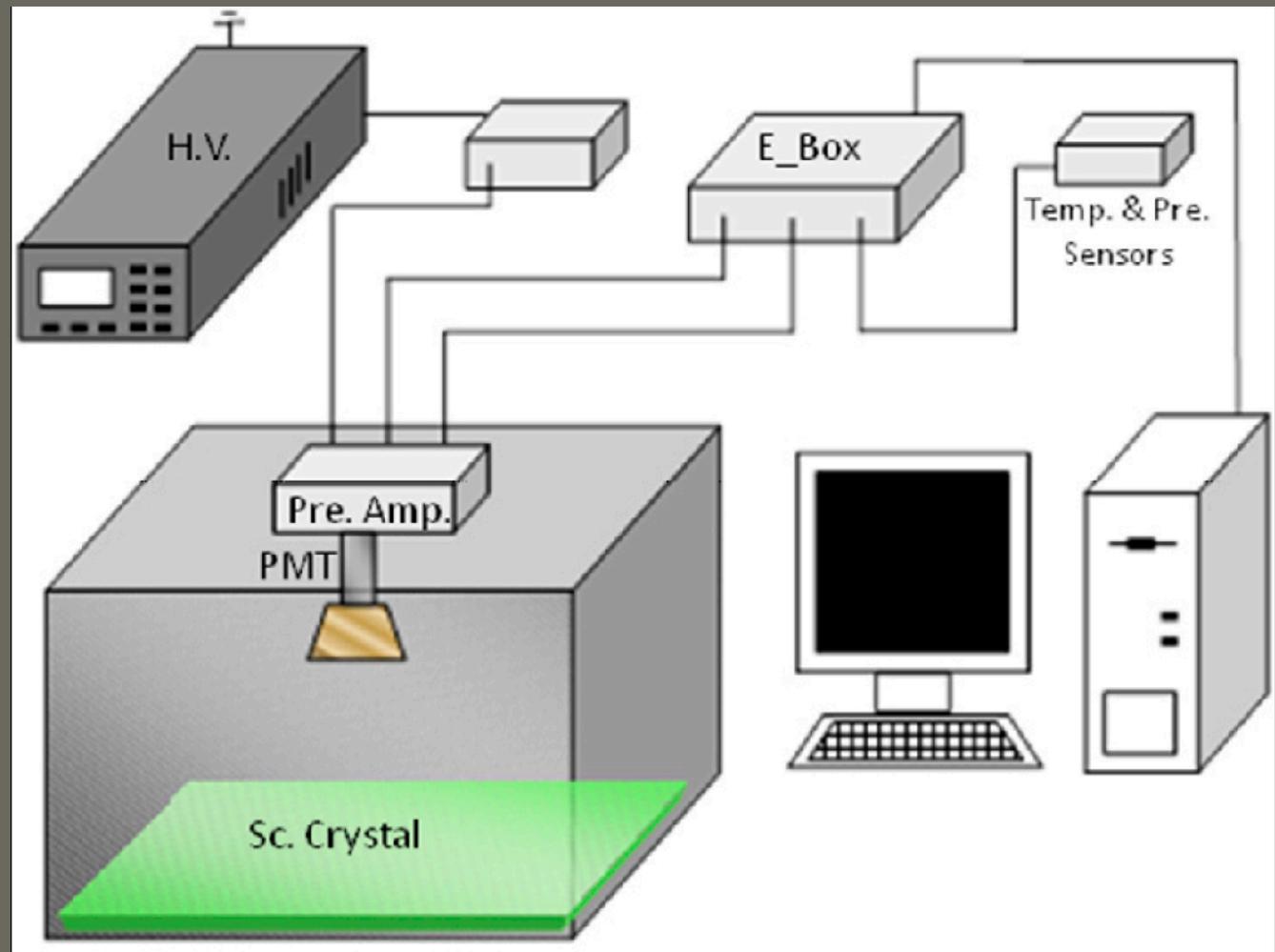
QuarkNet/UMSL/RET 2003



KACST - Saudi Arabia

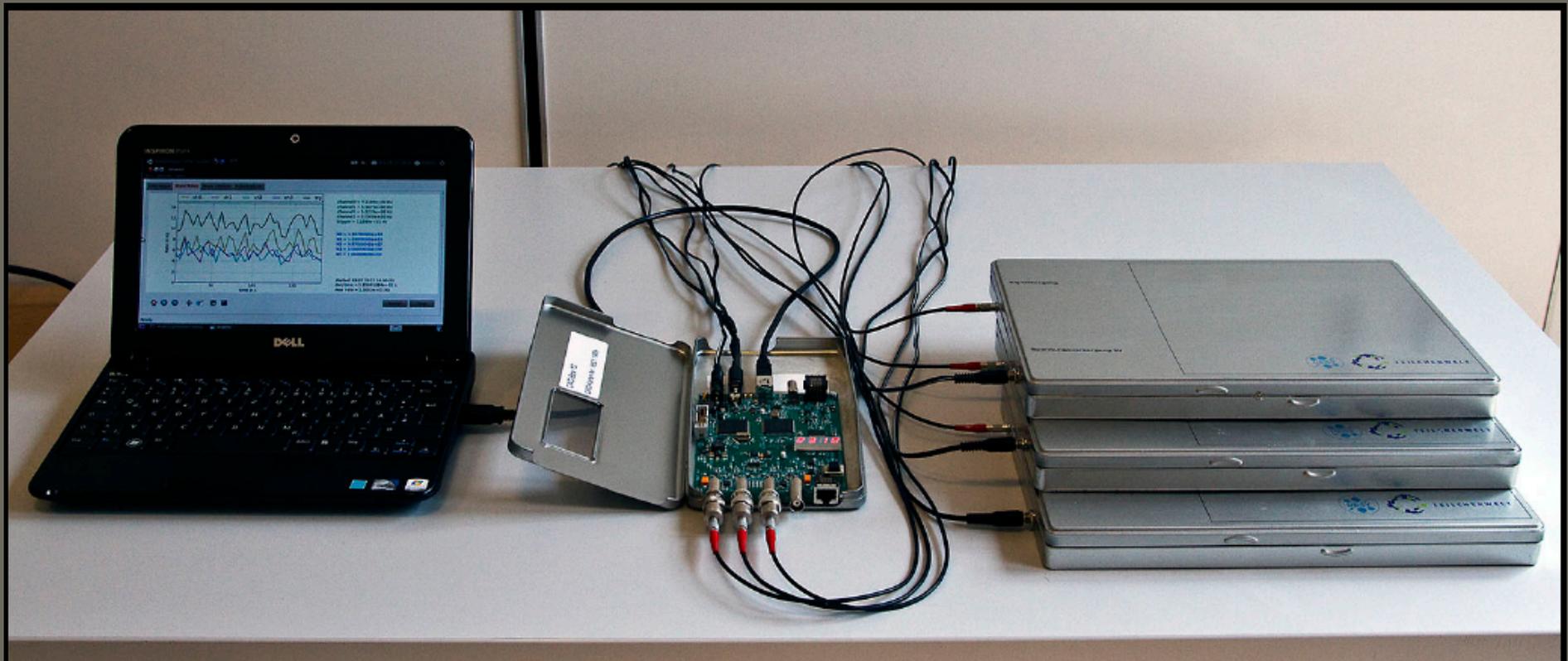
Prima realizzazione per un programma di outreach a Riyadh

Contatore
di muoni



CosMO

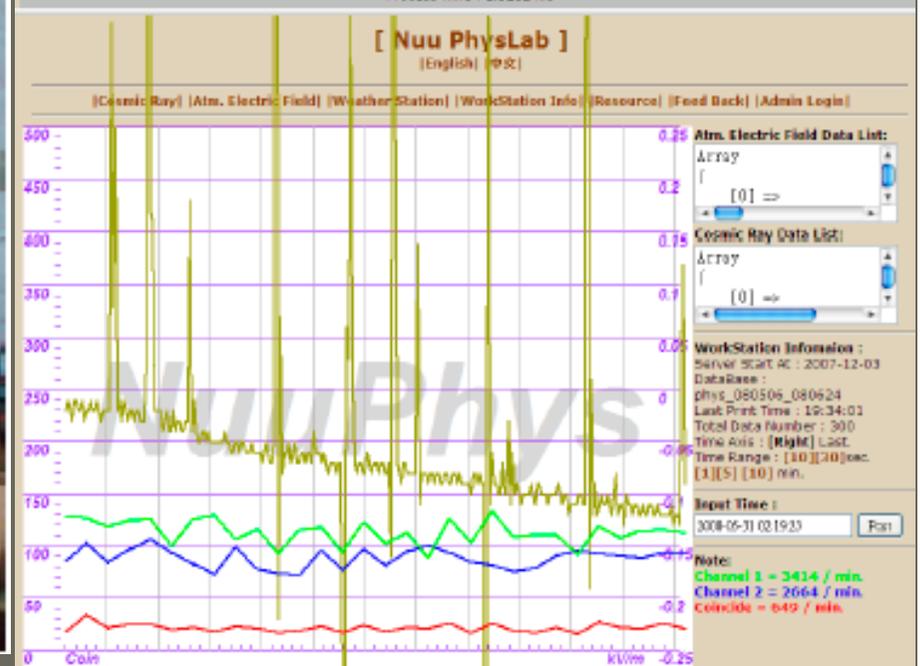
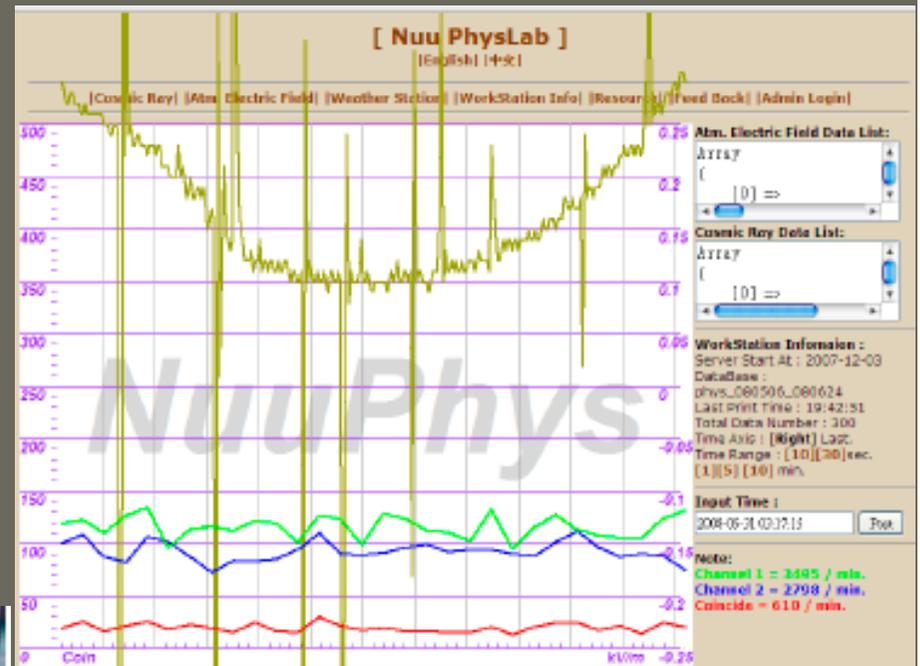
DESY/Netzwerk Teilchenwelt - Germania



- Contatori plastici a scintillazione facilmente trasportabili

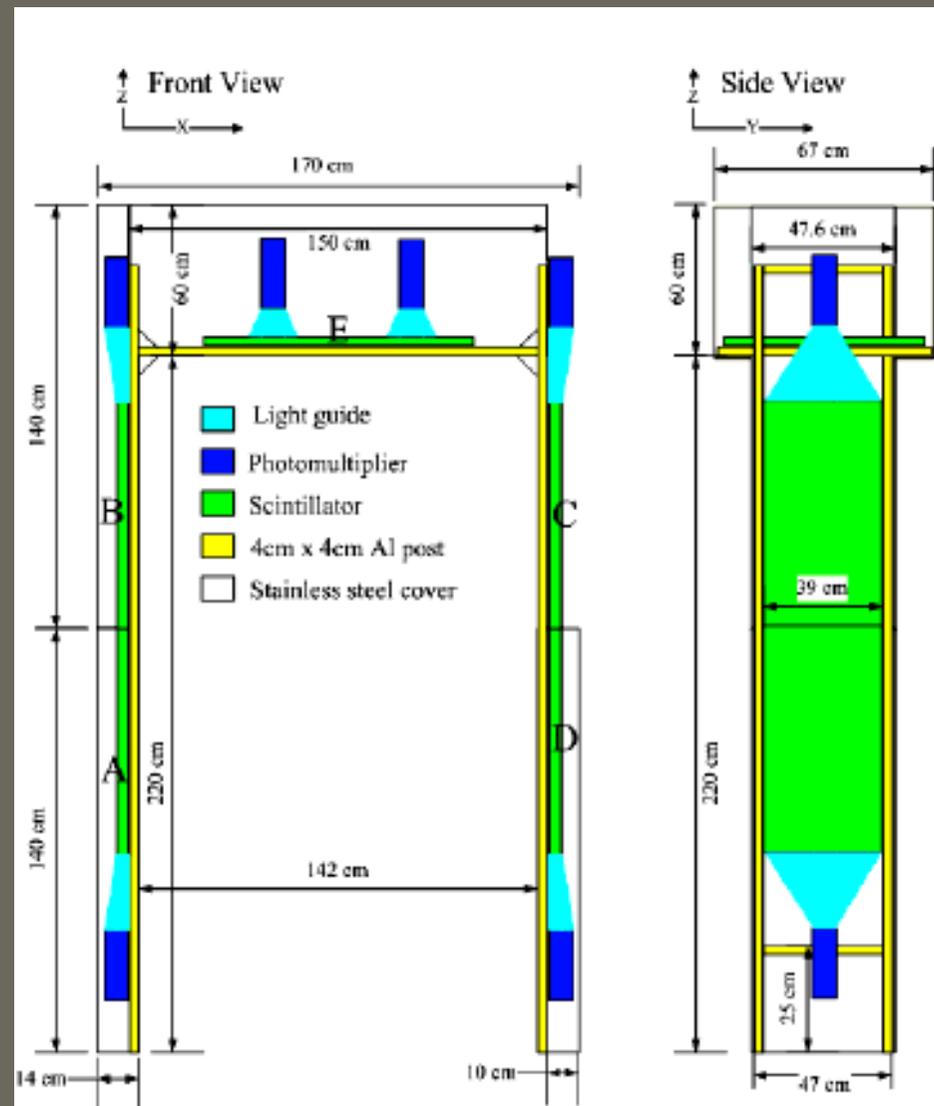
CRITE

Cosmic Ray Interaction in Terrestrial Environment



La Porta Cosmica

Museo Astronomico di Taipei (Taiwan)



Metropolitana di Napoli

Stazione Toledo

