

Update on candidate sites in Argentina for air-shower particle detectors at high altitudes

Visit to Salta

Adrián Rovero (IAFE)

Wide FoV Southern Observ.- Buenos Aires - December 2017

Outline

- ◆ Summary of scientific and political situation
- ◆ Update of site proposal (following the trip schedule)

Summary of my talk in Puebla

Recent few decades:

Observatories and experiments on High Energy Astrophysics

Pierre Auger Observatory (+ extensions + spin-off: LAGO, ANDES)

DSA-3 (Deep Space Antenna 3, ESA: fully operational in 2013)

CTA (site proposal during site selection process)

-> Man power + gained experience

-> High energy astrophysics community formed during the last two decades

-> Close cooperation with Brazilian colleagues (favors grant applications)

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National Government support:

The Ministry of Science (since 2007) has a permanent Board to analyze proposals for large scientific projects in astrophysics to operate in the country:

LLAMA (7MUSD); QUBIC (500 kUSD);

Provincial support:

The Province where the project is installed contributes with infrastructure:

Auger, DSA-3 (Province of Mendoza); LLAMA, QUBIC (Province of Salta: ~2MUSD)

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Customs and VAT: free importation for scientific projects (like Auger)

Groups with people interested in a southern observatory

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CAB (Centro Atómico Bariloche - Comisión Nacional de Energía Atómica)
(Auger, DSA-3, QUBIC) → 5 scientists + Engineers + PhD students

IAFE (Instituto de Astronomía y Física del Espacio - CONICET)
(Auger, VERITAS, CTA, LLAMA) → 4 scientists + PhD students

IAR (Instituto Argentino de Radioastronomía - CONICET)
(DSA-3, CTA, LLAMA, QUBIC) → 4 scientists + Engineers + PhD students

ITEDA (Instituto de Tecnología de Detección y Astropartículas)
(Auger, DSA-3, CTA, QUBIC) → 6 scientists + Engineers + PhD students

IFLP (Instituto de Física de La Plata - UNLP)
(Auger, LHC, etc.) → many

The visit: flight to Salta

SAC area

(San Antonio de los Cobres)



The visit: Wednesday (in Salta city)



Institute of Industrial Technology (INTI)



Int. Airport



Atomic Comm. (CNEA) - branch office



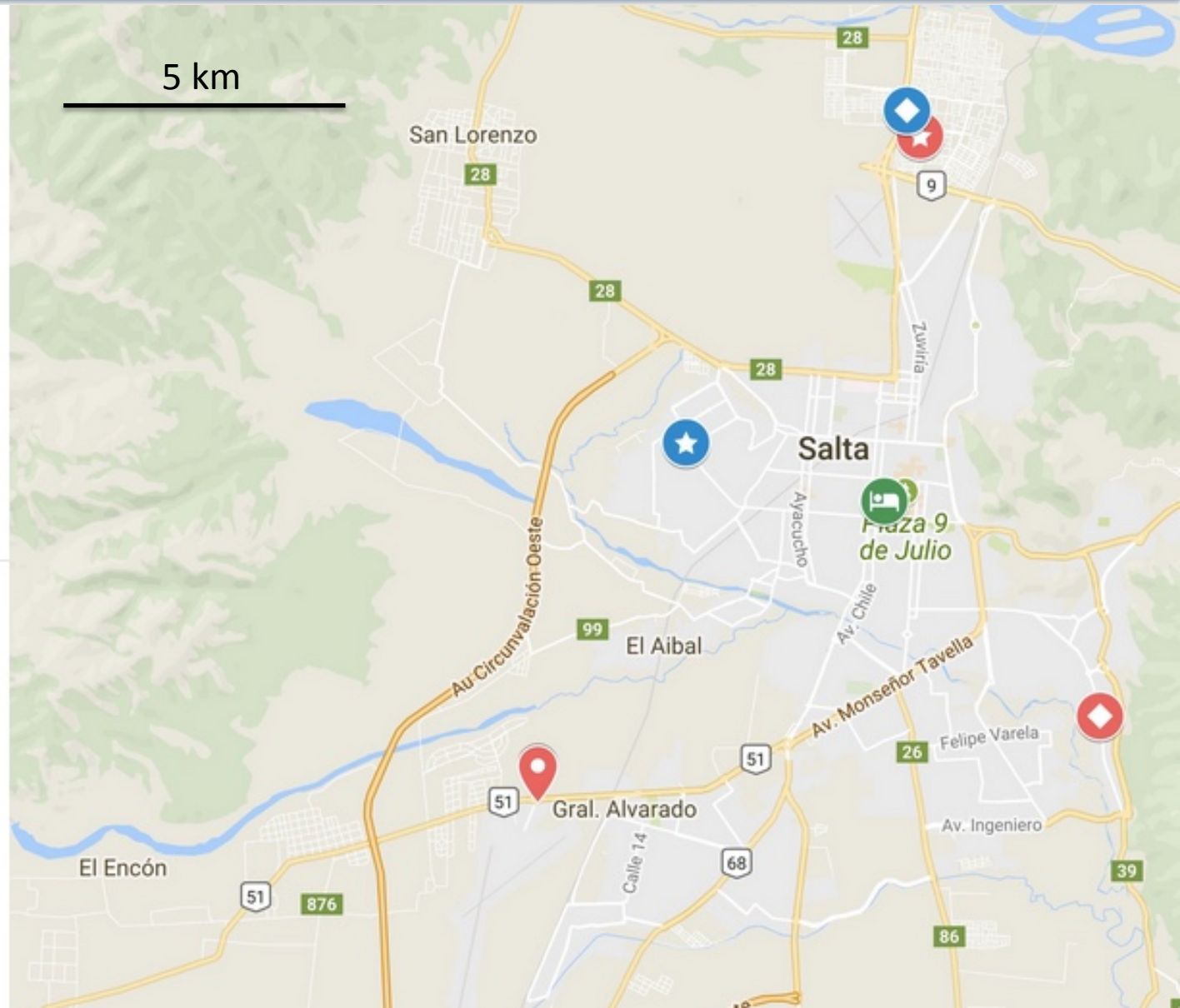
Salta National University (UNSa)









Government House



Hotel Las Vegas



The visit: Wednesday (in Salta city)

-  Institute of Industrial Technology (INTI)
-  Int. Airport
-  Atomic Comm. (CNEA) - branch office
-  Salta National University (UNSa)
-  Government House
-  Hotel Las Vegas









(19:00) Audience at the Government House:

Minister of Education:
Analía Berruezo Sánchez



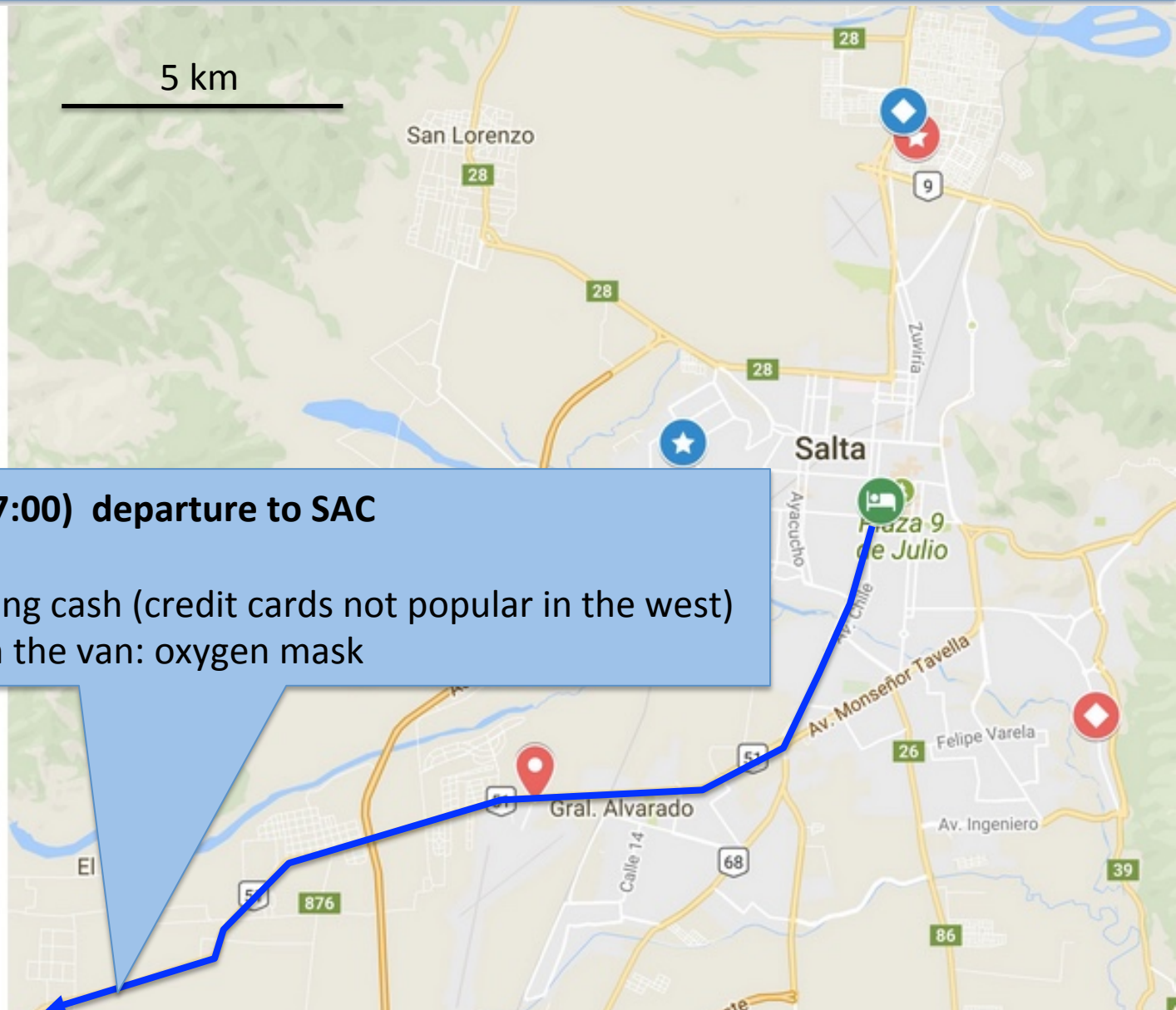
Secretary of Science and Technology:
María Soledad Vicente

The visit: Thursday (trip to the sites)

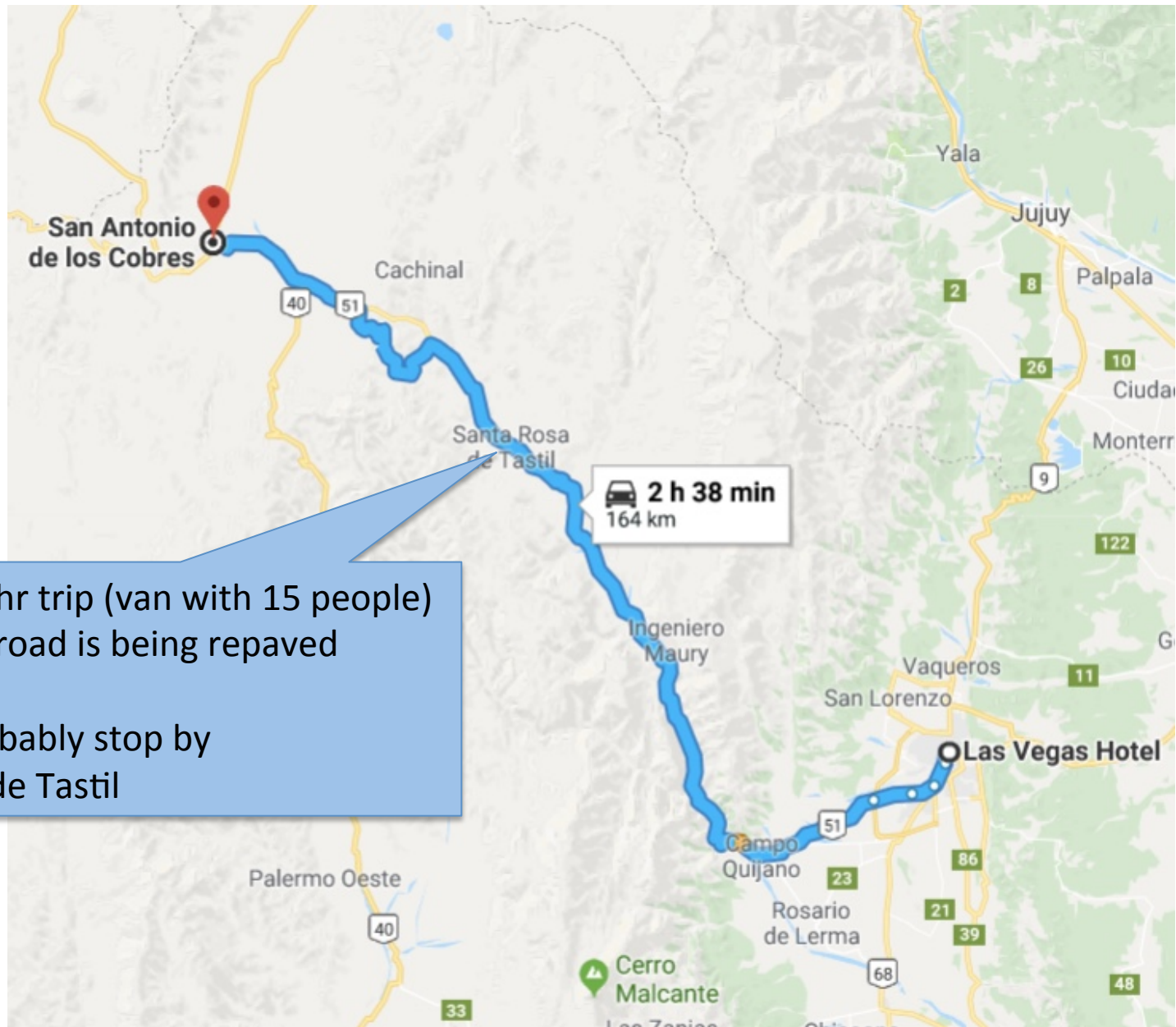
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(07:00) departure to SAC

Bring cash (credit cards not popular in the west)
On the van: oxygen mask



The visit: Thursday (trip to the sites)



- Probably 3 hr trip (van with 15 people)
- Part of the road is being repaved
- We will probably stop by Santa Rosa de Tastil

The visit: stop by Hotel de las Nubes

Town



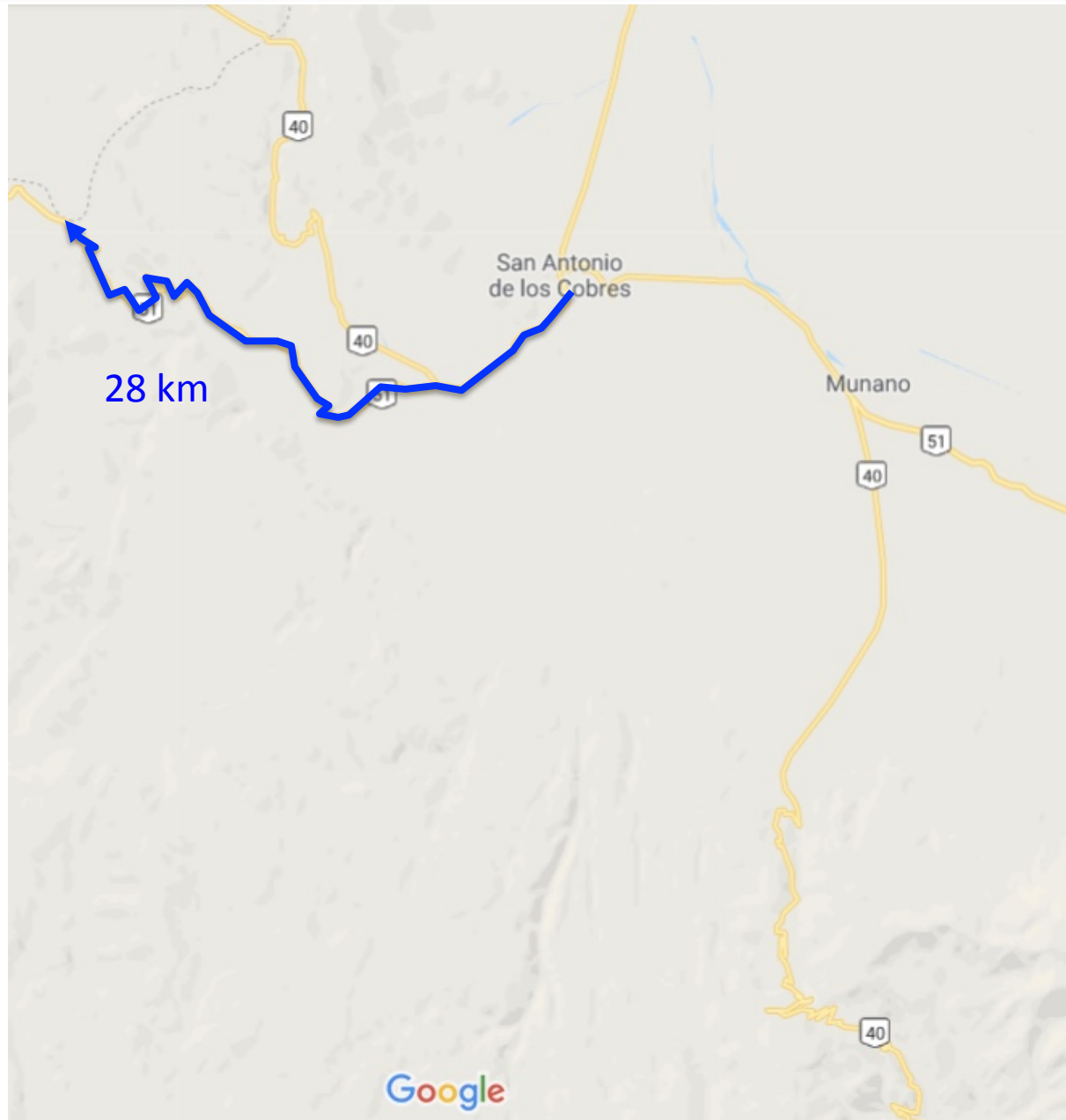
Hotel de las Nubes (lobby)



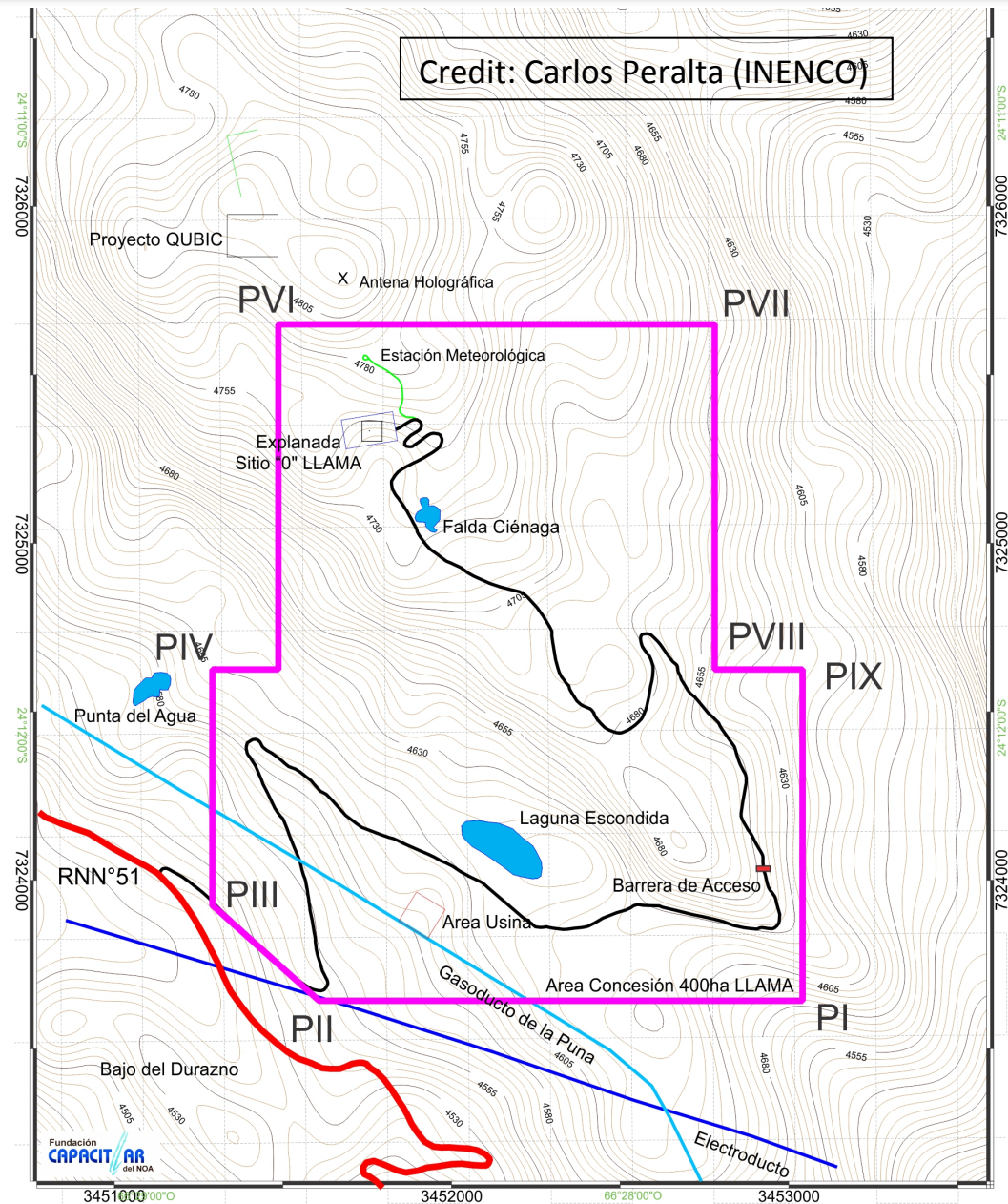
(entrance)

Take blood pressure
and oxygen saturation

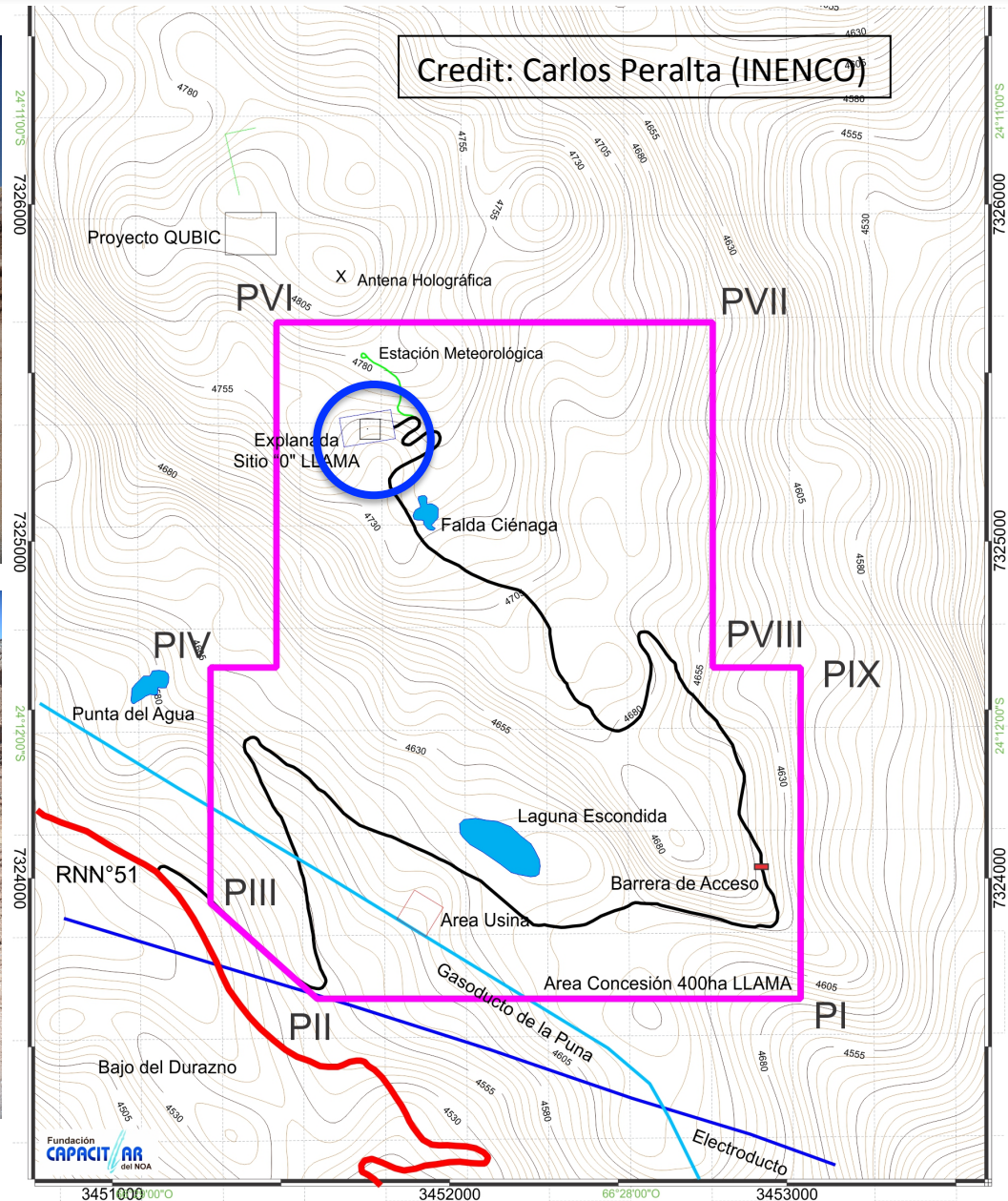
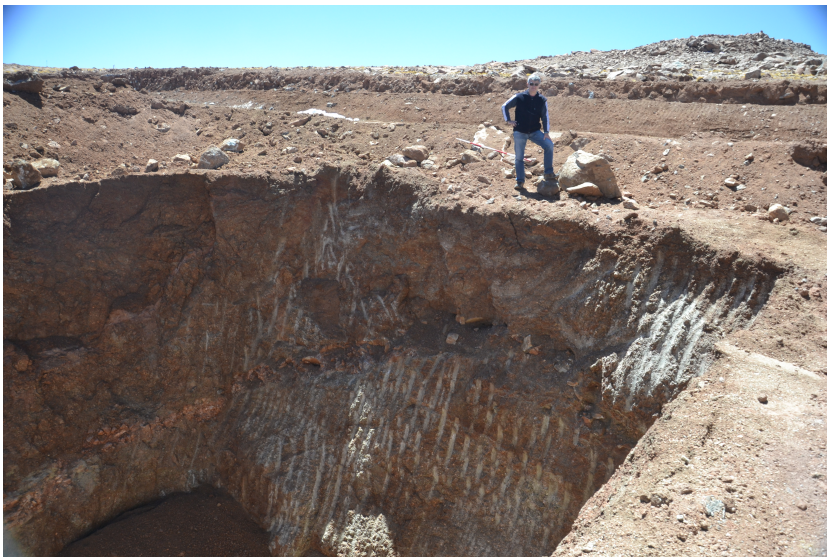
The visit: depart to main proposed site (LLAMA)



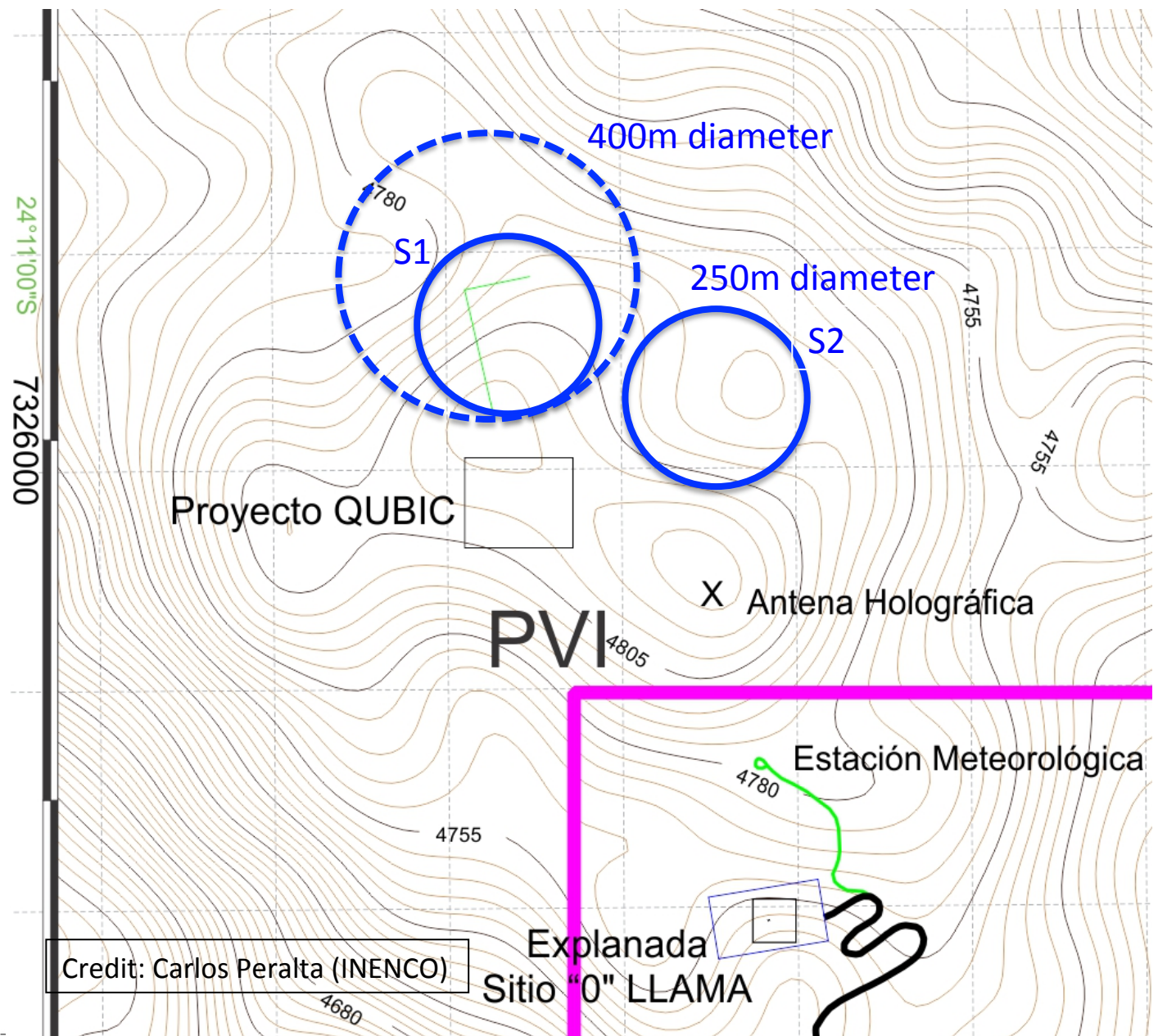
Main proposed sites: assigned area for LLAMA



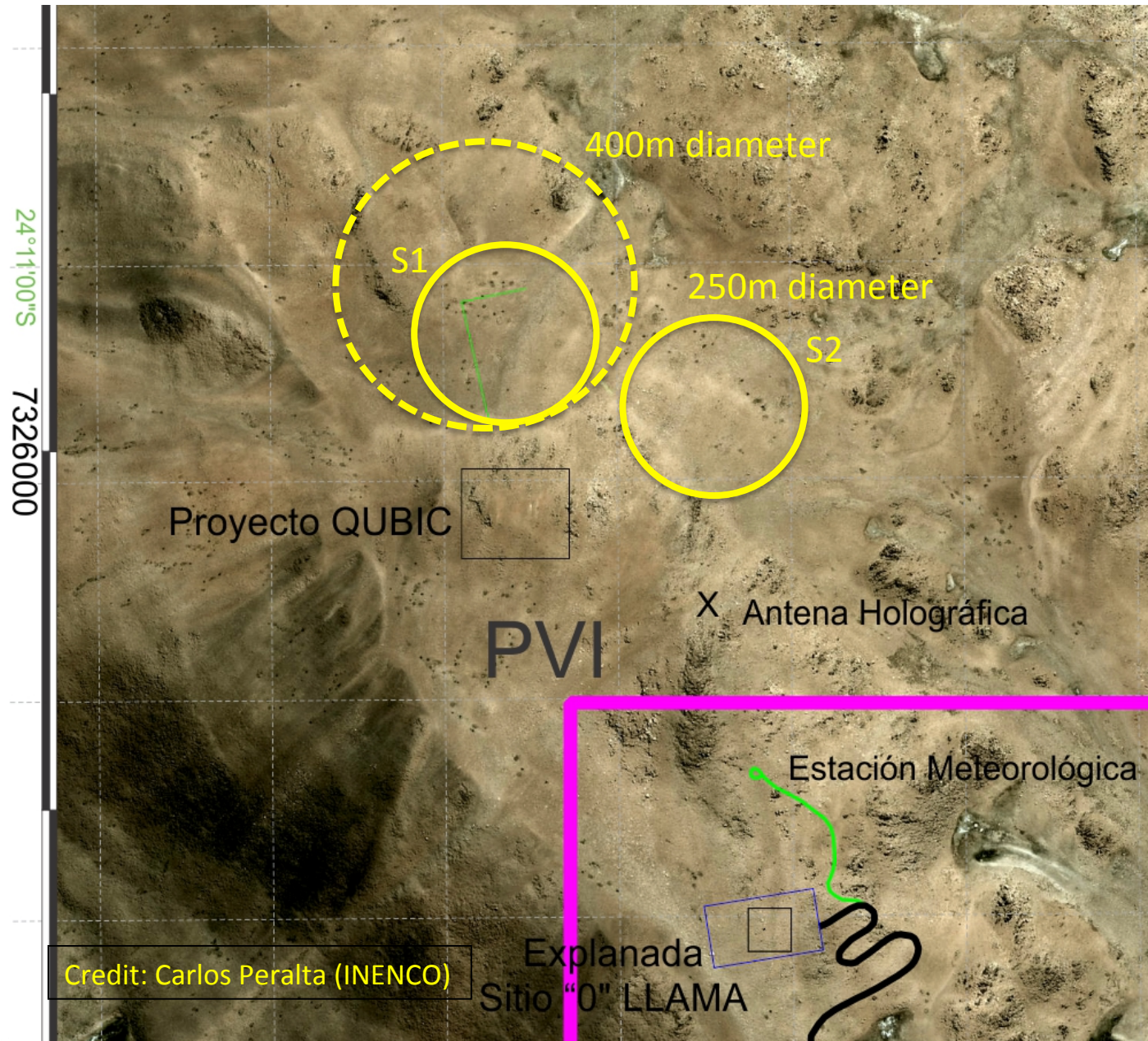
Main proposed sites: assigned area for LLAMA



Main proposed sites: 4800 masl



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Site1: 24:11:04.22 66:28:43.24

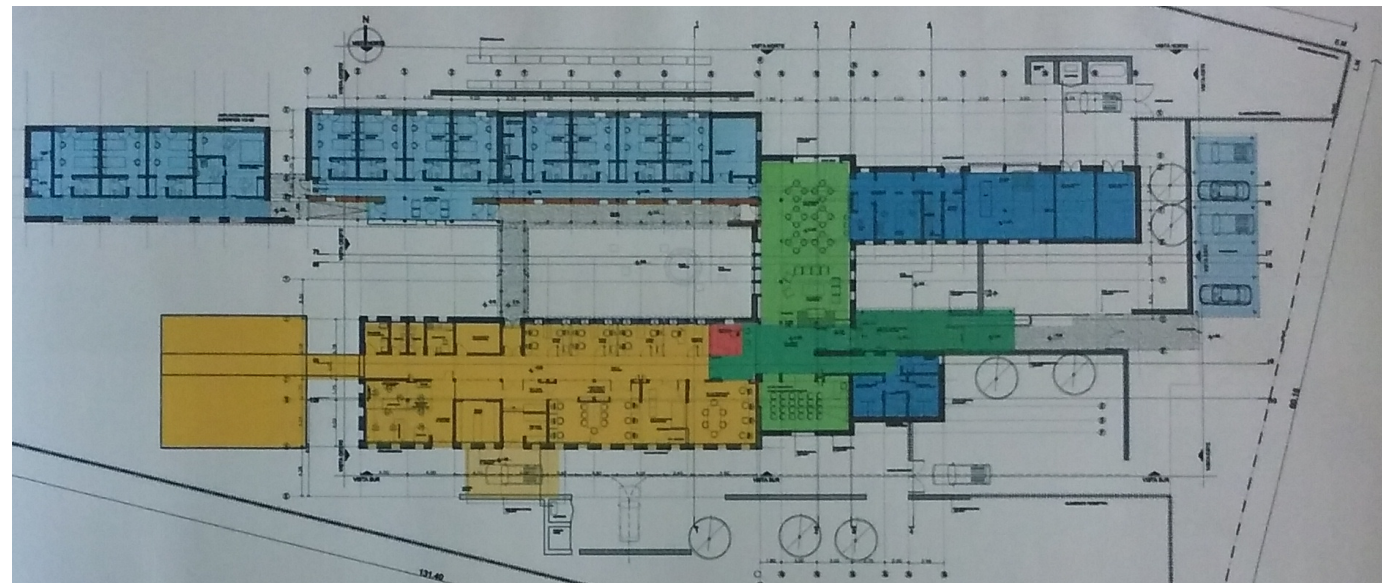
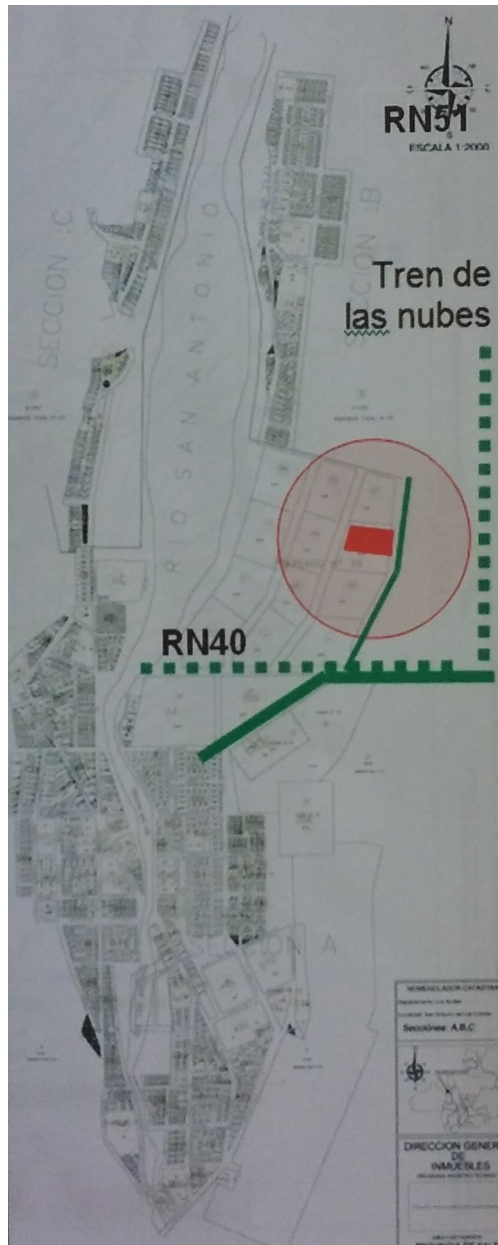


Site2: 24:11:07.56 66:28:30.53

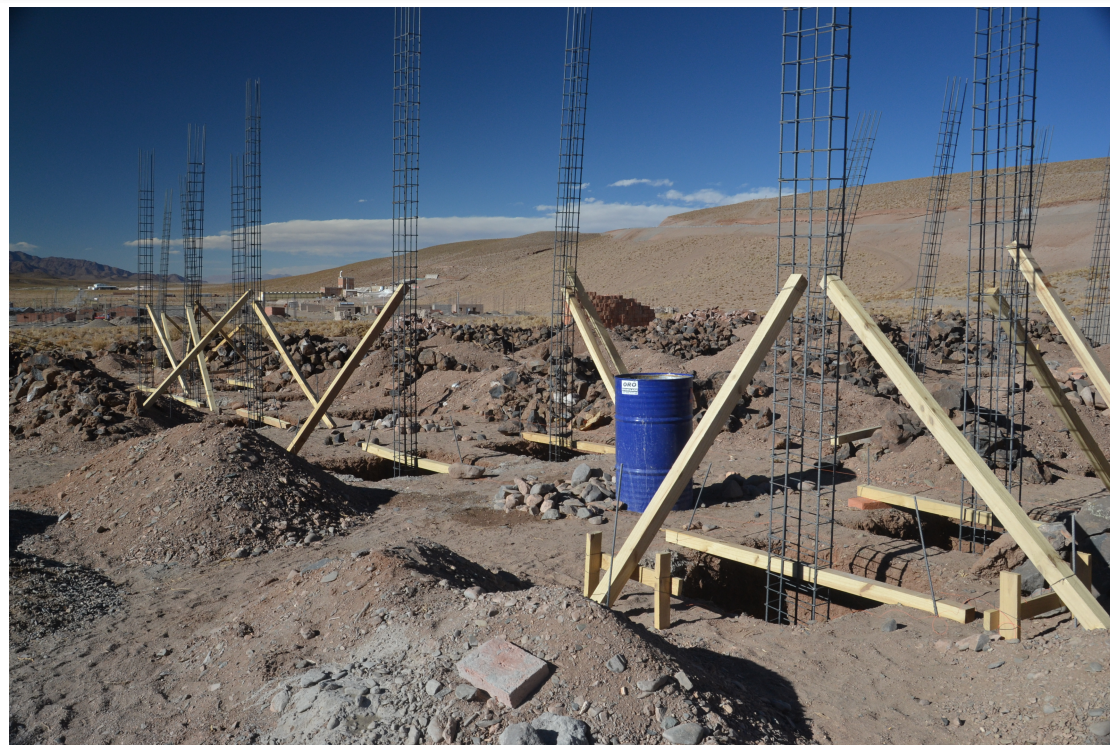


Come back to SAC: take a look at new future building

Facilities being constructed by the Provincial Government → will be shared with QUBIC



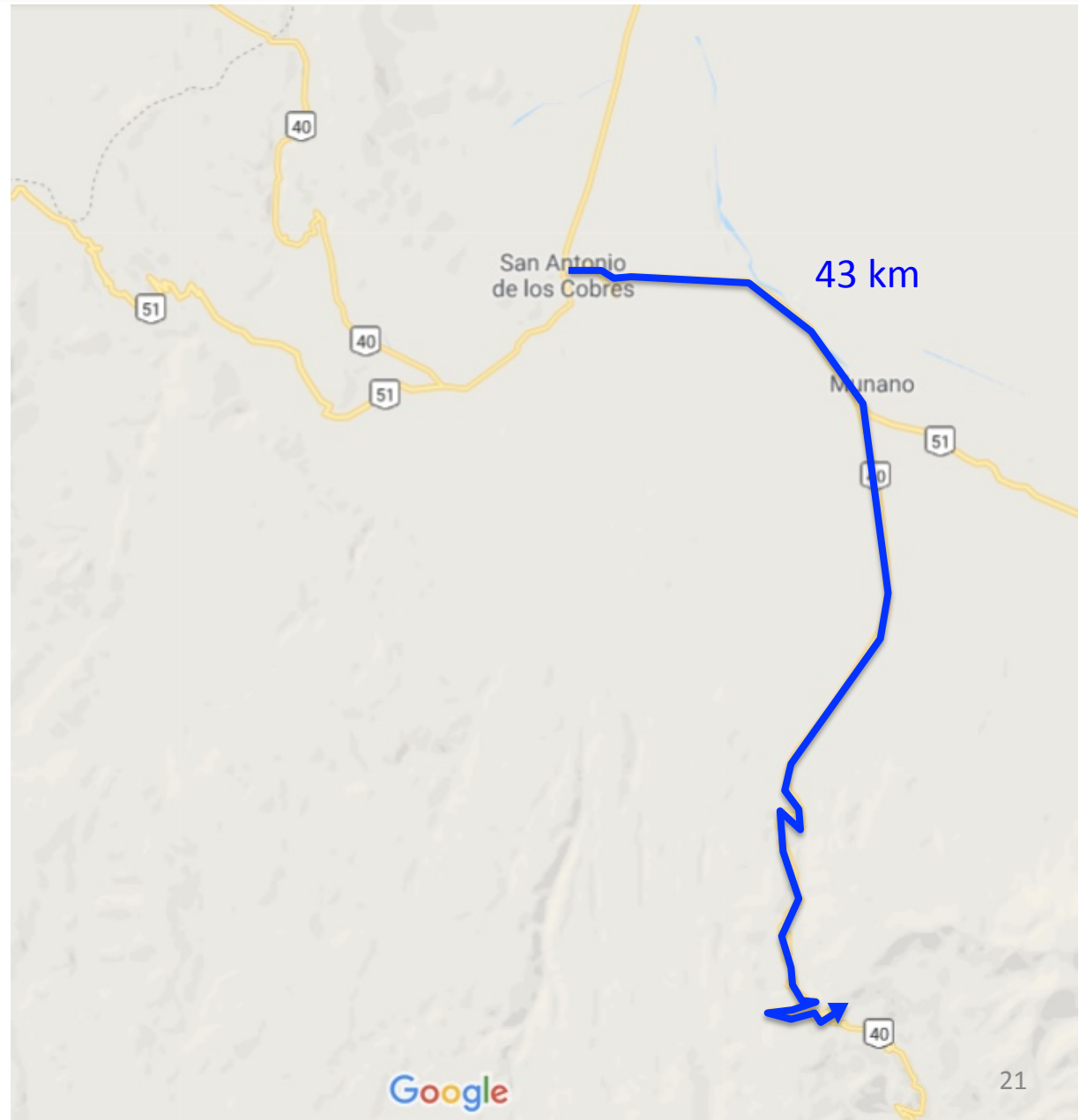
Come back to SAC: take a look at new future building



October 2017



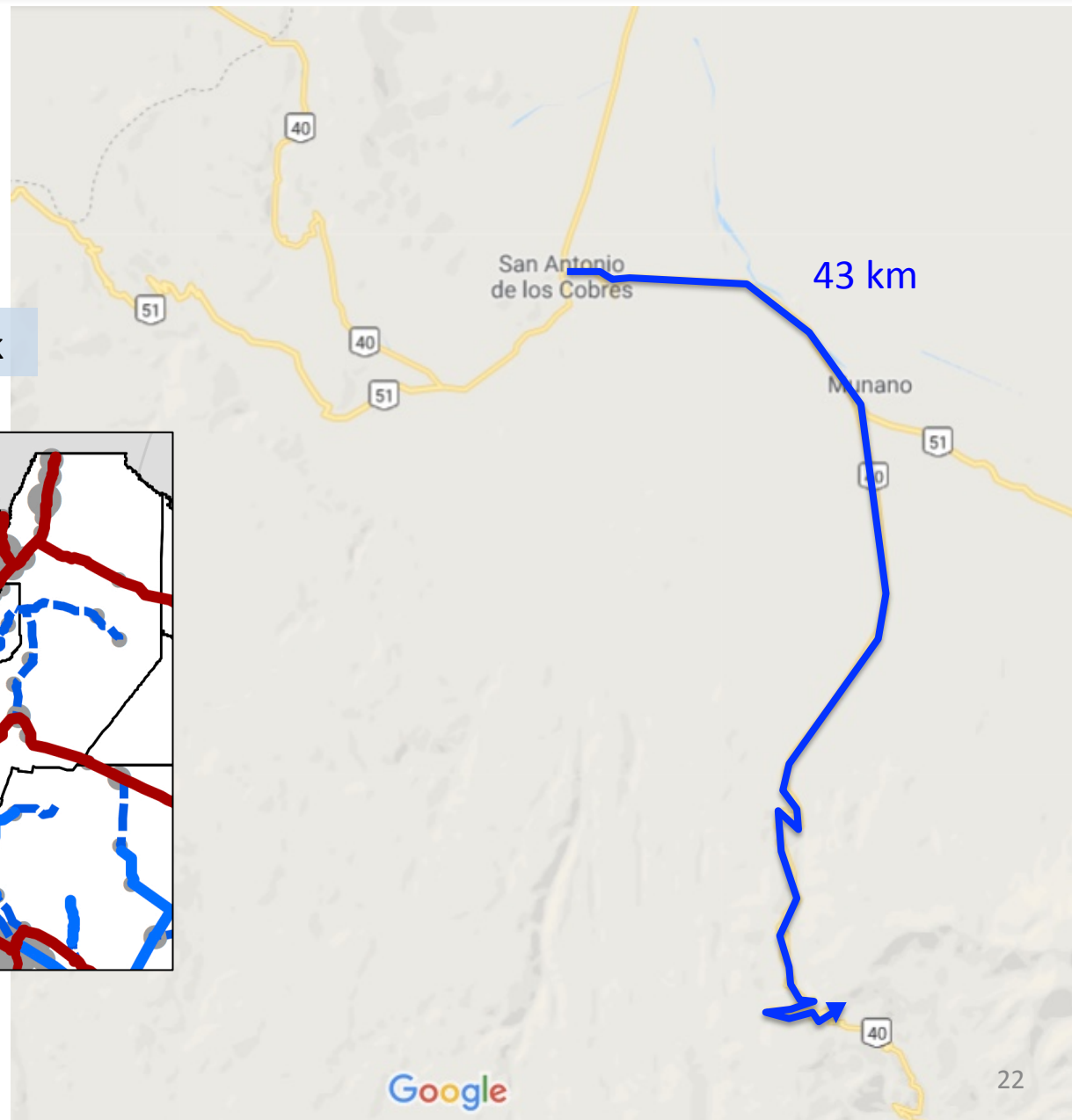
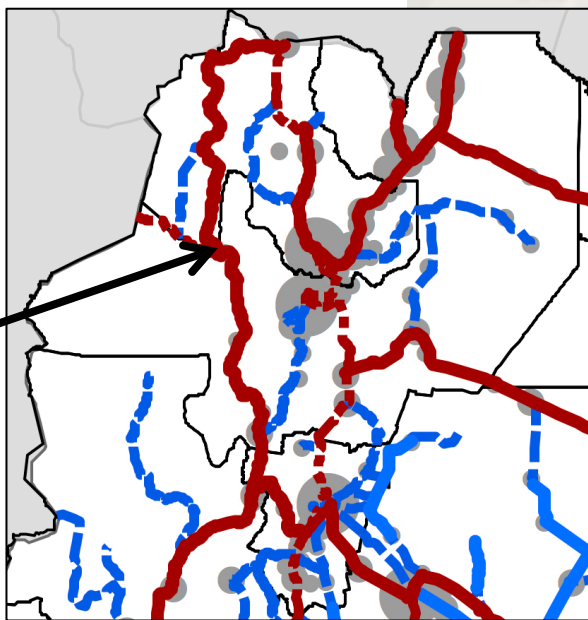
The visit: depart to alternative site (Abra del Acay)



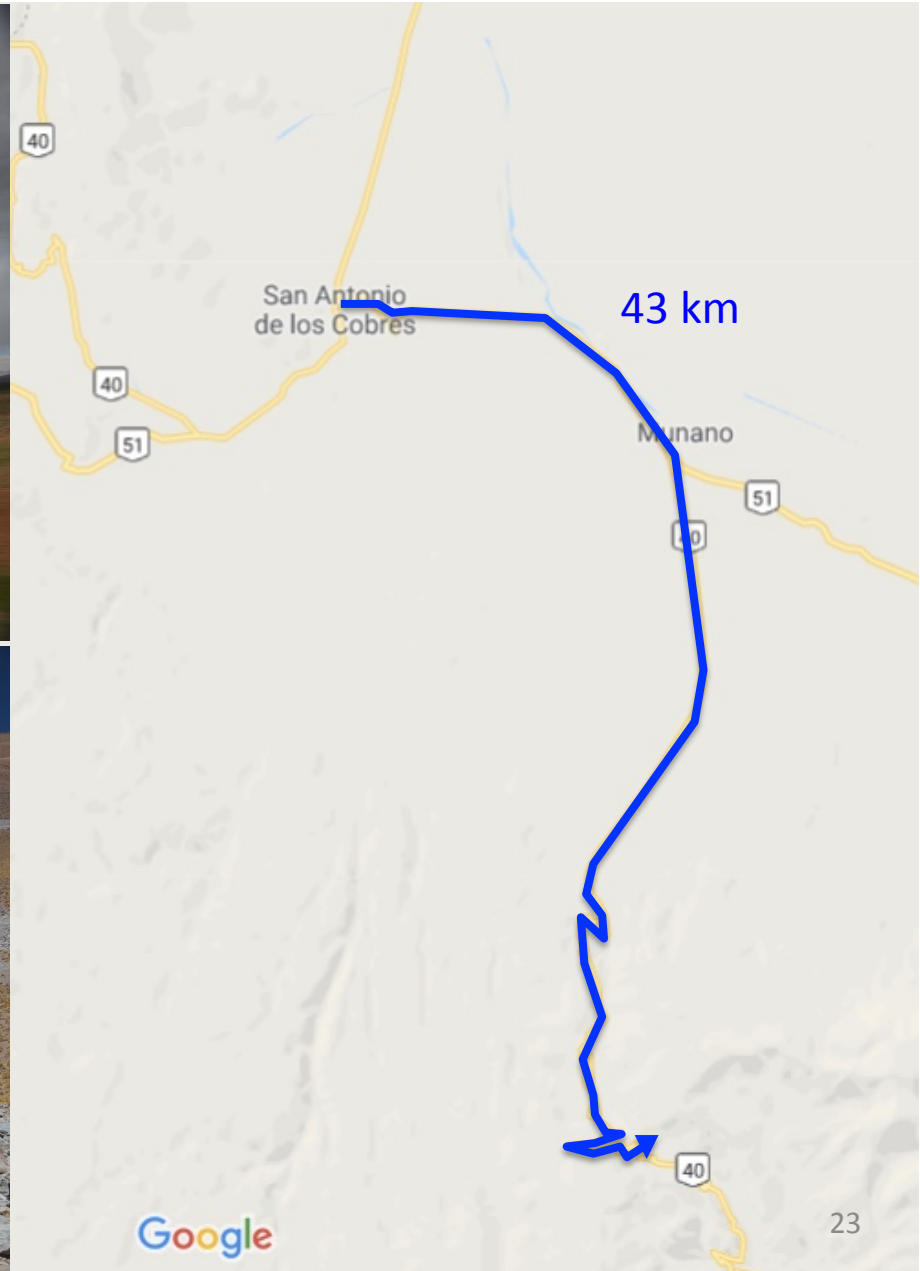
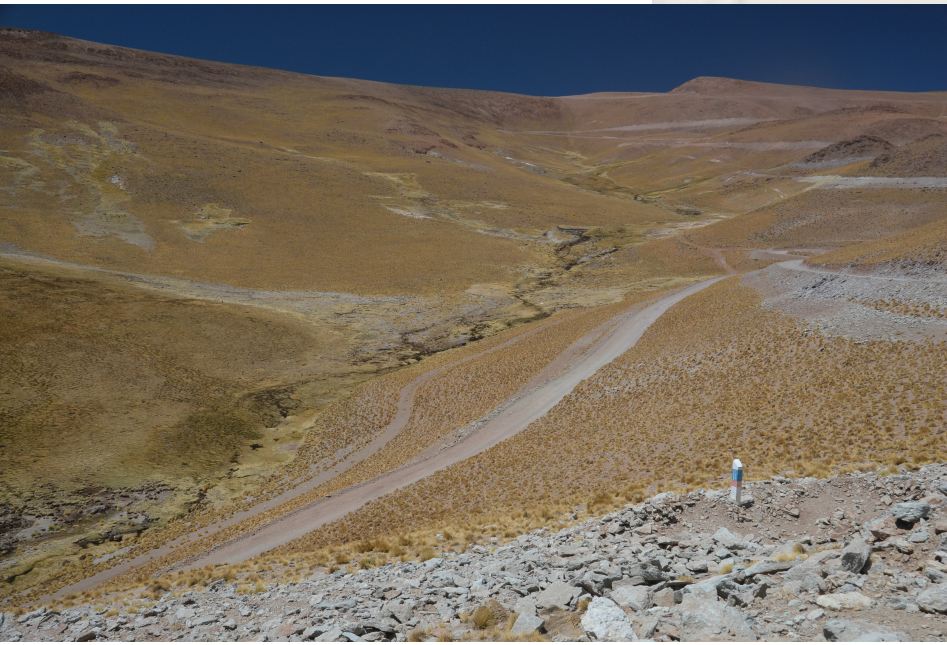
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Federal Optic Fiber Network

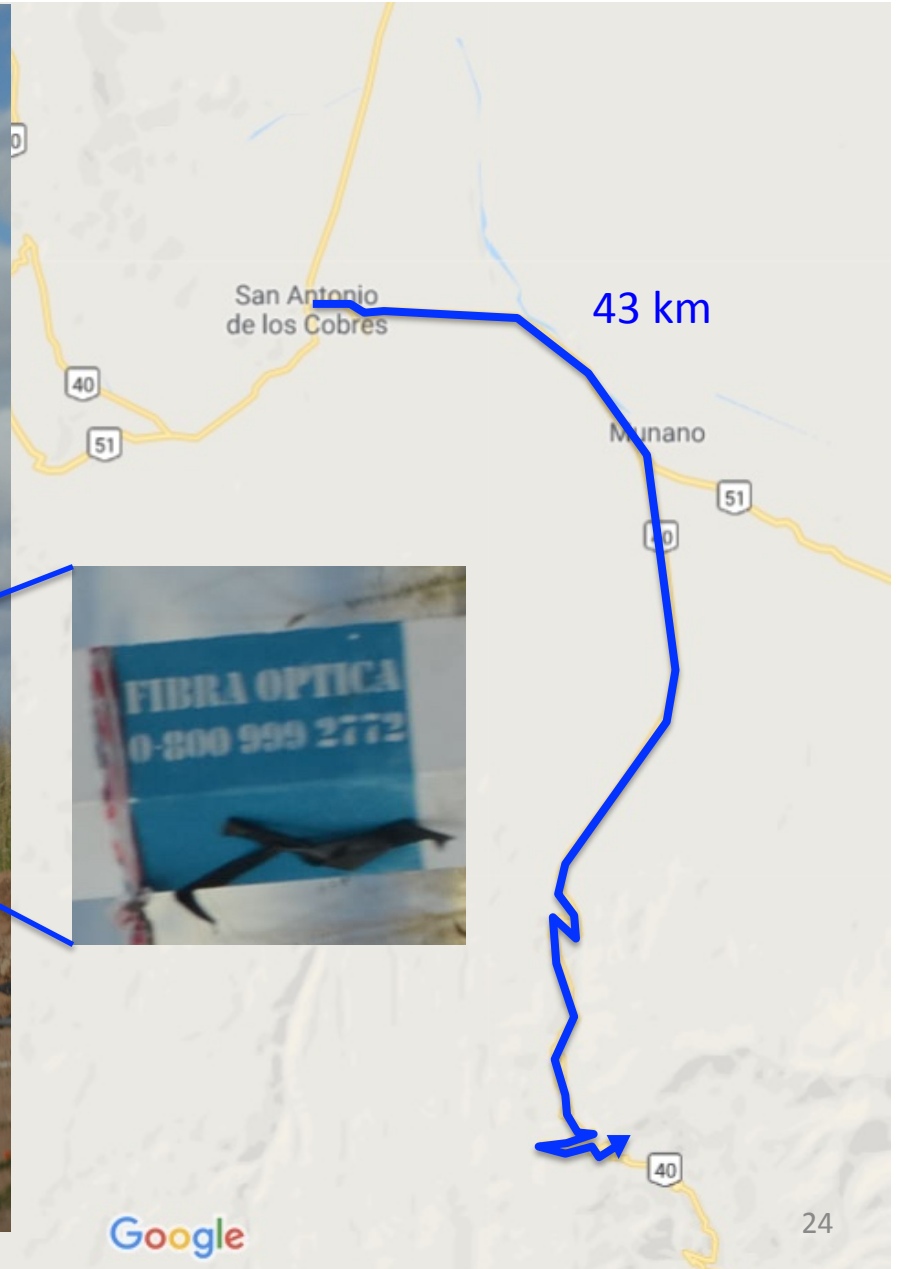
SAC



The visit: depart to alternative site (Abra del Acay)



The visit: optic fiber along route 40



Alternative sites: from Abra del Acay → 1500m South



Alternative sites: site 1 (5150masl)



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Alternative site 1

Leyenda

Abra del Acay

water

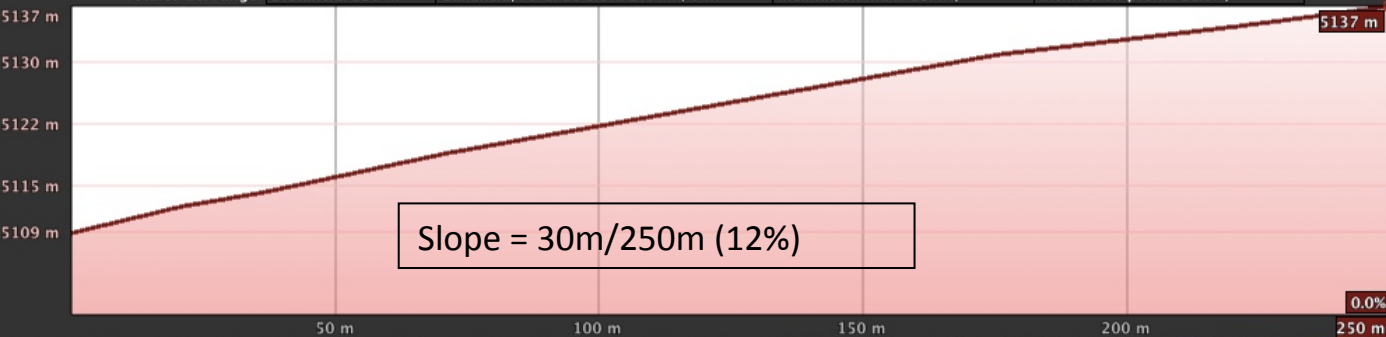
Gráfico: Min., Prom., Máx. Elevación: 5109, 5124, 5137 m

Totales del rango: Distancia: 250 m

Ganancia/Pérd. de elev.: 27.4 m, 0 m

Inclinación máx.: 15.4%, -

Inclinación prom.: 11.0%, -



siteAcay 5150m

Google Earth

Image © 2017 CNES / Airbus

Adrian Rovero - Buenos Aires - Dec. 2017

1 km

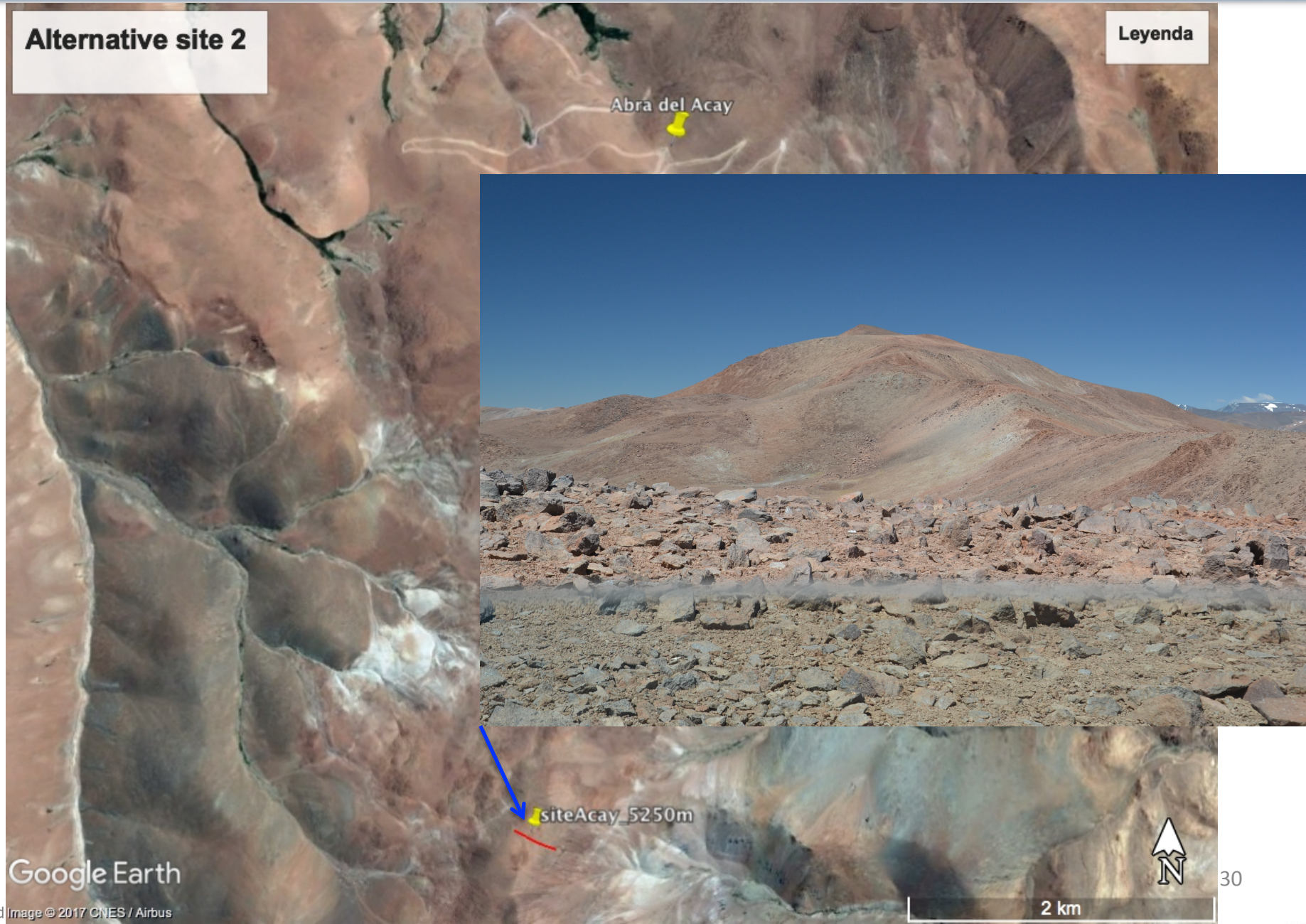
Alternative sites: site 1 (5150masl)









Alternative sites: from Abra del Acay → 5000m South

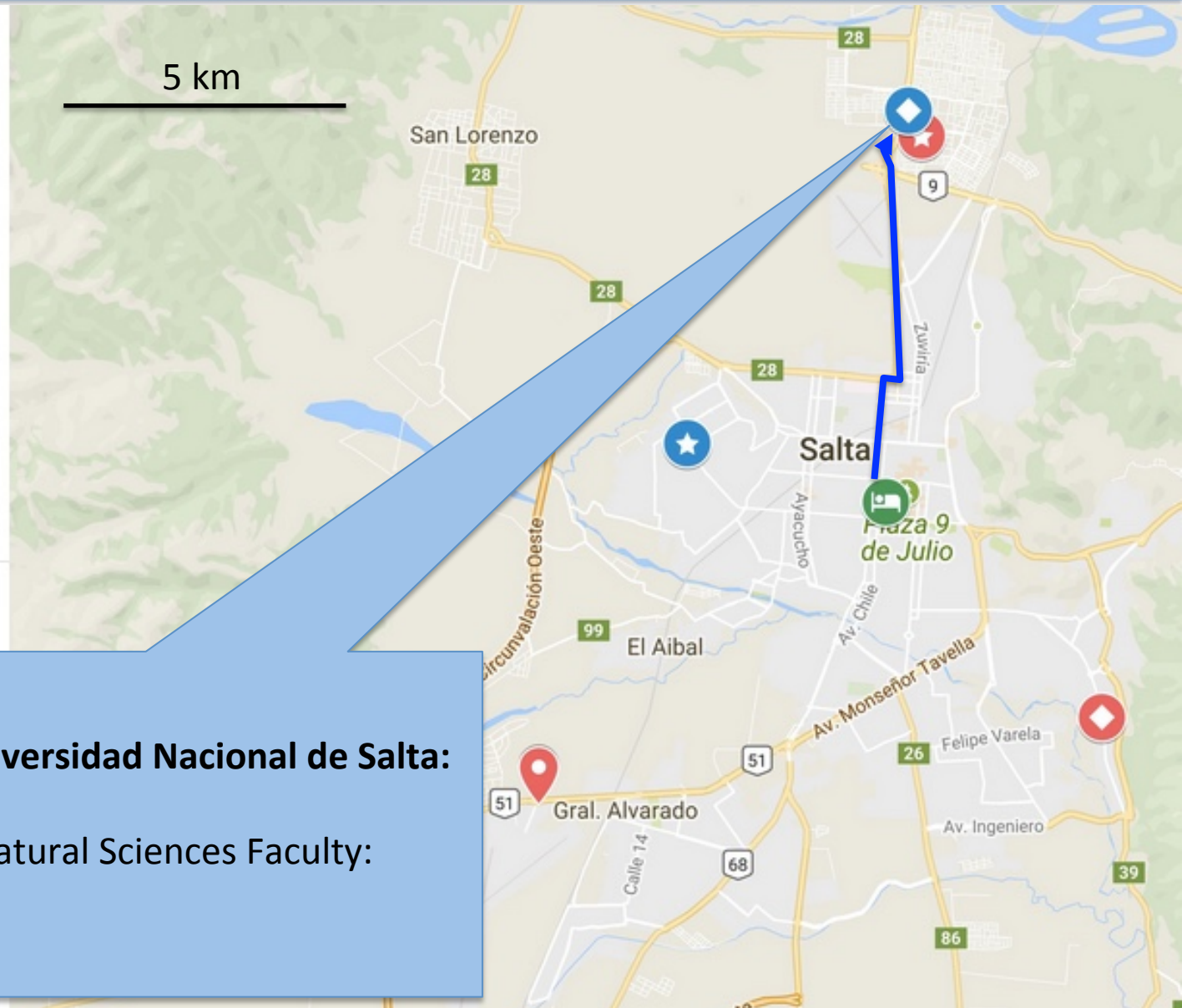


Alternative sites: site 2 (5270masl)



The visit: Friday (in Salta city)

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(10:30) Visit to Universidad Nacional de Salta:

Vice-dean of the Natural Sciences Faculty:
Daniel Hoyos

The visit: Friday (in Salta city)



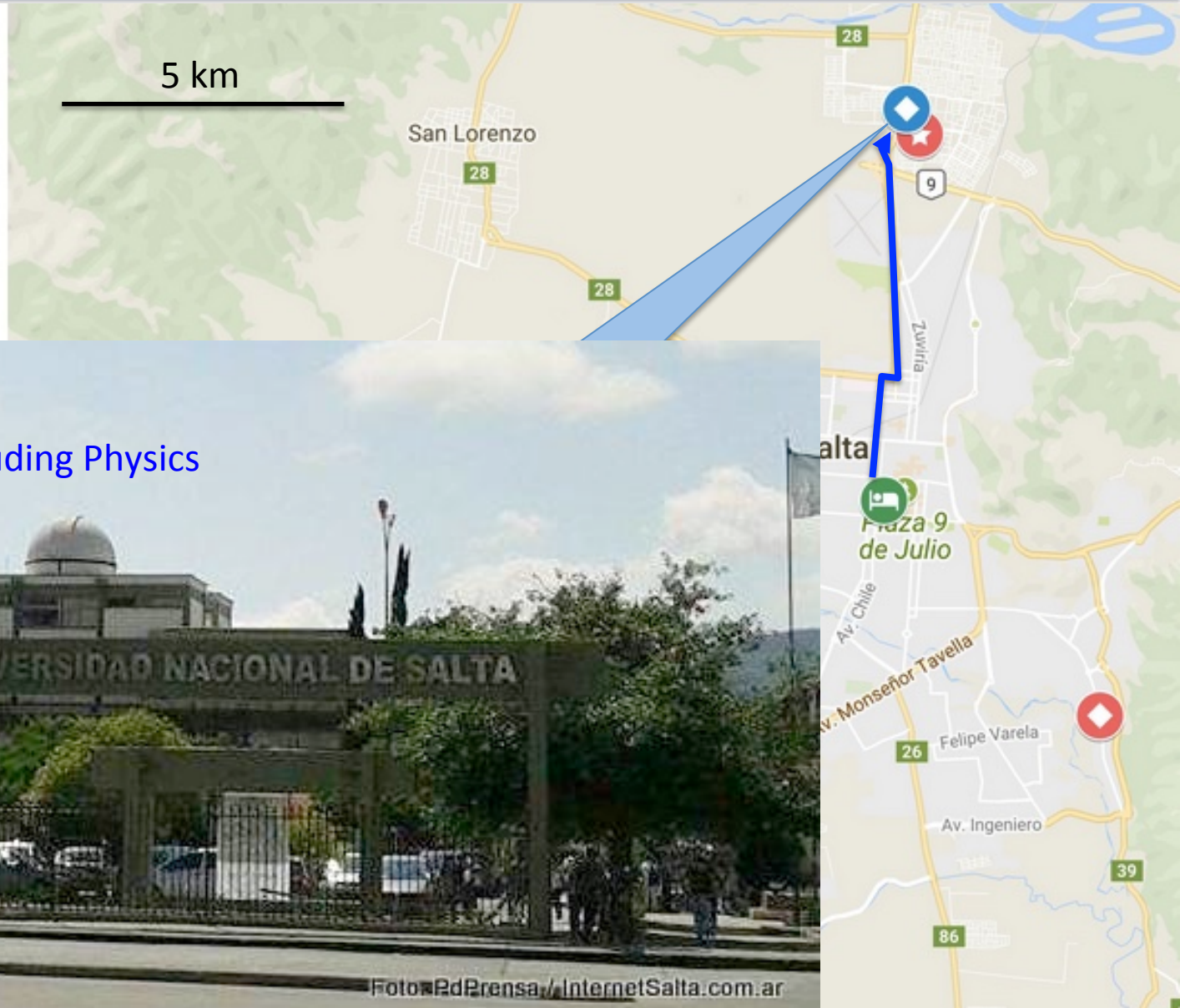
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~80k students total

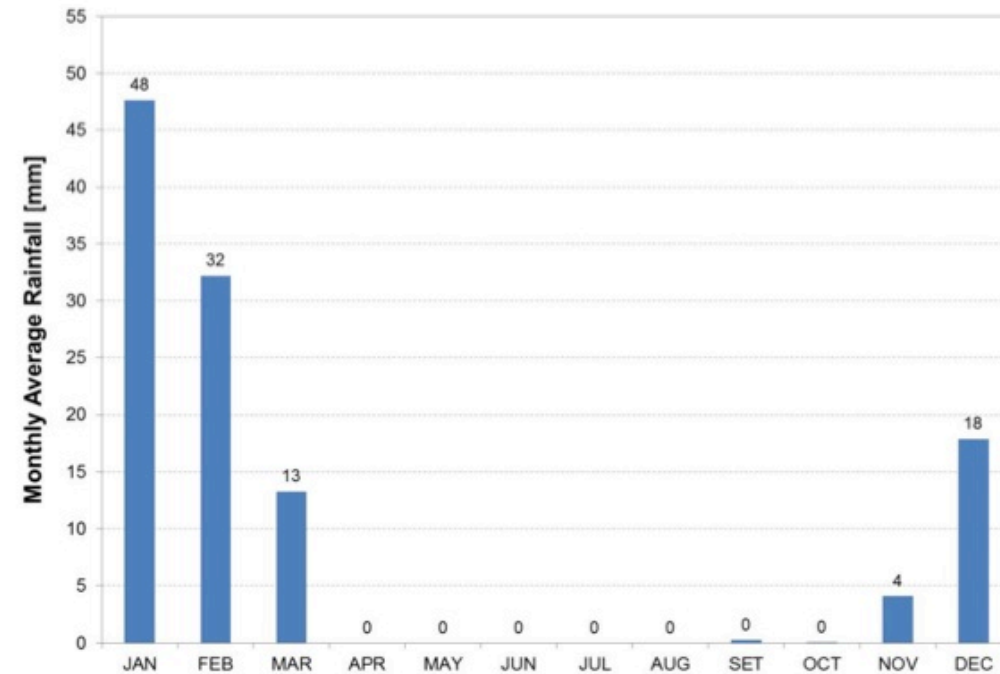
Several careers including Physics



Historical weather data:

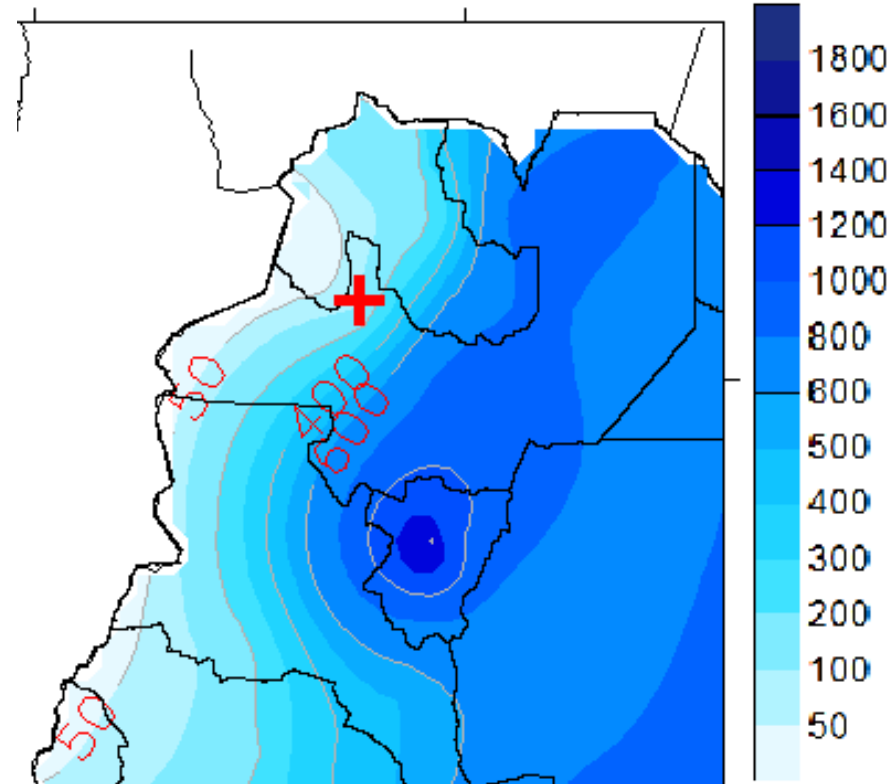
Precipitation in SAC: total annual ~120 mm

Snow: scarce: no accumulation



Monthly annual rainfall for SAC in the period 1949-1990. Records obtained by INTA (Instituto Nacional de Tecnología Agropecuaria)

Temp. these days: SAC: 0-16 °C
Salta: 18-30 °C



Annual average rainfall in SW Argentina
(Servicio Meteorológico Nacional).