

2019 Total Solar Eclipse Expedition (Chile)

D. Kodama
AISIG -- 7 Aug. 2019



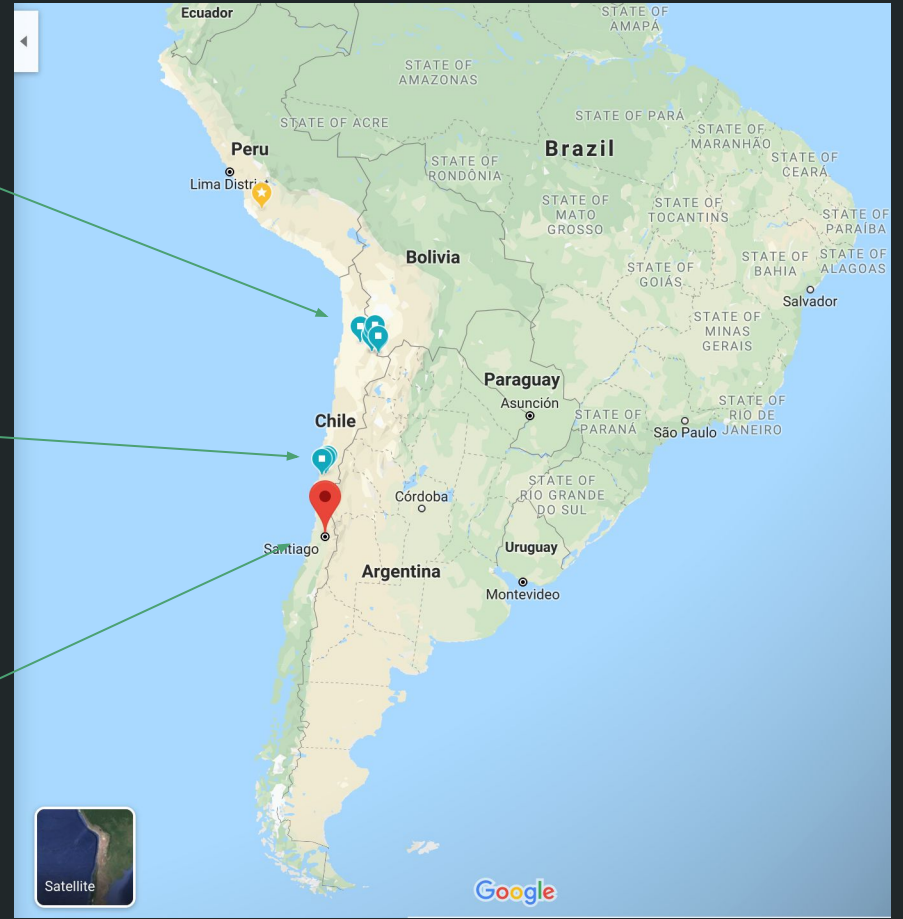
D. Kodama
kodama@alumni.caltech.edu

Google

San Pedro de Atacama, radio observatories

La Serena, optical observatories, eclipse viewing

Santiago



San Pedro de Atacama, radio observatories (~22.9 S)

La Serena, optical observatories, eclipse viewing (~30.0 S)

Santiago (~33.4 S)





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First stop - Santiago (via Lima, Peru)

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OAN (National Astronomy Observatory) in Santiago

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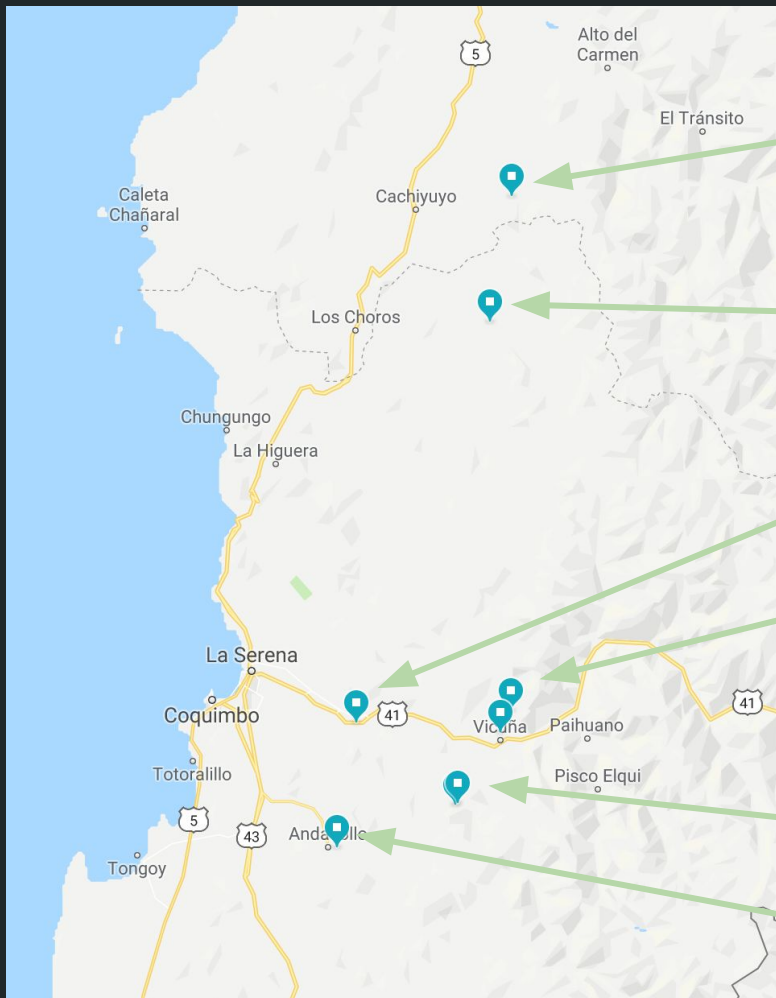


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Las Campanas Observatory

La Silla Observatory


Observatorio Cerro Mayu

Mamalluca Observatory

La Serena / Elqui Valley

Cerro Tololo Observatory

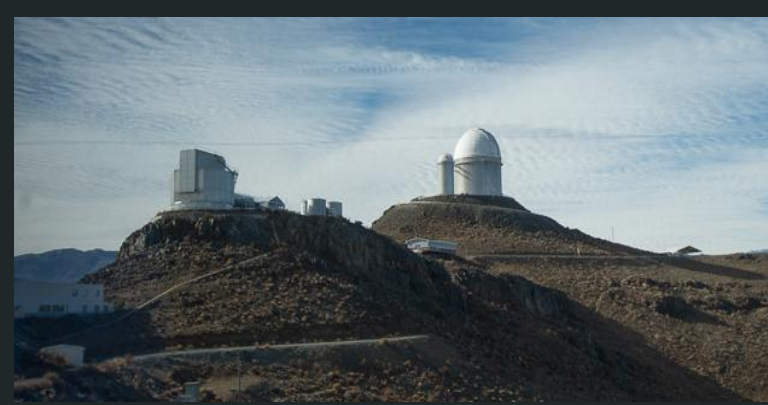
Collowara Tourism Observatory



Dawn in the Andes -- En route to La Silla Observatory

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La Silla European Southern Observatory (ESO)



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ESO New Technology Telescope (NTT) --
Alt-Az 3.58-metre Ritchey-Chretien

La Silla observatories are at ~2400 meters
(~7800 ft.)

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ESO 3.6 meter Cassegrain scope



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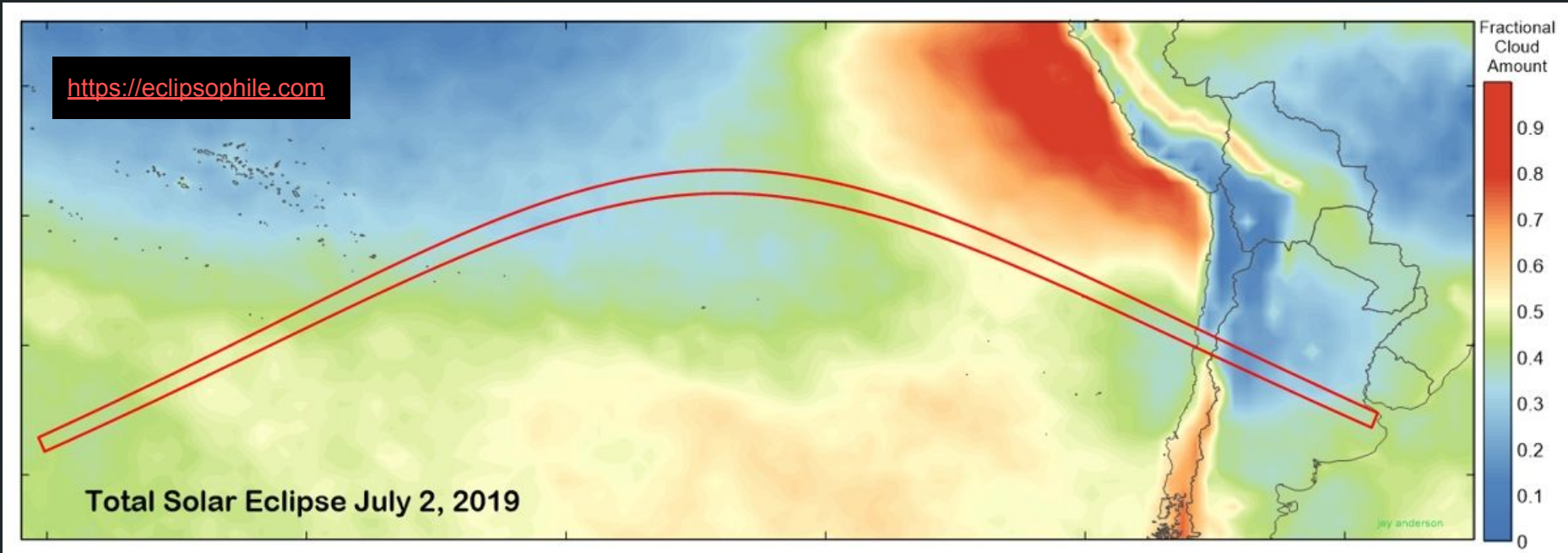
Worrisome but colorful clouds plus a jet contrail and shadow on low clouds.

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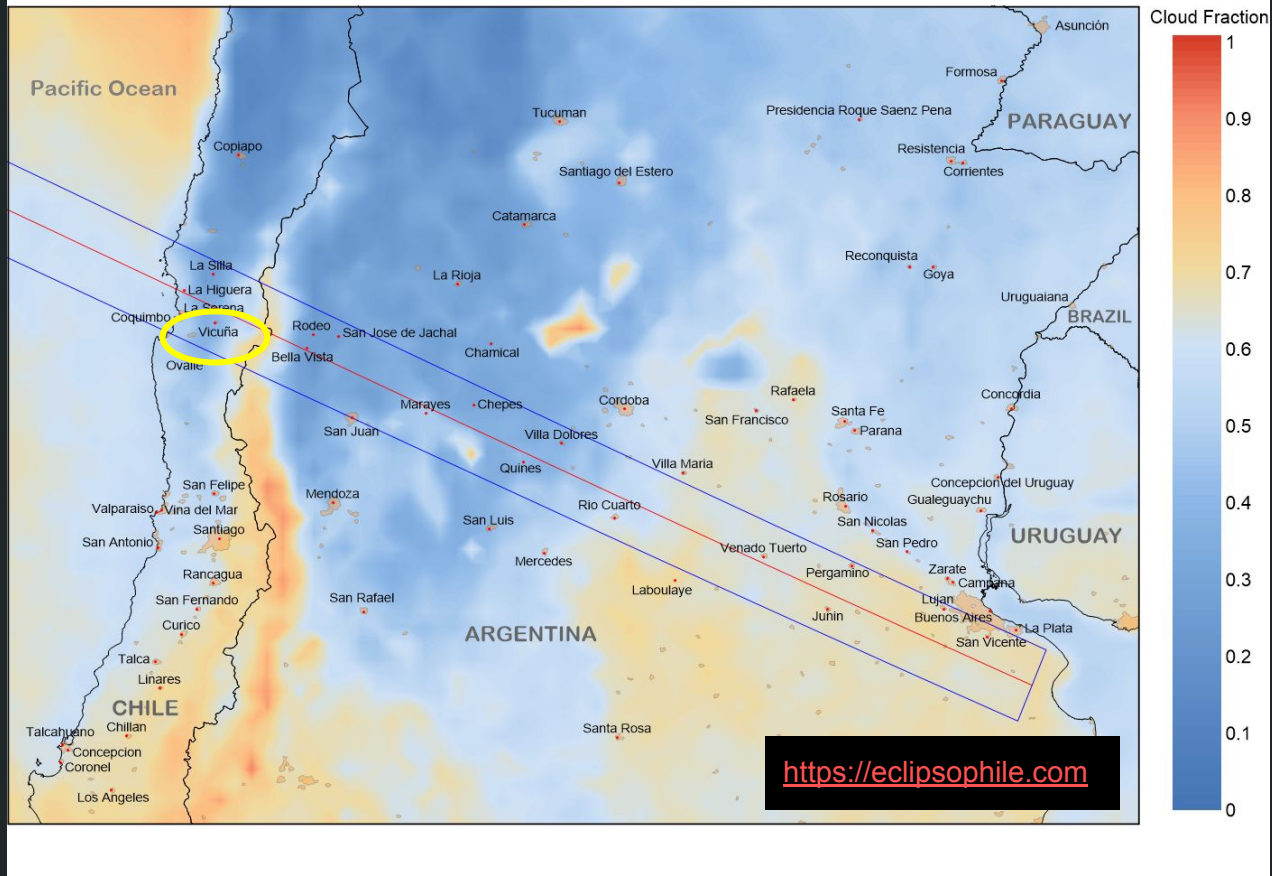


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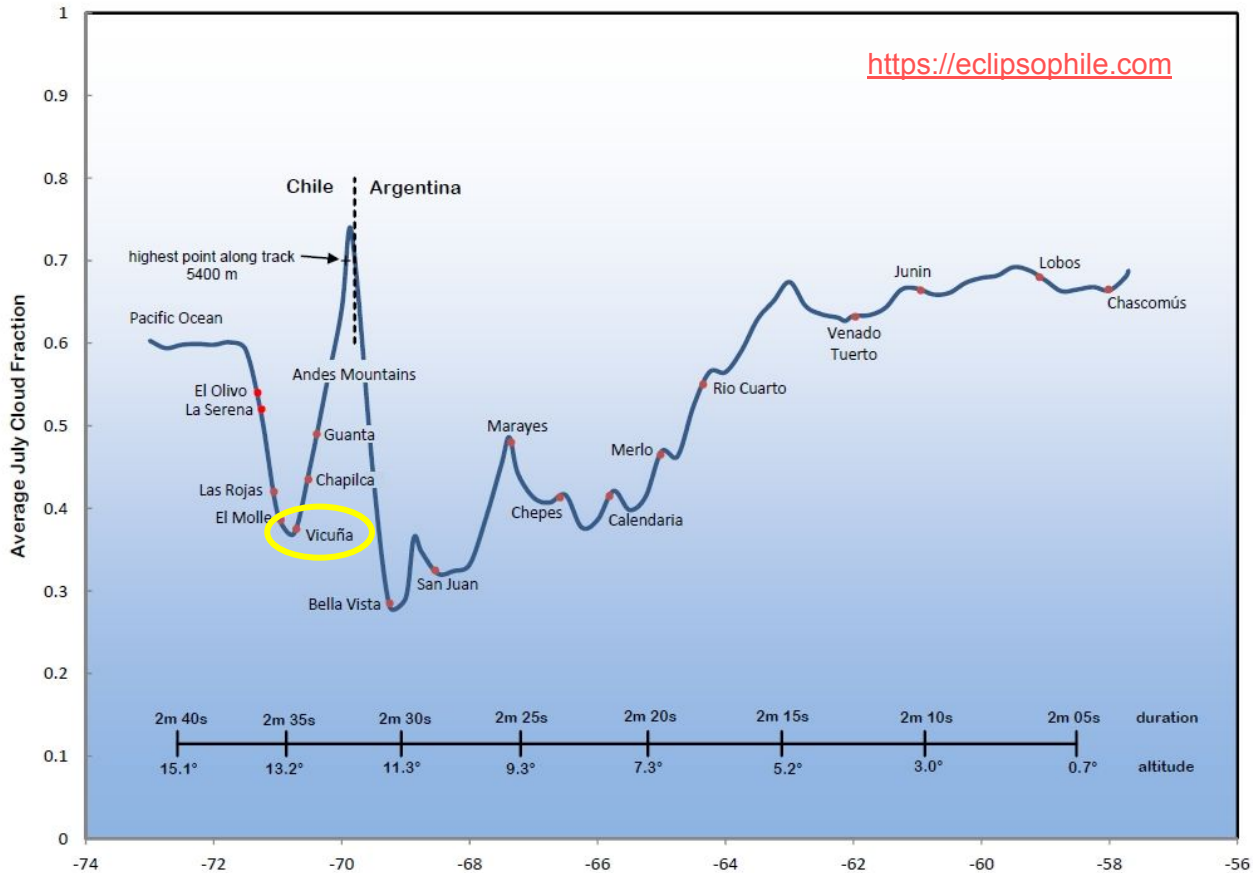
In the distance... Las Campanas Observatory, operated by the Carnegie Observatories (headquarters in Pasadena)



Cloud cover prediction for eclipse (blue is good).



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Observing location: Mamalluca Observatory

Nearby preparations for Vicuna's expected eclipse crowd.



2 July 2019 -- Mamalluca Observatory Eclipse Viewing Site



created with PTGui panorama stitching software

Mamalluca Observatory eclipse viewing site interactive 360x180 degree panorama:
<http://media.astrocamera.net/2019/20190702-EclipseSite-2/index.htm>

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- Date: 2 July 2019
- 10-minute intervals
- Nikon D600 / Sigma 12-24mm @ 24mm
- 1/60 sec. / f/5.6
- Baader Solar Film



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Partial Phase Activities ...

Pinhole projections



Pinhole images attract an audience.



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Observation area for visual observers

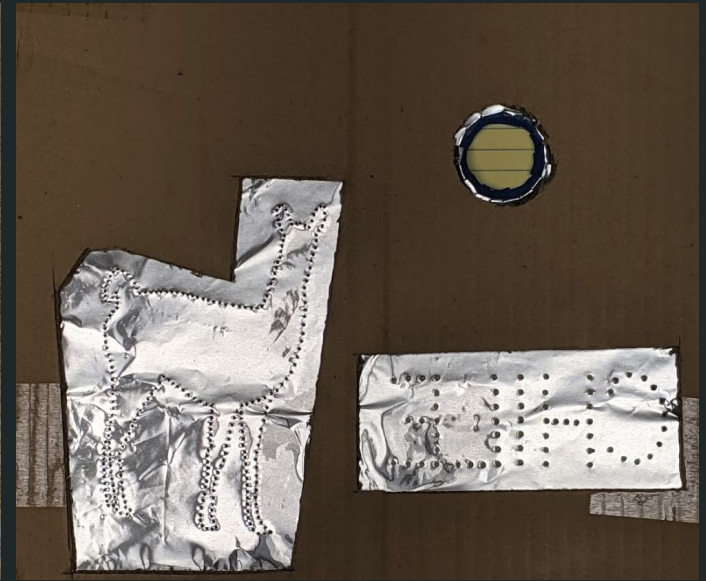
Projection telescope

Pinhole pattern

Skywatcher tracker

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Front/back views of the pinhole pattern. The lettering holes were done with a 1/16" (1.59mm) craft punch. The smaller holes were done with a pushpin (1.13 mm dia.)



Celestron 30mm (15x) Mini Scope used for projected view of the sun. This is essentially half of a pair of binoculars.



Telescopic setup included a 4" Borg refractor (100ED) mounted on a modified (non-Goto) Losmandy GM8 mount on a custom wooden tripod. Also attached is a Hutech Hinode solar autoguider which corrects tracking due to any misalignment of the mount's polar axis.

Counterweights are two 50,000 mAh lithium battery packs. A single pack is capable of running the mount, autoguider, and cameras all day (and night).



The Losmandy GM8 used was a late '90's non-Goto mount.

The standard GM8 dovetail saddle and plate were replaced with a light aluminum plate bolted directly to the top of the mount.

Except for the mount "cup", the wooden tripod components were made from standard lumber and plywood.



This shows the standard Losmandy components which were replaced. Two 50,000 mAh battery packs replaced the counterweight bar and weight.

Modified Losmandy GM8 Setup

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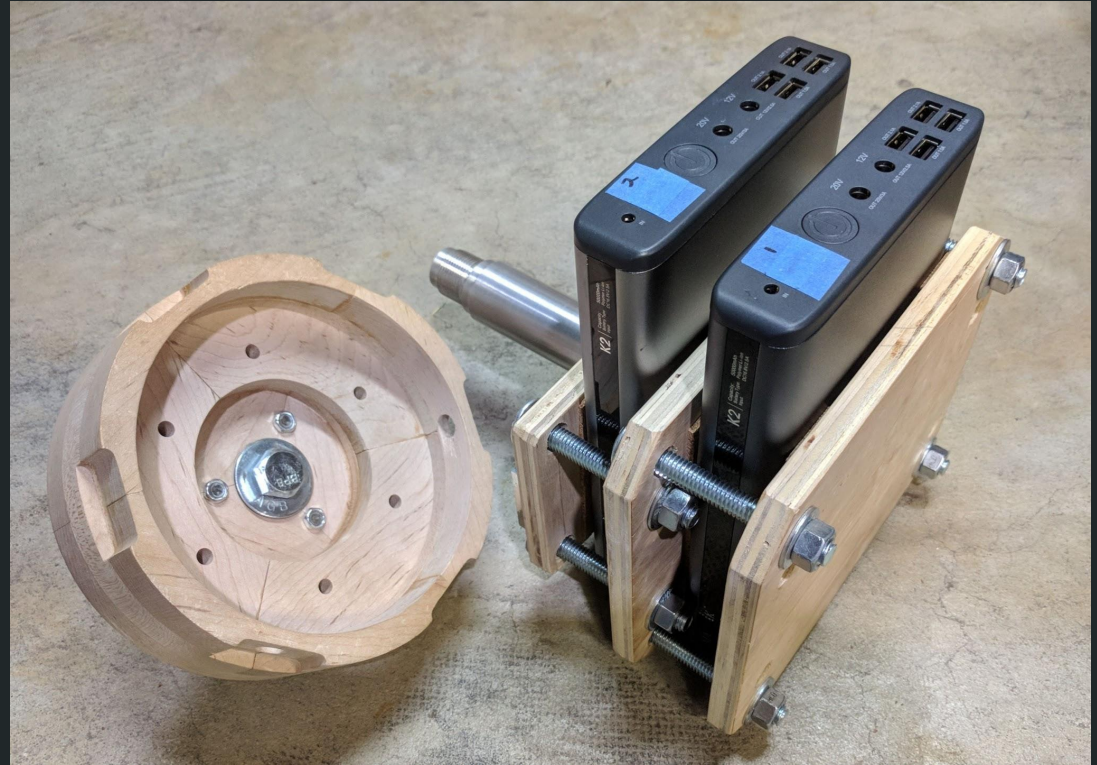


Tripod components...
Leg segments are short enough (22") to fit into a medium-sized suitcase.

Losmandy mount "cup" designed and NC milled out of maple by Jim Windlinger.



Losmandy GM8 in
(Harbor Freight)
Apache case



Losmandy mount adapter & battery counterweights

1st Contact

- Nikon D850 @ ISO200
- Borg 100ED / 0.85x focal reducer
- 1/8000 sec.
- Losmandy GM-8
- Hutech Hinode Solar Guider

No sunspots!

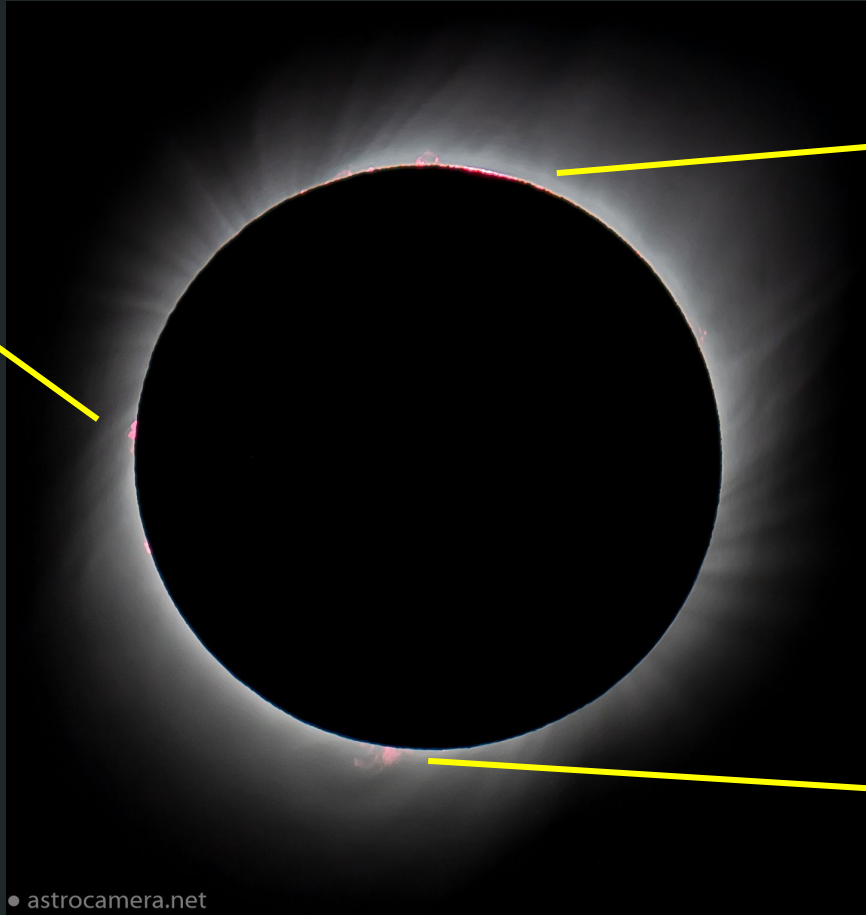
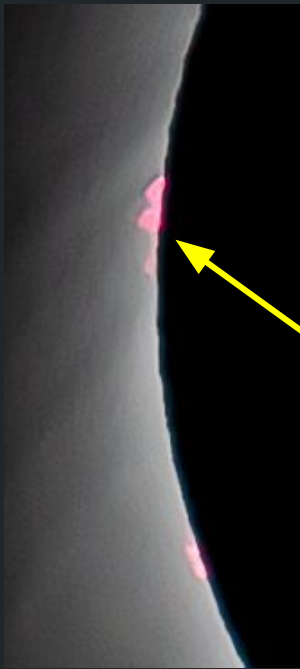


2nd Contact

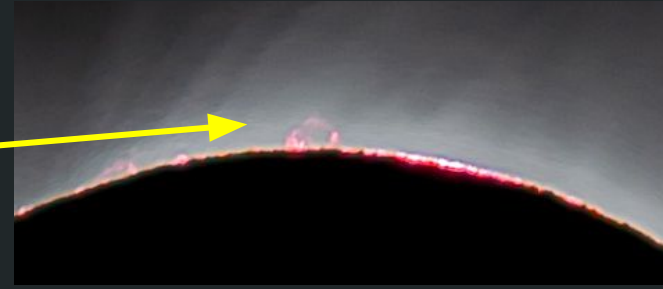
- Nikon D850 @ ISO200
- Borg 100ED / 0.85x focal reducer
- 1/800 sec.
- Losmandy GM-8
- Hutech Hinode Solar Guider



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● astrocamera.net



Chromosphere and inner corona composite -- combination of 2nd and 3rd contact images.





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Outer Corona

- Nikon D850 @ ISO200
- Borg 100ED / 0.85x focal reducer
- Thousand Oaks Solar Filter
- 1/2000 sec. - 2 sec. (composite)
- Losmandy GM-8
- Hutech Hinode Solar Guider

[Under Construction]

Eclipsed Sunset

- Nikon D850 @ ISO200
- Borg 100ED / 0.85x focal reducer
- Thousand Oaks Solar Filter
- 1/2000 sec.
- Losmandy GM-8
- Hutech Hinode Solar Guider



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Final Pinhole Images



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The eclipse was a hit in Chile!

Las Últimas Noticias
www.lun.com • 5400 • Regiones I, II, XI, XII • XV: \$500 • Año CXVII • N° 39.237 • Miércoles 3 de julio de 2019

Klaus von Storch pilló la sombra durante 2 minutos 36 segundos, en un



Piloto que siguió la sombra del eclipse: 850 km/h es muy difícil

Copa América: Gala le alegró el día a Isla, en Porto Alegre 34 **Tome nota: 17 ocu que faltan espec**

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LT LATERCERA 14-15 NACIONAL

General (R) Humberto Oviedo: "La jueza Rutherford ha actuado con parcialidad"

Comandante en jefe del Ejército de 2014 a 2018, procesado por la ministra en visita por malversación de \$ 4.500 millones, se defiende: "En mi mandato los gastos reservados se emplearon en los fines que determina la ley". Oviedo dice a **La Tercera** que "mi patrimonio es fruto de 42 años de carrera militar"

4-8 TEMAS DE HOY



La Serena, 16:39 horas

10 POLITICA: Cartas presidenciales expondrán en cita oficialista de alcaldes
20-21 DEPORTES: Brasil elimina a Argentina y espera en la final a ganador de Chile-Perú
3 PULSO: Inversión de proyectos en trámite ambiental sube 54% a junio
13 NACIONAL: Suprem inicia p de reme de jueces Rancag

9 EDITORIAL ECLIPSE Y ENTUSIASMO POR LA CIENCIA - 9 CORRIDO

Hoy juega La Roja Chile vs Perú/20:30 hrs.
Brasil / Transmite TVN y Canal 13.

Santander

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La Cuarta DE TODOS

MIÉRCOLES 3 julio 2019 / www.lacuarta.com

La Cuarta GUÍA DE SERVICIOS → **¡Está hoy y todos los miércoles!**
¿Qué hacer si la naturaleza se va en mala con la casa que arrendó? Hay solución
SE ARRIENDA
TODOS LOS DÍAS PUZZLE GIGANTE

EL OTRO FENÓMENO APARECE HOY... CHILE BUSCA SU TERCERA FINAL DEP
A LAS 20:30 HRS.
CHILE PERÚ

A la chilena: máscaras de soldar con cartón y escenarios improvisados
En modo eclipse: Pínera y Cubillos se tomaron La Silla
No vino Iron Man, pero sí Bill Gates: arrendó por 18 palitos



QUEDAMOS LOCOS

Todo Chile y el mundo siguió con sus respectivos lentes el paso del eclipse. Aplausos, anécdotas y hartos memes iluminaron la jornada. /4 a 9

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Star party at
Touristic
Observatory
Collowara near
La Serena



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Click for full
screen

Keys:

- [shift] : zoom in
- [ctrl] : zoom out

Mouse:

- Zoom with scroll wheel or right button + drag up/down
- Pan with left button + drag

360 x 180 interactive panorama:

<http://media.astrocamera.net/2019/20190629-SouthernSkiesFromObsCollowara-2/index.htm>



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- Hutech-modified Canon EOS RP
- ISO 3200
- Sigma 15mm @ f/2.8
- 20 sec.
- Fixed tripod

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Cerro Mayu Observatory



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Cerro Mayu Observatory

Alpha & Beta Centaurus

Magellanic Clouds

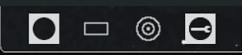
Coal Sack and Southern Cross

Eta Carinae complex

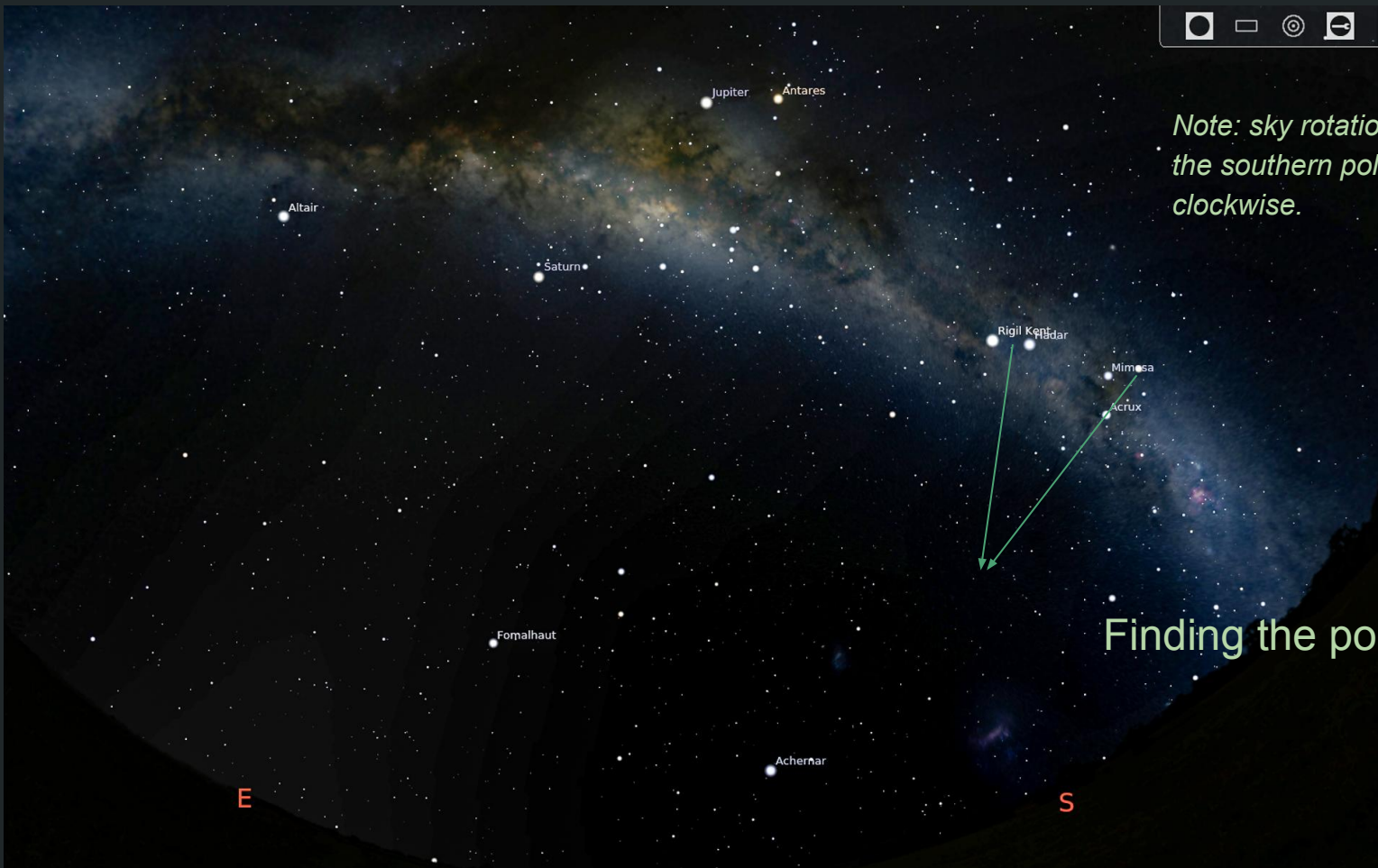
- Hutech-modified Canon EOS RP
- ISO 1600
- Sigma 15mm @ f/2.8
- 25 sec.
- Fixed tripod



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Note: sky rotation around the southern pole is clockwise.



Finding the pole

San Pedro de Atacama, radio observatories

La Serena, optical observatories, eclipse viewing

Santiago





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San Pedro de Atacama



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Rush hour in San Pedro de Atacama



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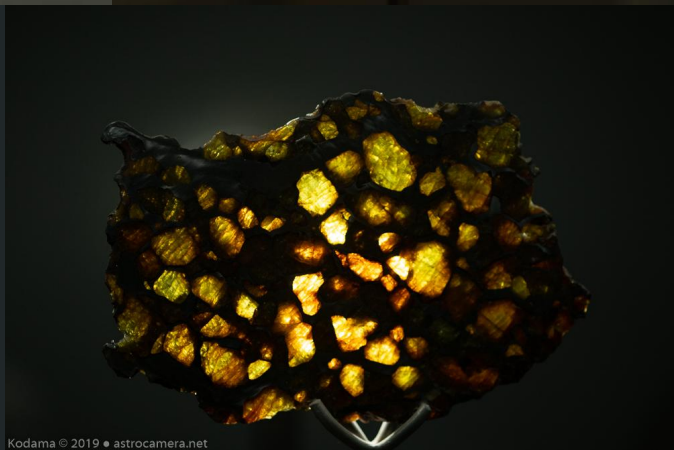
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A visit to the San Pedro Meteorite Museum



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Valle de la Luna



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Miscanti Lake -
Elevation: 4140
meters (13,583 ft.)



San Pedro
de Atacama

Coyo

Cucuter

27

27

23

Simons Observatory / Array

Atacama Large Millimeter Array (ALMA)

Atacama Lodge, San Pedro de Atacama



Observing field at the Atacama Lodge. The Lodge was hosting numerous “star tours” in the wake of the solar eclipse.



Setting up for the first night at the Atacama Lodge outside San Pedro de Atacama (2409 meters / 7900 ft.).

The prominent symmetrical volcanic cone in the background is Licancabur which is on the border between Chile and Bolivia. The top of the cone is 5916 meters (19,409 ft.).

6 July 2019



Sunset setup at the Atacama Lodge

<http://media.astrocamera.net/2019/20190706-p3-AtacamaLodge1/index.htm>



<https://www.youtube.com/watch?v=a3jK8DqUaZ0&feature=youtu.be>

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Eastward view from
the Atacama Lodge
under moonlight

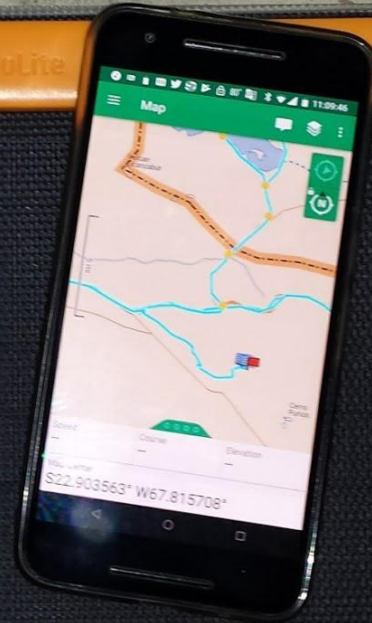
- Nikon D850
- ISO 1600
- Sigma 15mm @ f/2.8
- 20 sec.
- Fixed tripod



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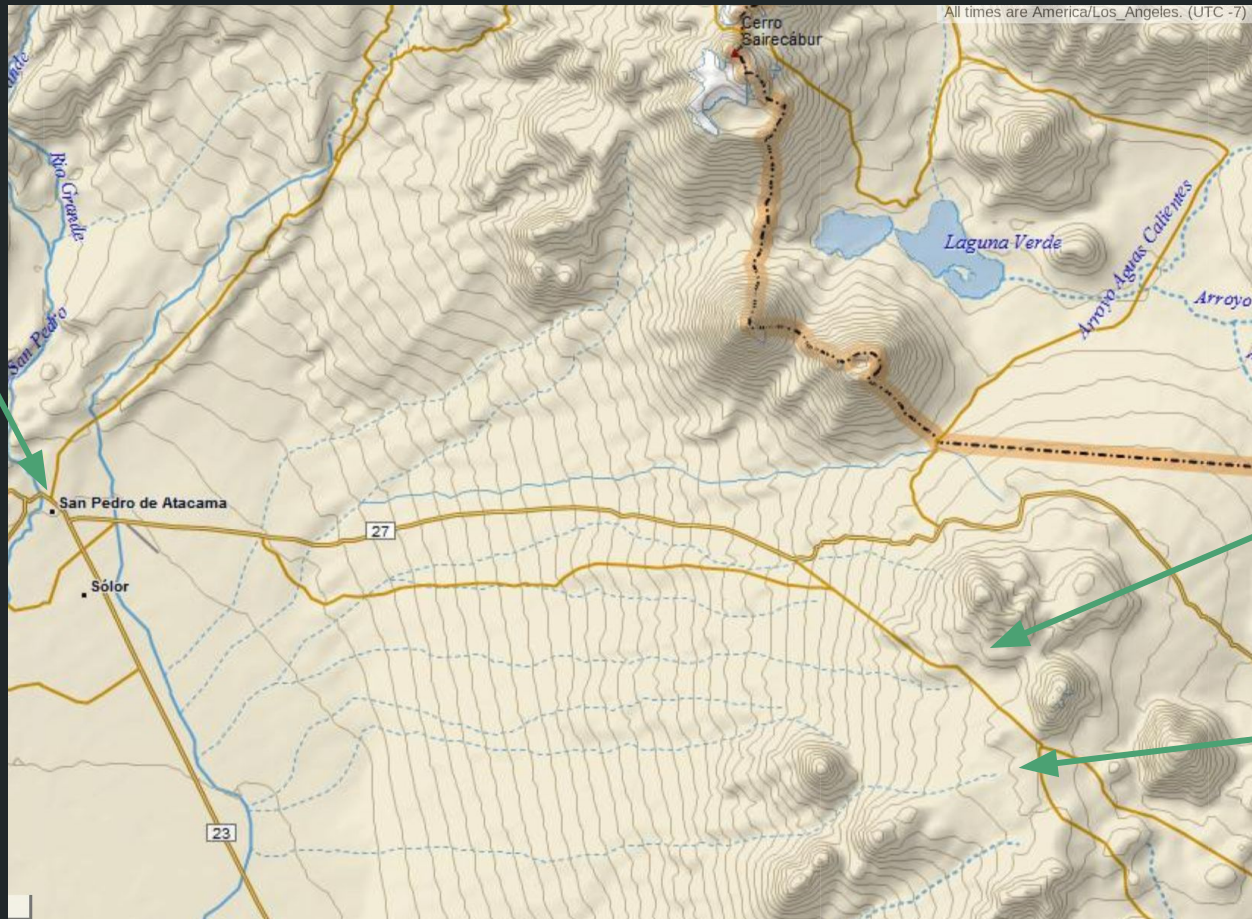
Communications:

- Cell phone on Google Fi
- Biolite battery/solar charger
- Garmin InReach Mini (GPS, Iridium satellite 2-way texting)



San Pedro de Atacama

... ~9000 ft.
lower in
elevation than
the high
altitude
observatories



Simons
Observatory
Complex

ALMA

Simons Observatory Area Visit

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Highway 27 to the borders with Bolivia and Argentina

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ALMA

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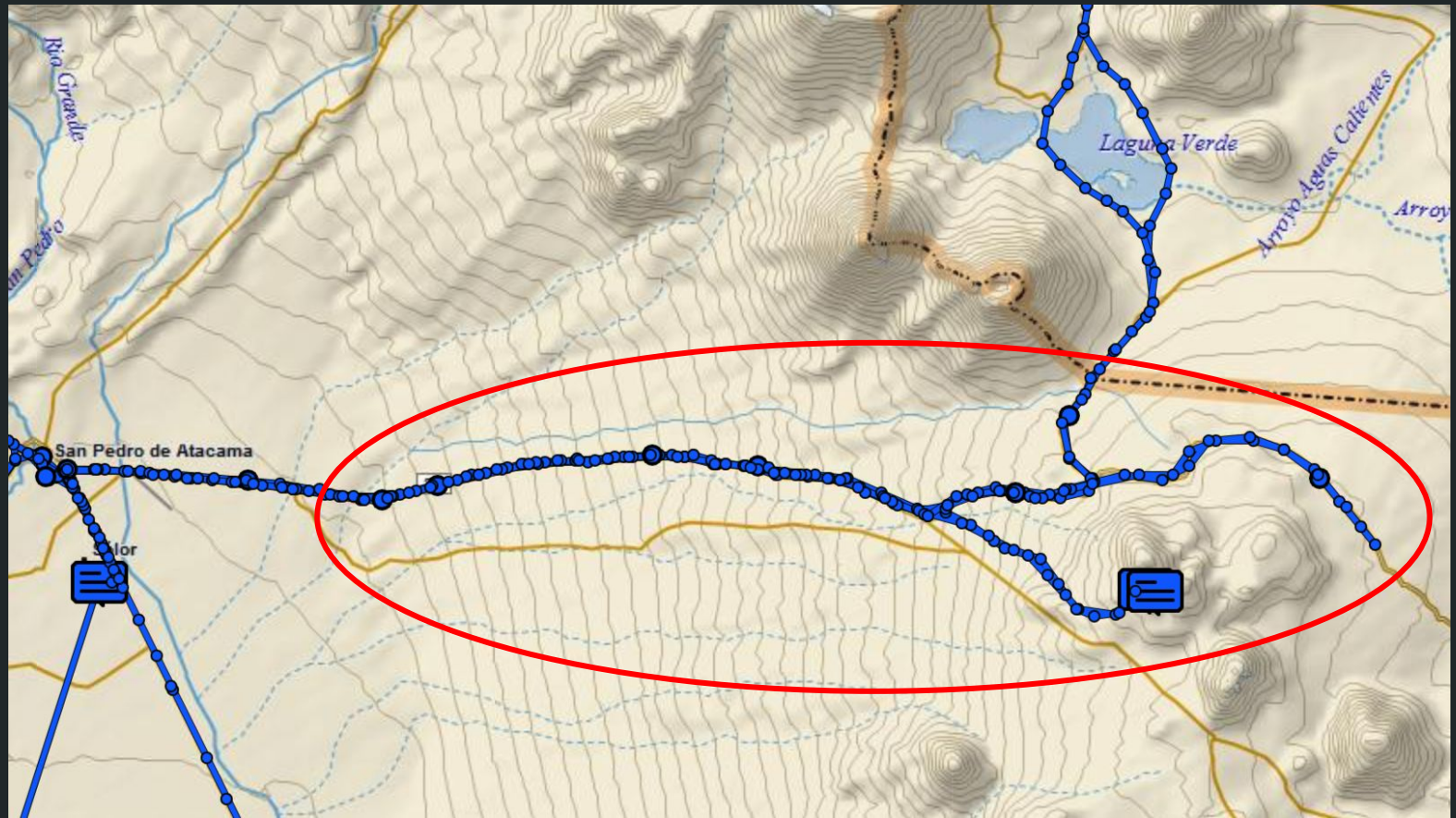
Simons Observatory area

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Simons
Observatory
complex under
moonlight.

http://media.astrocamera.net/2019/SimonsObs_7/index.htm



A little glitch in plans...

Highway 27 to the borders with Bolivia and Argentina



Missed this!



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Heading over the border into Bolivia for the day...

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Photo-bombed
by the Moon!



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While heading back to Santiago...

Aconcagua -- 6961 meters (22,837 ft.) -- tallest peak outside Asia.



Back to Santiago
for a few days

Heading home...



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