The Future of AUGER

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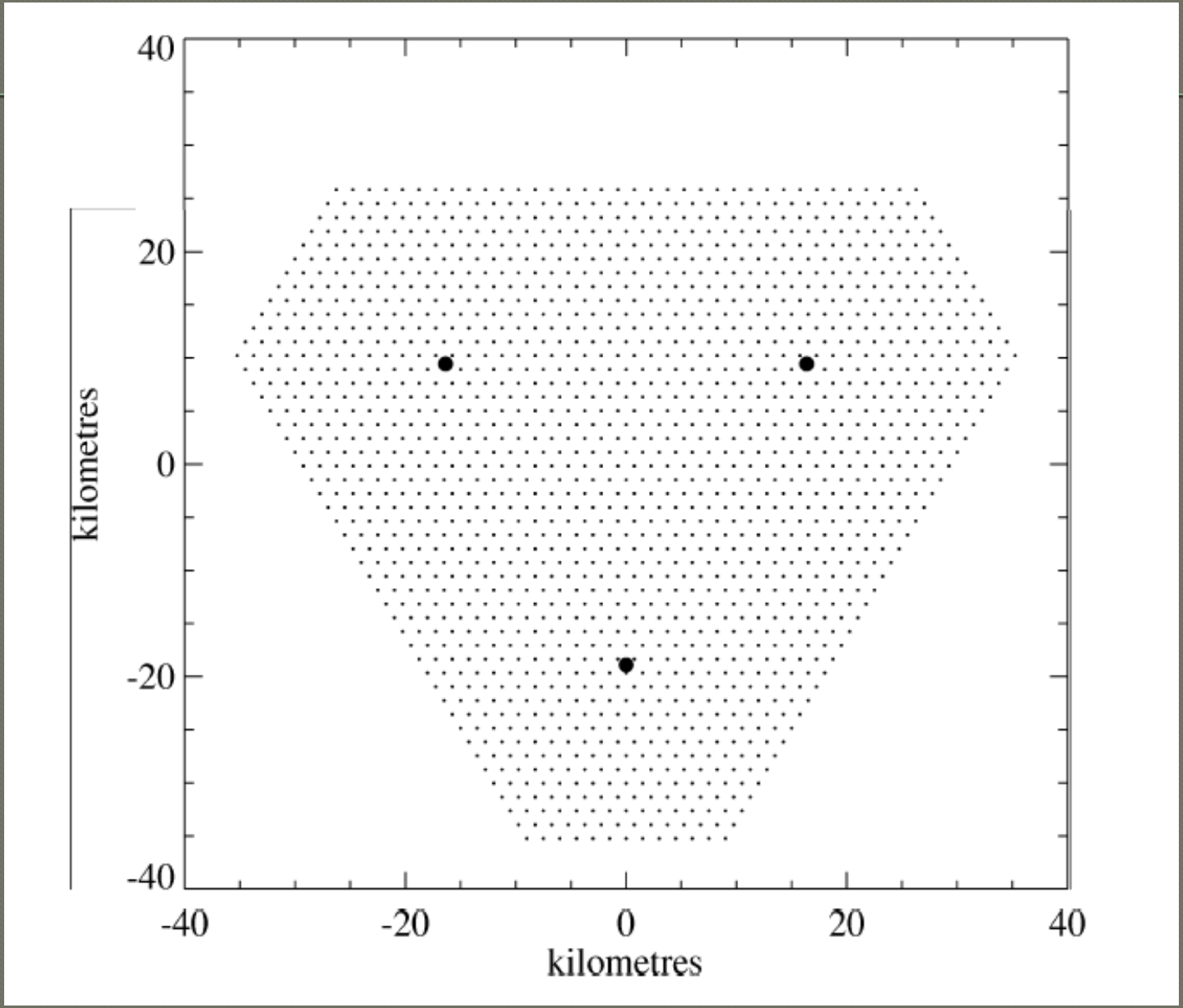
The past

- 1995 Meeting at UNESCO in Paris
  - Decide to build Auger
  - Start with the Southern Observatory
  - Choose Argentina as the site
- 1996 Meeting in Valle Grande (San Rafael)
  - Choose USA as site of Auger North (later changed to Colorado)

The past



The past

- Scientific case:

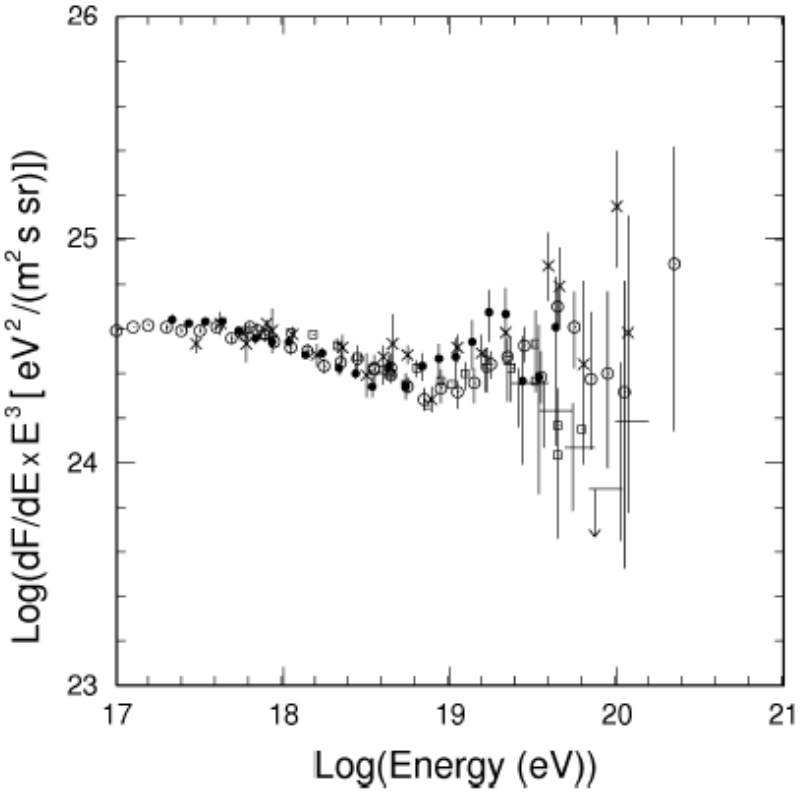


Figure 3.4: Combined differential energy spectra ($\times E^3$) from the Haverah Park ($\times$), Fly's Eye (stereo, $\bullet$), Yakutsk ($\square$), and Akeno/AGASA ($\odot$) experiments. The energy scale of each experiment has been slightly shifted to match the AGASA result around 10^{18} eV. (This figure is an updated version of a plot originally given in reference [15]).

The past

- Scientific case:
  - Study origin and nature of the highest energy cosmic rays
  - Study their propagation in space
  - Possibility of "New Physics"

One year ago

- Scientific case:
  - ~~Possibility of "New Physics"~~
    - Gamma content of UHECR excludes models with New Physics (gamma papers)
  - Study origin and nature of the highest energy cosmic rays
    - UHECR follow roughly the distribution of tracers of mass distribution in the near Universe (anisotropy papers)
    - Yes, GZK is acting (spectrum papers)
    - UHECR do not seem to behave as protons (composition paper)
  - Study their propagation in space (Sources?)

One year ago

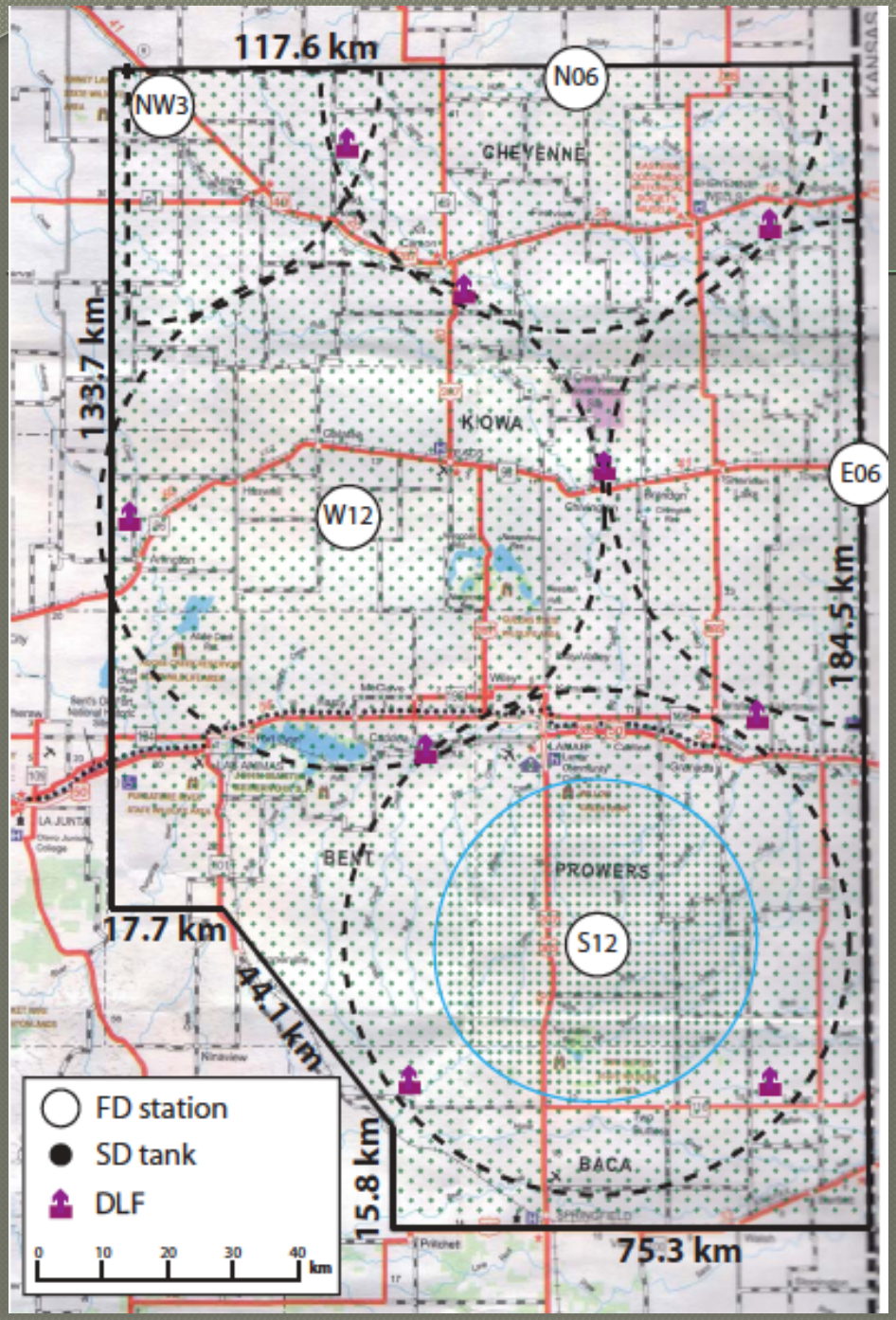
- AUGER North is the future

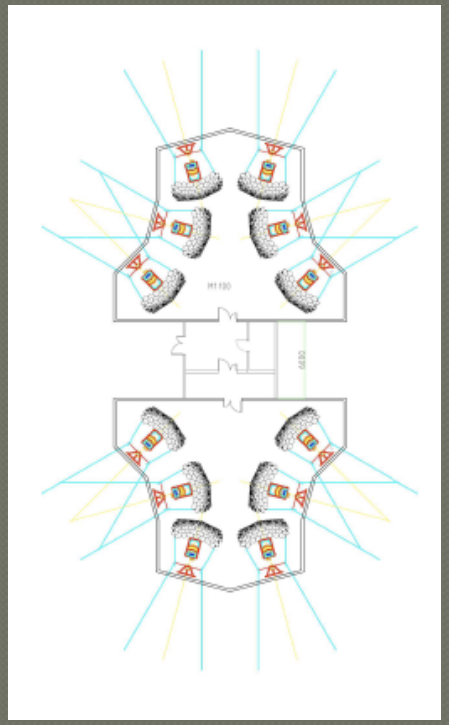
One year ago

	Auger South	Auger North
Location	35° S, 69° W	38° N, 102° 30' W
Altitude [m a.s.l.]	1,300 - 1500	1,300
Area	3,000 km^2	20,000 km^2
Number of SDs (infill)	1600	4000 (400)
SD spacing (infill)	1500 m	2300 m (1600 m)
PMT sensors per SD	3	1
Communications network	SD-tower radio	peer-to-peer
SD array 50% efficient at	0.7-1 EeV	8-10 EeV
SD array 100% efficient at	3 EeV	80 EeV
FD stations	4	5
FD telescopes	24 (4×6)	39 $(2 \times 12 + 2 \times 6 + 3)$
Begin construction	1999	2011
End construction	2008	2016

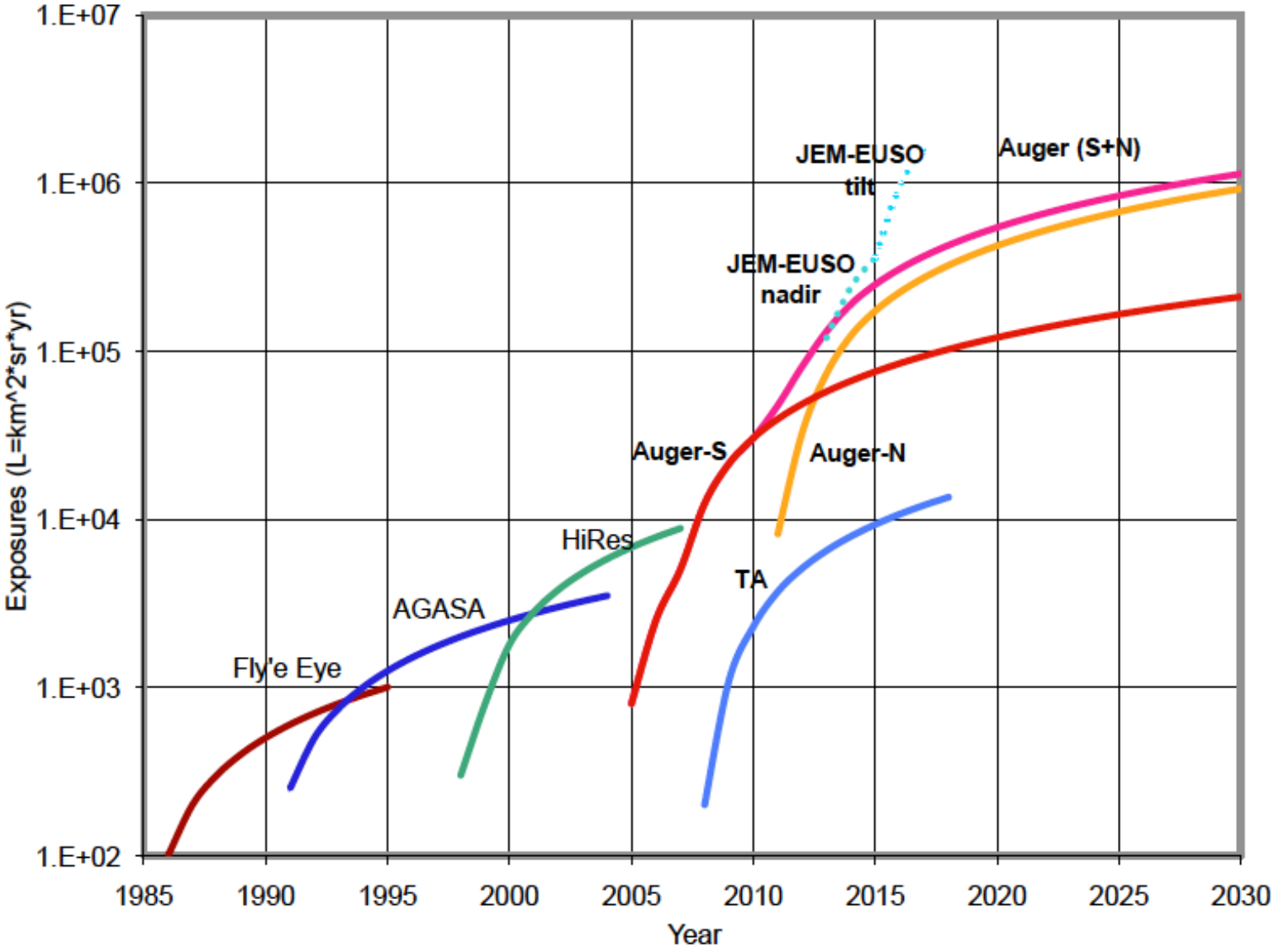
One year ago

COST:
120 MUS$





One year ago


1.E+07
1.E+06
1.E+05
1.E+04
1.E+03
1.E+02
Exposures (L=km^2*sr*yr)
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
Year
JEM-EUSO tilt
Auger (S+N)
JEM-EUSO nadir
Auger-S
Auger-N
HiRes
TA
AGASA
Fly'e Eye

New Worlds, New Horizons

in Astronomy and Astrophysics

Committee for a Decadal Survey of Astronomy and Astrophysics

Board on Physics and Astronomy

Space Studies Board

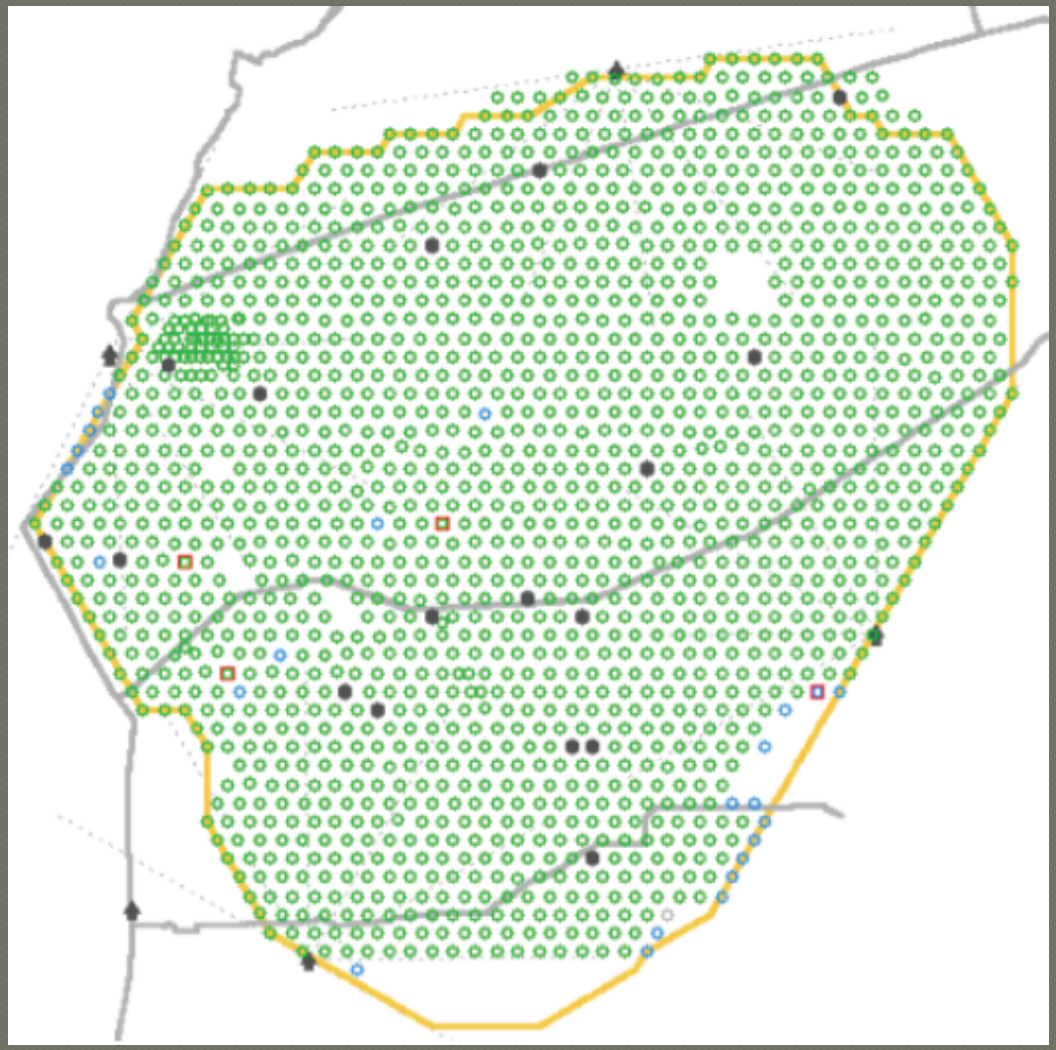
Division on Engineering and Physical Sciences

NATIONAL RESEARCH COUNCIL

OF THE NATIONAL ACADEMIES

Today

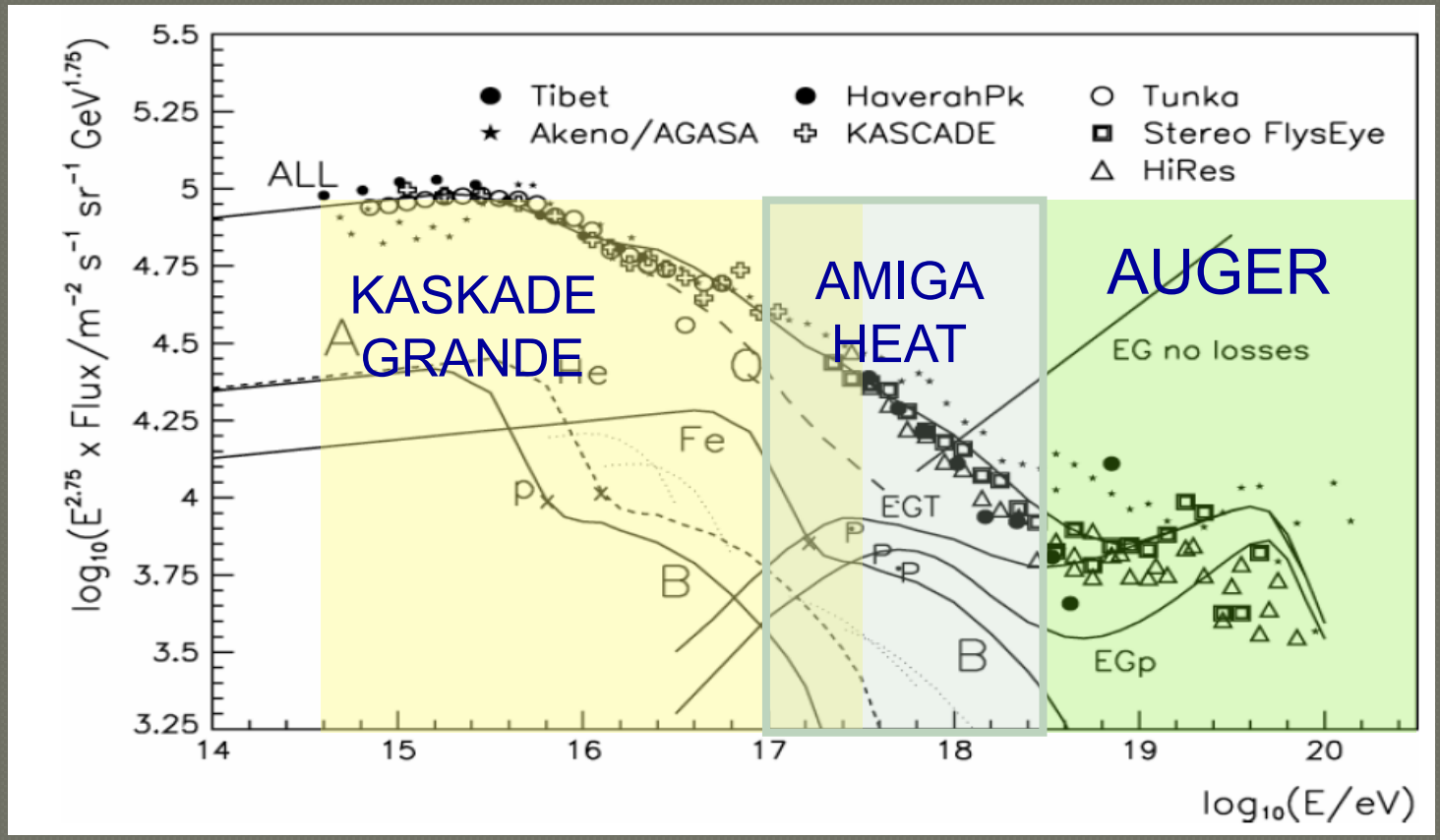
- Full system in operation



Annual cost
≈ 1.7 MUS$

Today

- New systems
  - HEAT
  - INFILL and AMIGA



Today

- Prototype systems
  - AERA
  - MIDAS
  - EASIER

Tomorrow

- Search for a new site in the Northern Hemisphere.

Tomorrow

- It will take time to identify and develop a new site.
- Options are far from obvious.

ALTERNATIVE

Think South!

Auger North South

Tomorrow

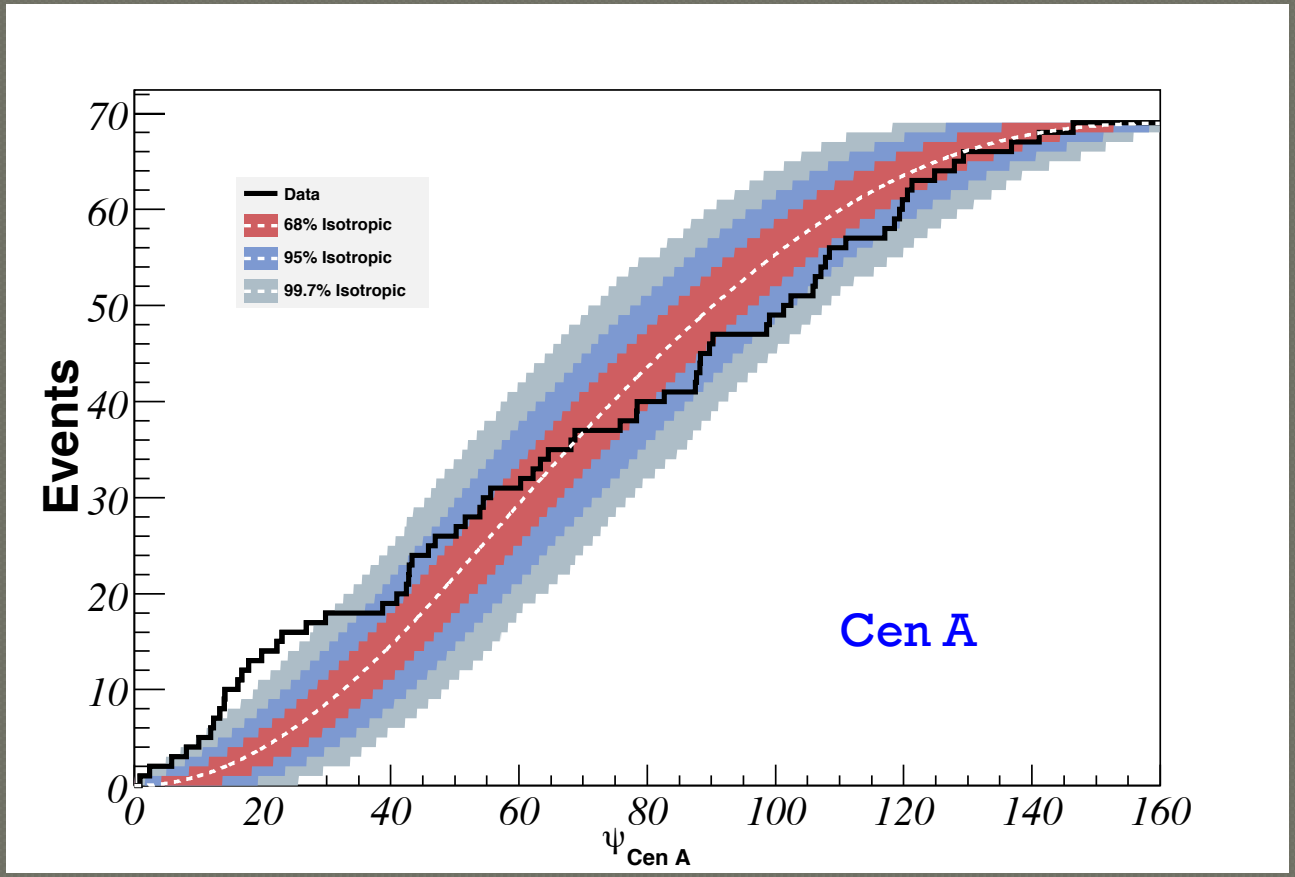
Think South: Auger North South

WARNING: THE PROPOSAL IN THE FOLLOWING SLIDES ARE OF MY OWN MAKING

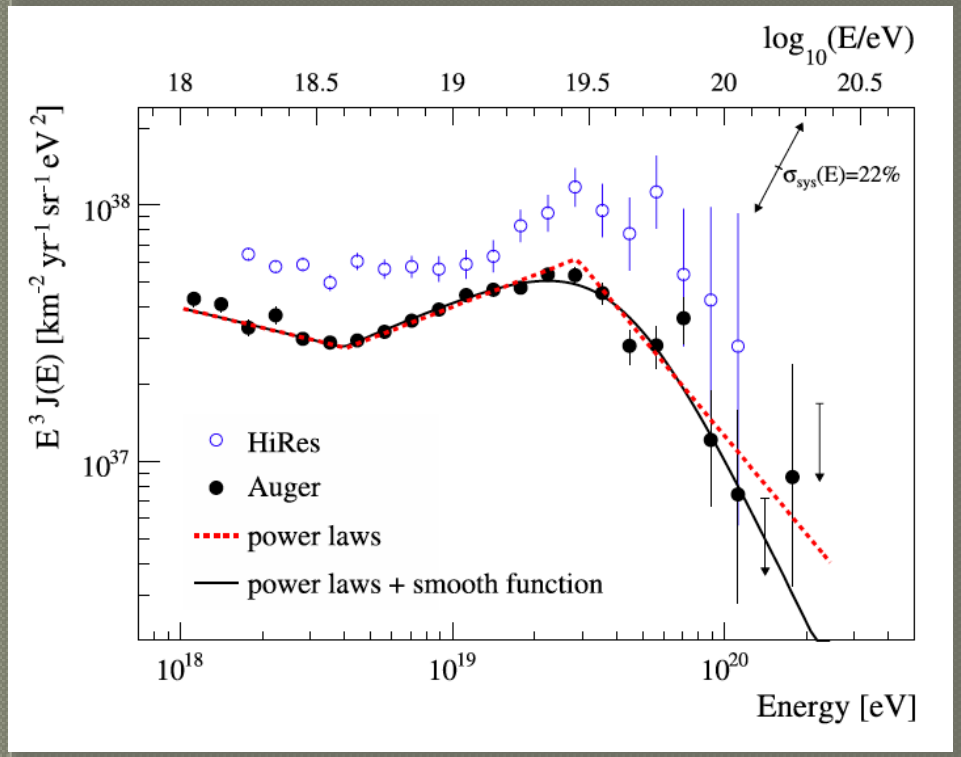
IT IS NOT SANCTIONED BY THE AUGER COLLABORATION

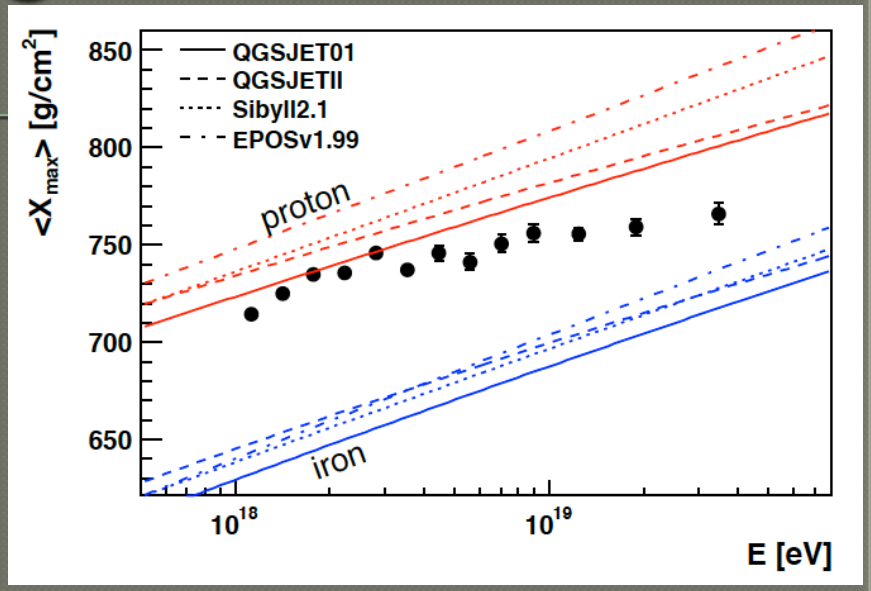
Auger North South

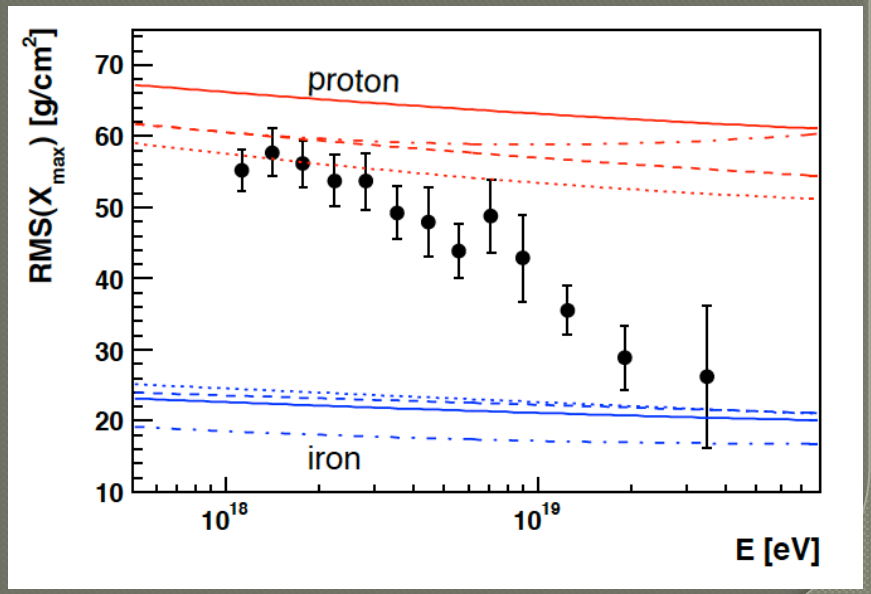
- Is there a Science case for larger Observatory in the Southern Hemisphere?



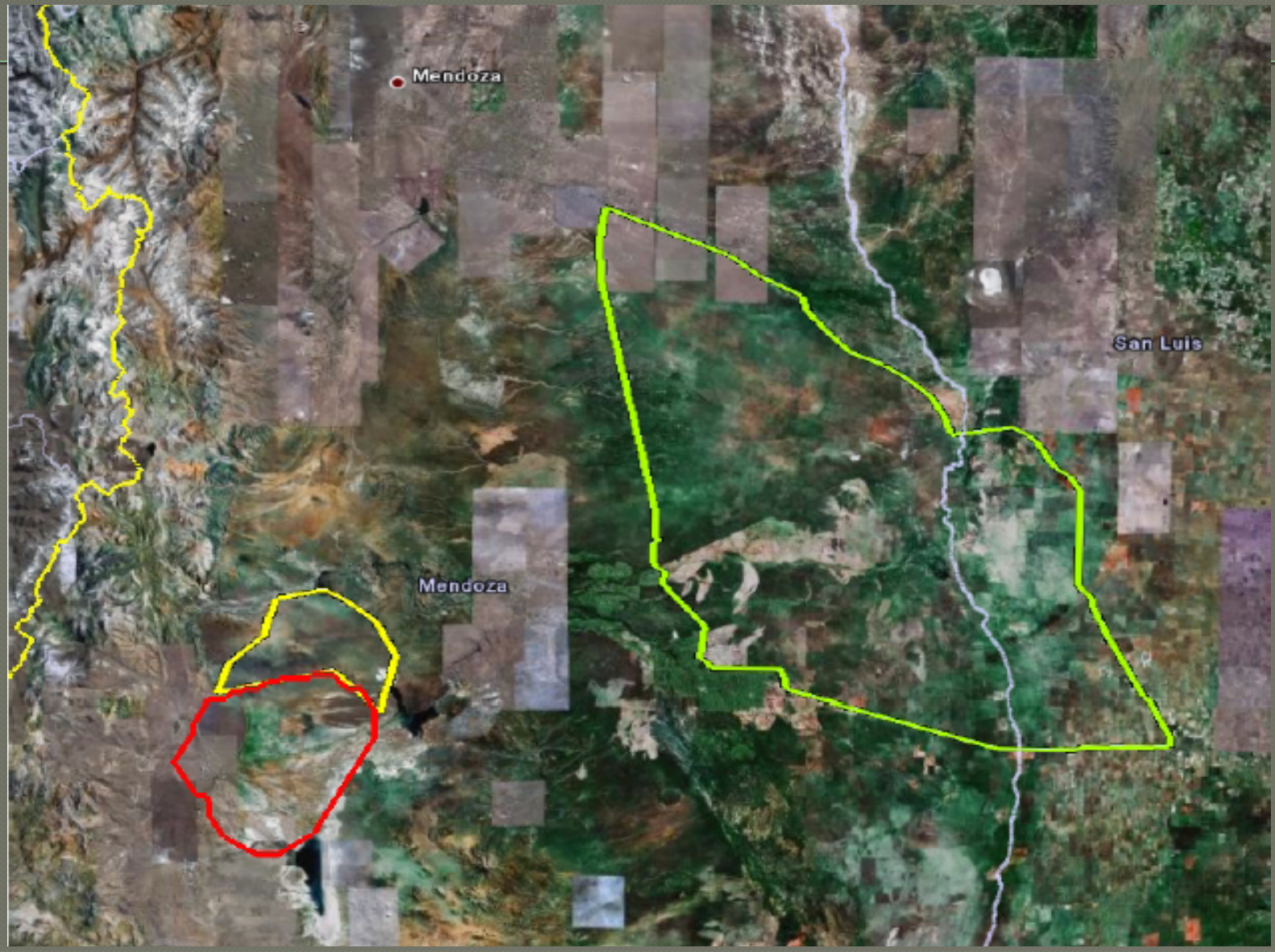
Auger North South



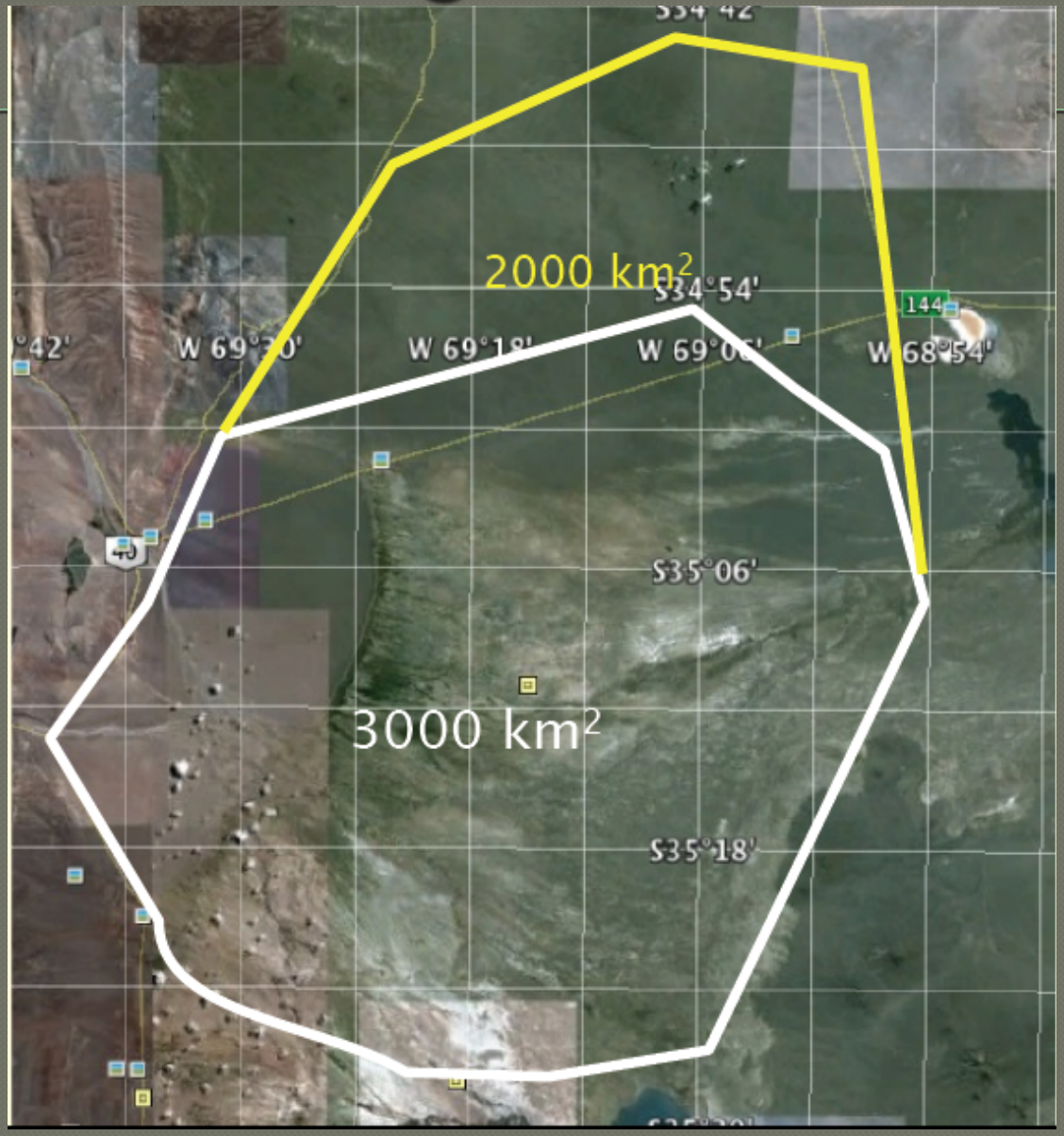




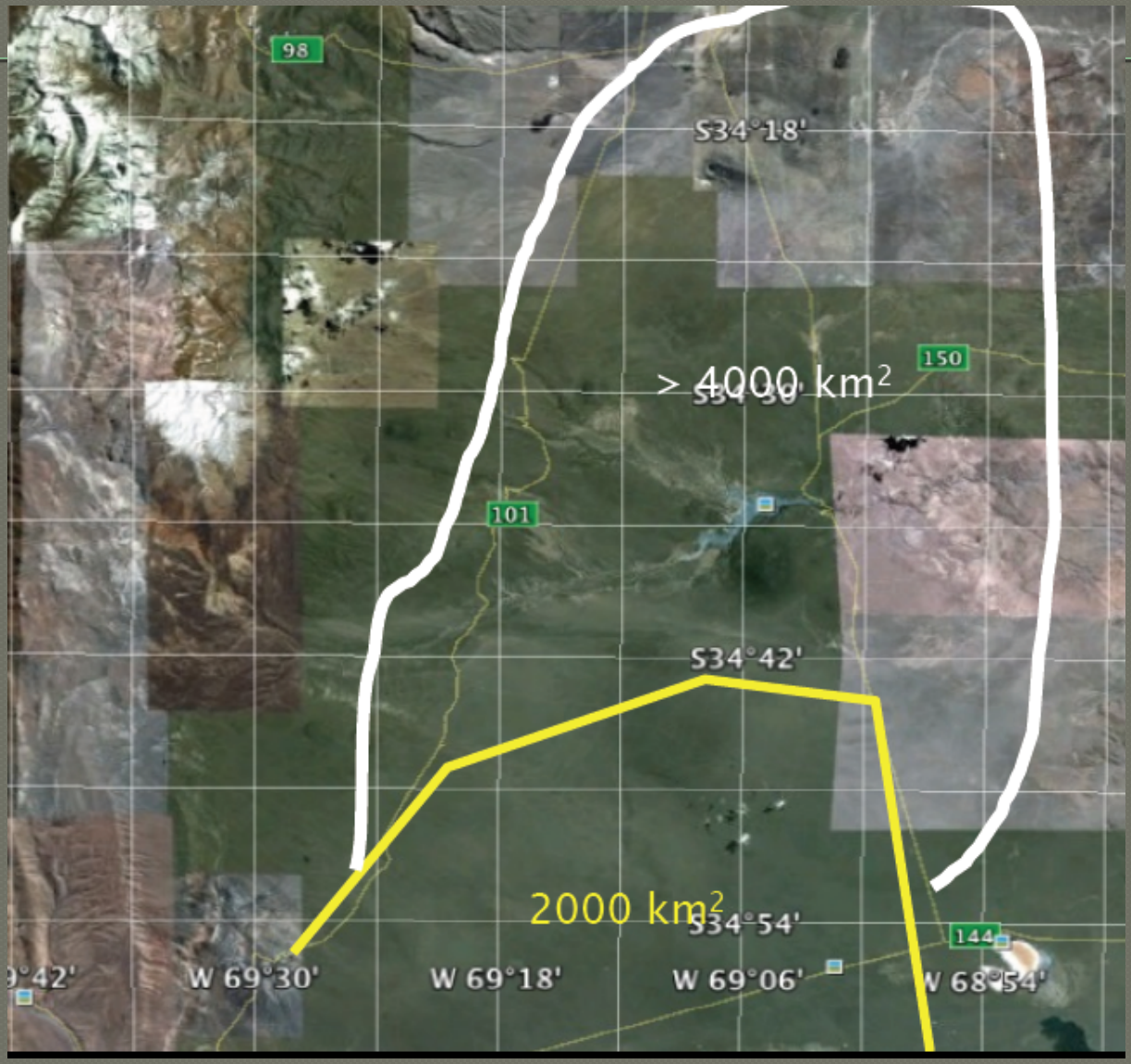
Auger Eagle



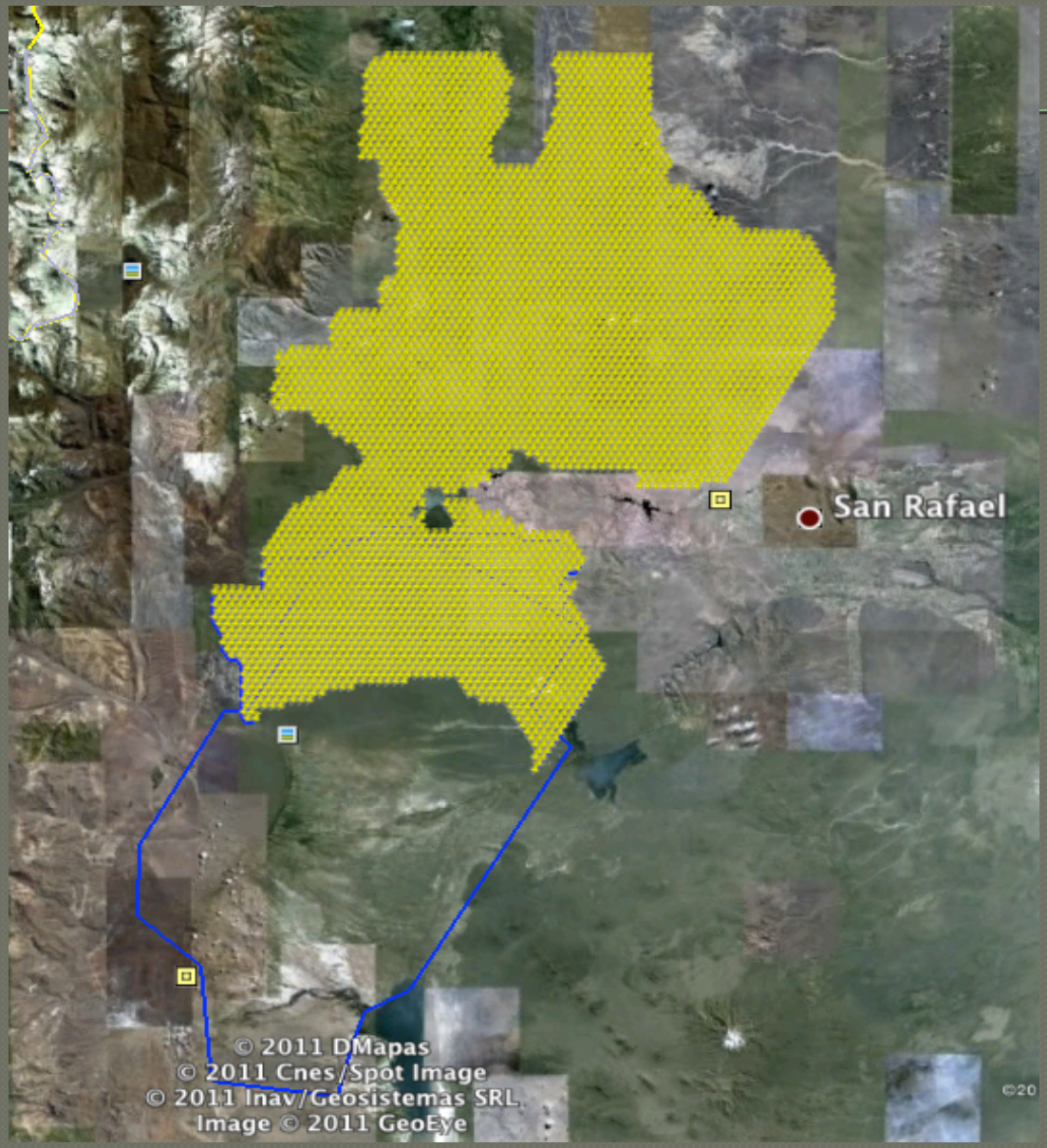
Auger South Extended



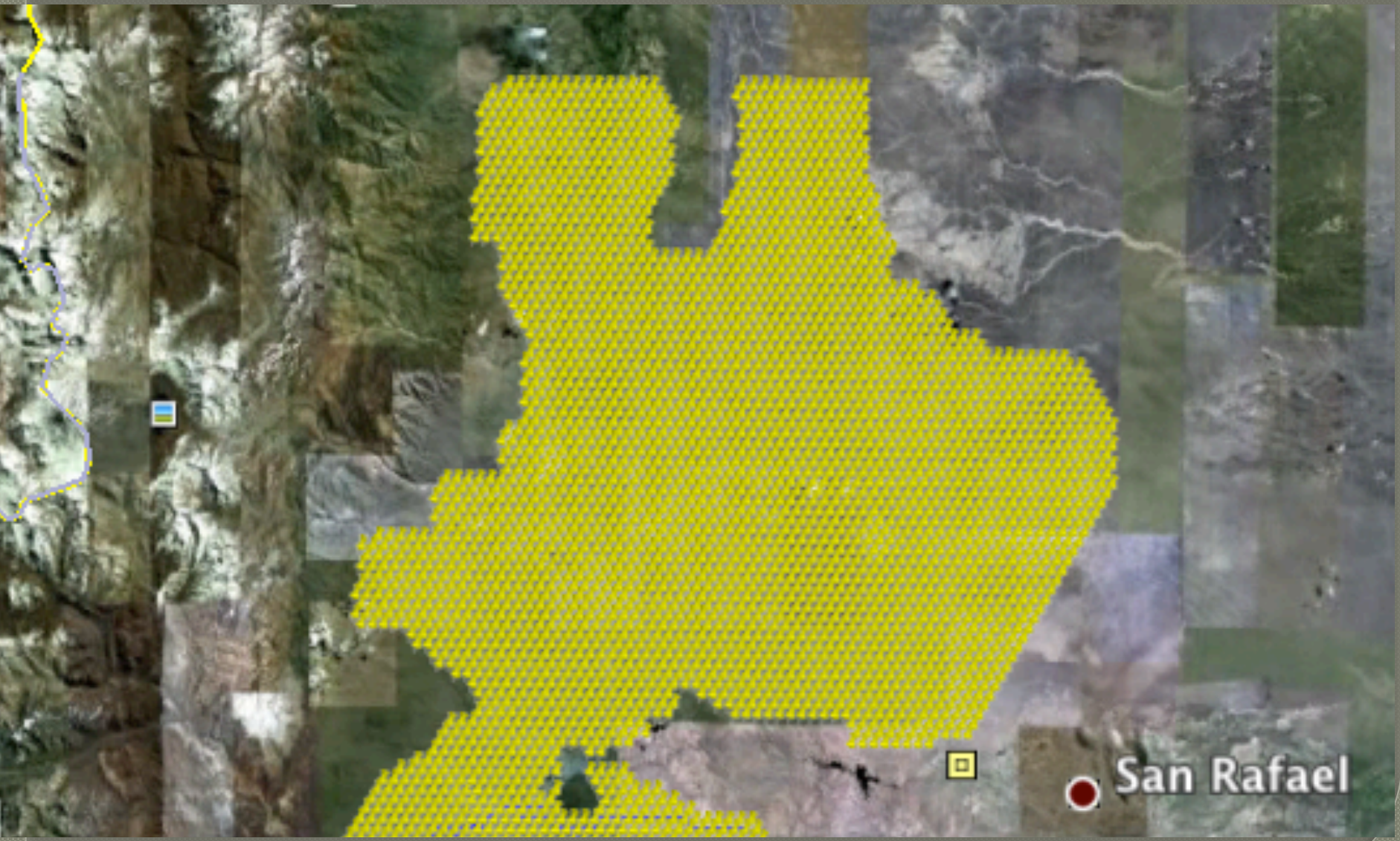
Auger South North



Diamante region

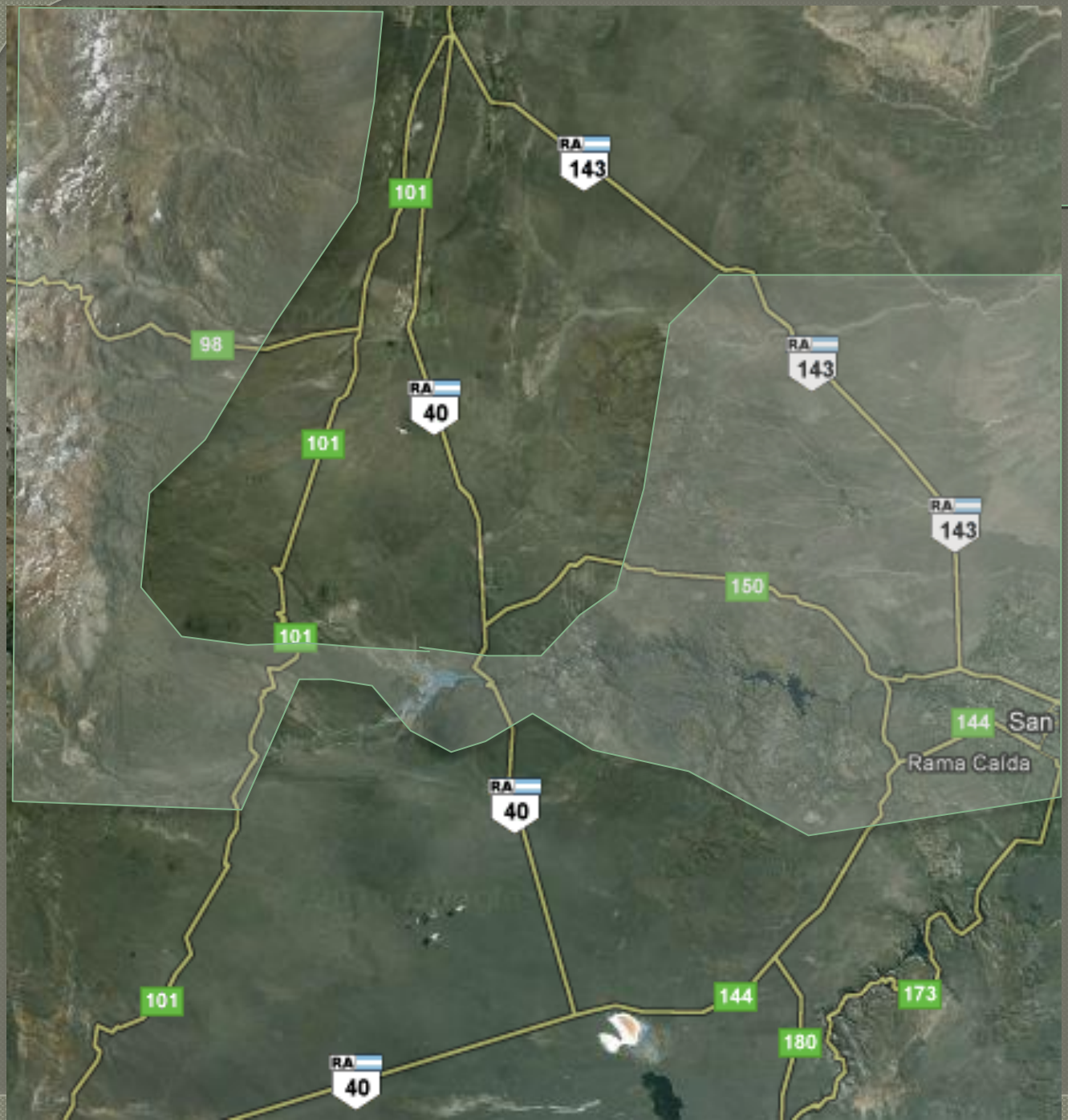


Diamante region



Diamante region

Region


RA 143
101
98
RA 40
101
RA 143
RA 143
150
101
144 San
Rama Calda
RA 40
101
144
173
180
RA 40

Region North

Auger North South

- One could go to 10 000 km^2
- Use Auger North design
- Triangular array separation $\approx$ 2000m
- Cost $\approx$ 40 MUS$
- Operating costs $\times$ 2
- Doable in a frame of time consistent with original Auger North

Conclusion

- Maintaining Auger South is a challenge in itself (another 15 years)
- Expanding Auger South is even more challenging, but the Physics potential make it worthwhile

Thank you!