

AURORAS & ASTRONOMY: A YEAR AT THE SOUTH POLE

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South Pole

- 90° S
- 2900 m elevation
- > 1000 km to nearest station
- Completely inaccessible for nine months of winter
- On top of glacier, more than 1.5 km deep

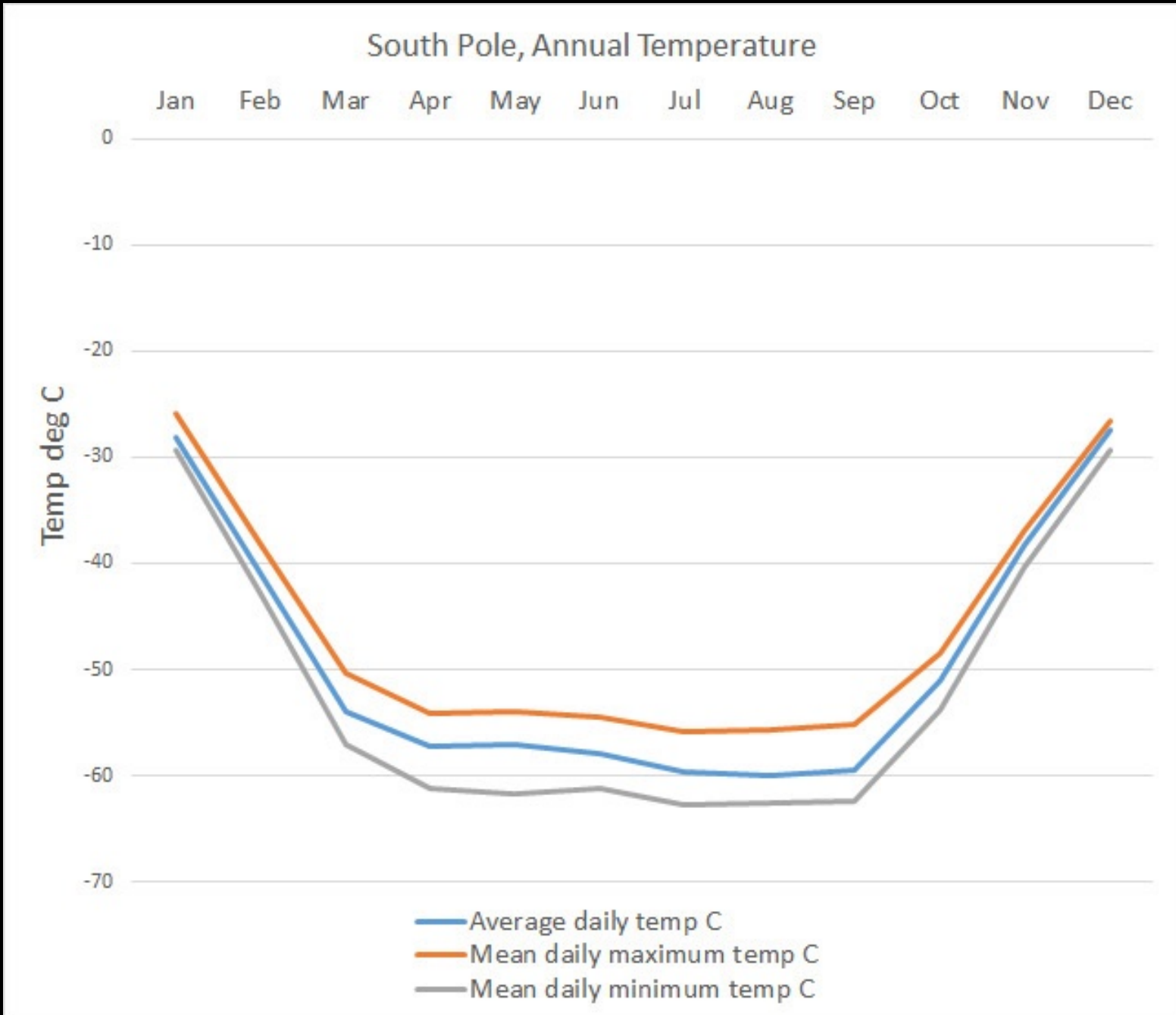
Amundsen-Scott South Pole Station

- Funded and run by USAP/NSF
- Continuous presence since 1957
- Summer population: ~120
- Winter population: ~45



Winter Weather

- Maximum temp: -37.9°C
- Minimum temp: -73.5°C
- Wind chill \sim -100°C
- Max wind speed: 62 km/h





Sunglasses and long underwear are recommended for comfort.

Extreme Cold Weather Gear

- No exposed skin when outside
- Minutes to serious frost bite

The Journey To Pole: McMurdo to the South Pole



The South Pole



The South Pole

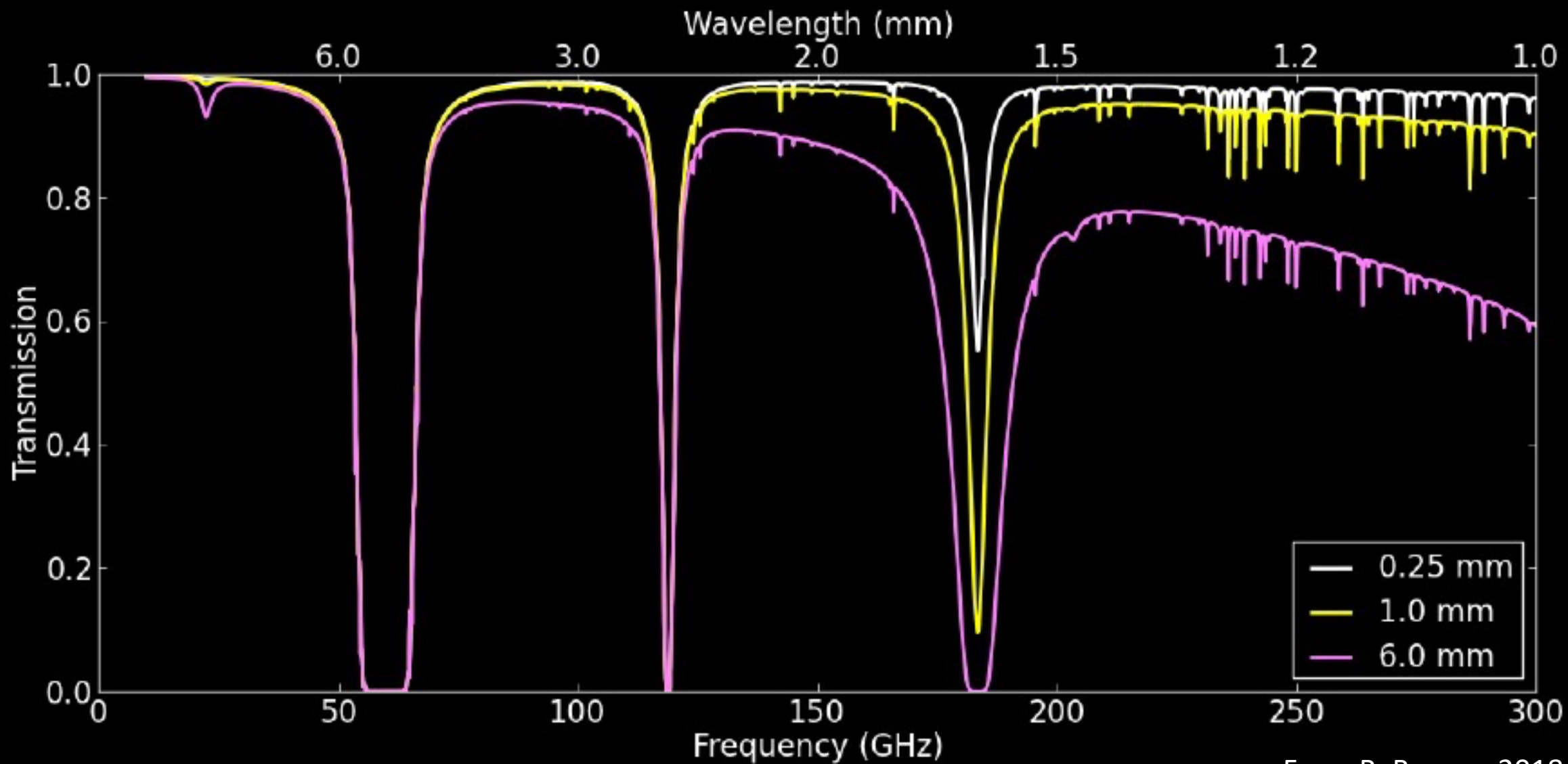


The South Pole Telescope [SPT]

- 10-meter diameter CMB telescope
- 90, 150, 220GHz observing bands
- 1.6, 1.2, 1.0 arcmin resolution
- Built in 2007
- SPT-3G camera installed in 2017
- ~16,200 Transition Edge Bolometers
- Tri band & dual polarization
- Detector plane operates at 300 mK



The South Pole Microwave Sky

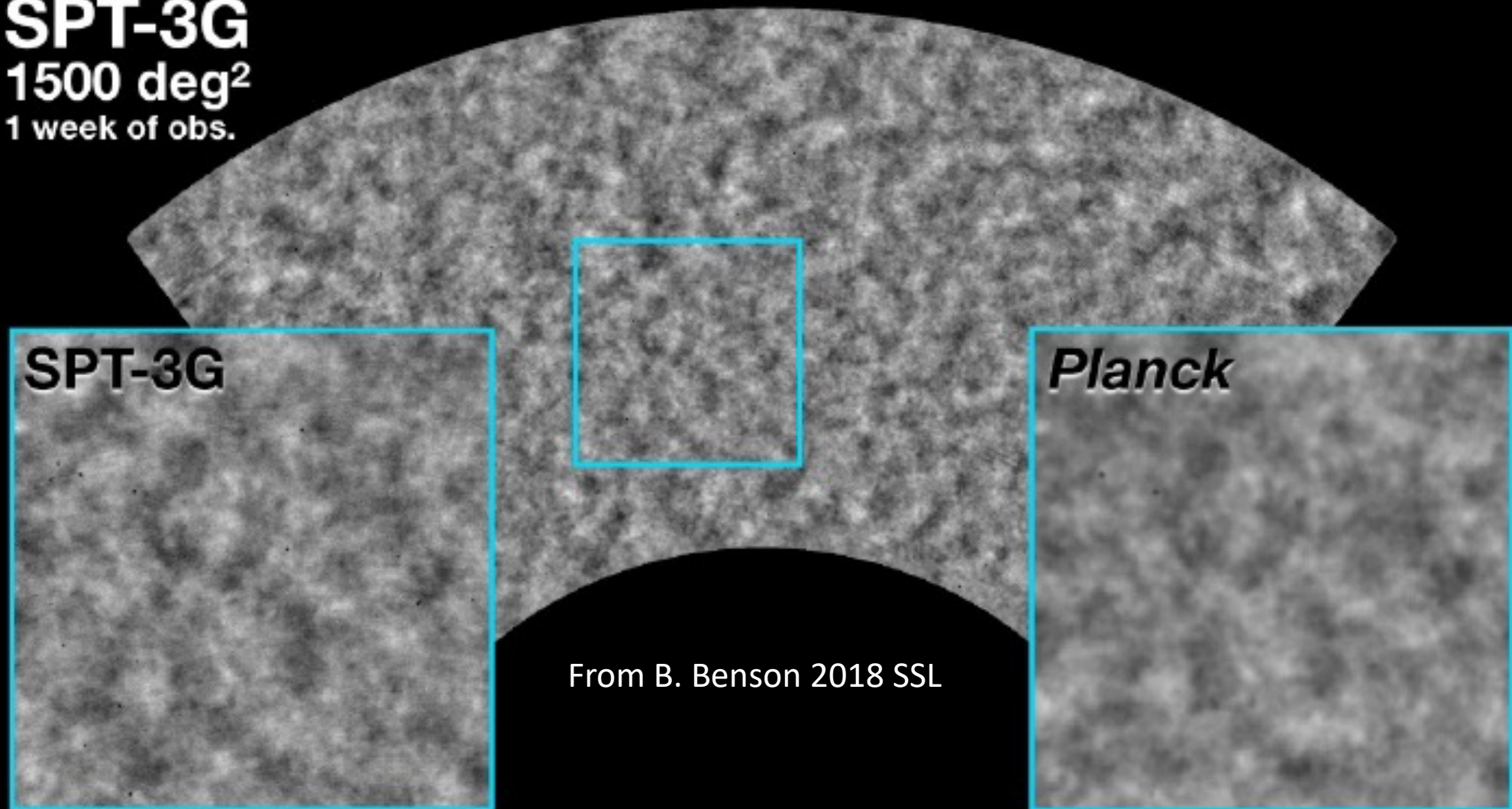


From B. Benson 2018 SSL

The SPT-3G 1500 deg² Survey

*SPT-3G data is deeper than Planck
with only 1 week of observations!*

SPT-3G
1500 deg²
1 week of obs.



From B. Benson 2018 SSL

SPT Science Goals

- Inflation & Primordial Gravitational Waves
- First Galaxies, Protoclusters and Galaxy Clusters
- Millimeter Transient Universe
- Black Holes and the Event Horizon Telescope

Winterover Position

- The South Pole Telescope hires two fulltime winterovers each year
- In charge of observing, data quality checks, maintenance and fixing anything that breaks
- 2022: Aman & Allen
- 14 months: 2021/10/25 – 2022/12/14



SPT Winterover: Daily Tasks



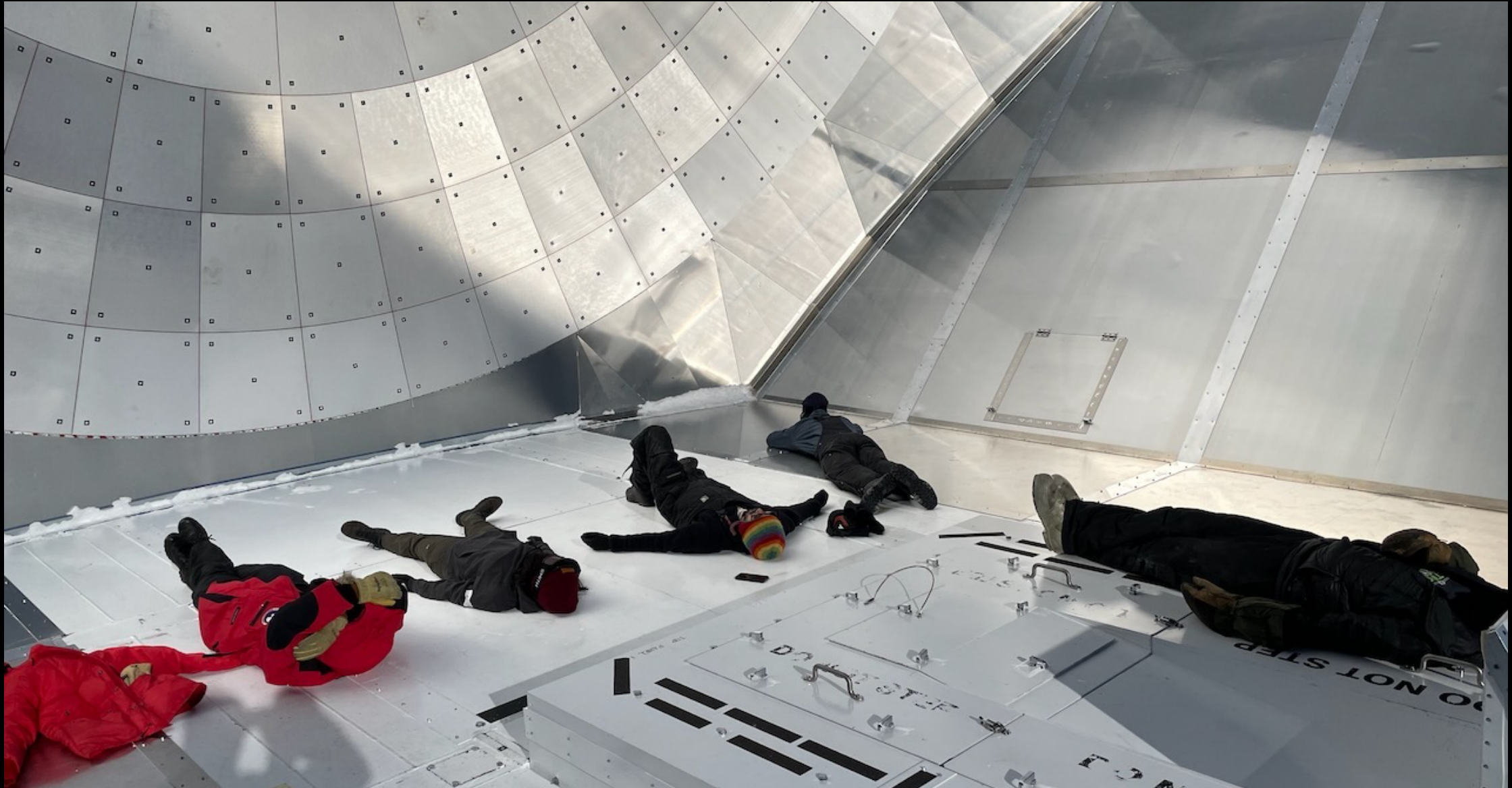
SPT Winterover: Greasing and Preventative Maintenance



SPT Winterover: Preventative Maintenance



SPT Winterover: Hard at Work



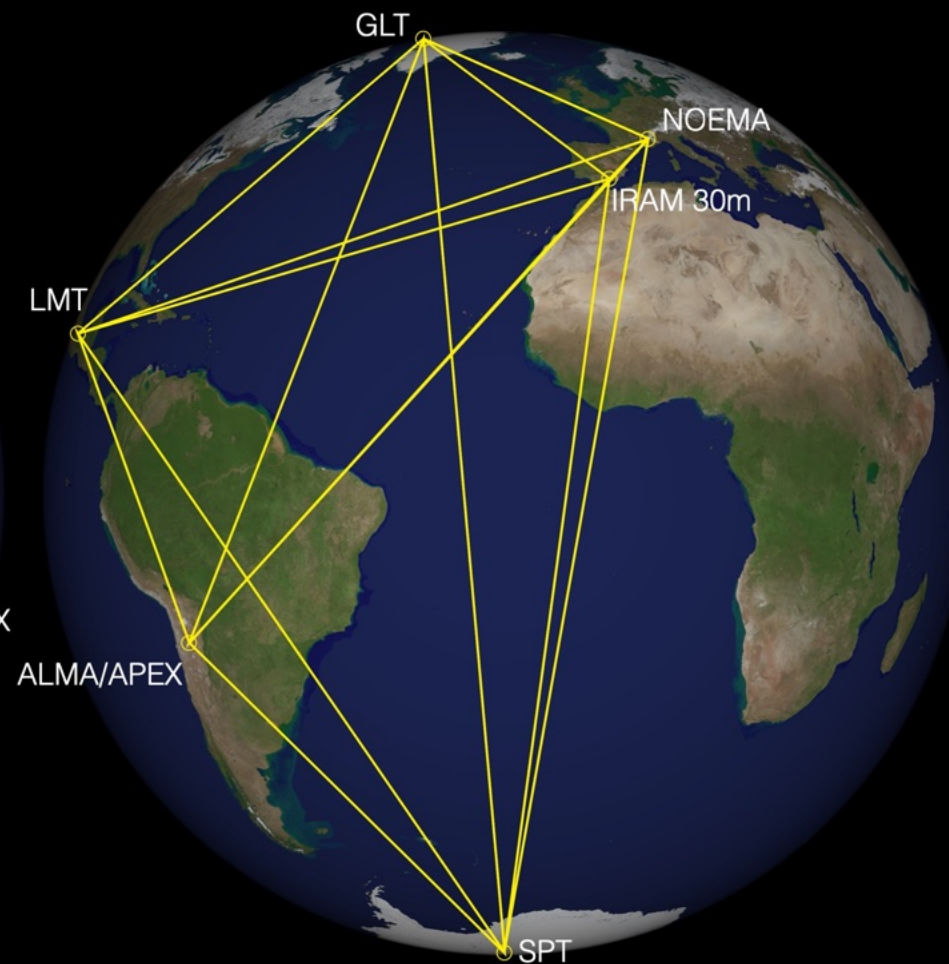
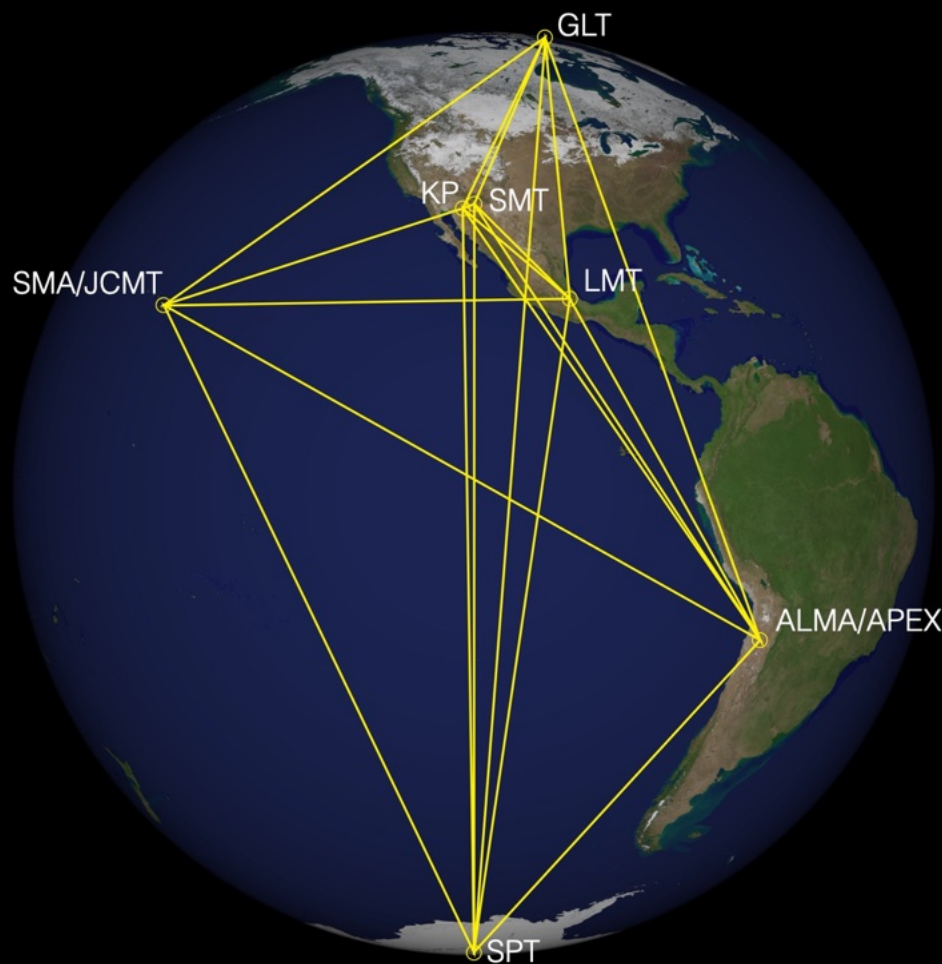
Event Horizon Telescope: Observing Black Holes From the South Pole

- For two weeks a year, SPT participates in the EHT observing campaign
- Install new secondary/tertiary optics, redirecting focal plane to EHT receiver
- Calibrate SPT with new 24h pointing model to account for telescope sinking
- Coordinate with 10 other telescopes around the world for 7 consecutive 16 hour observing runs, with barely any internet access
- Scans must begin within 2 seconds of other telescopes

Very Long Baseline Interferometry



Event Horizon Telescope

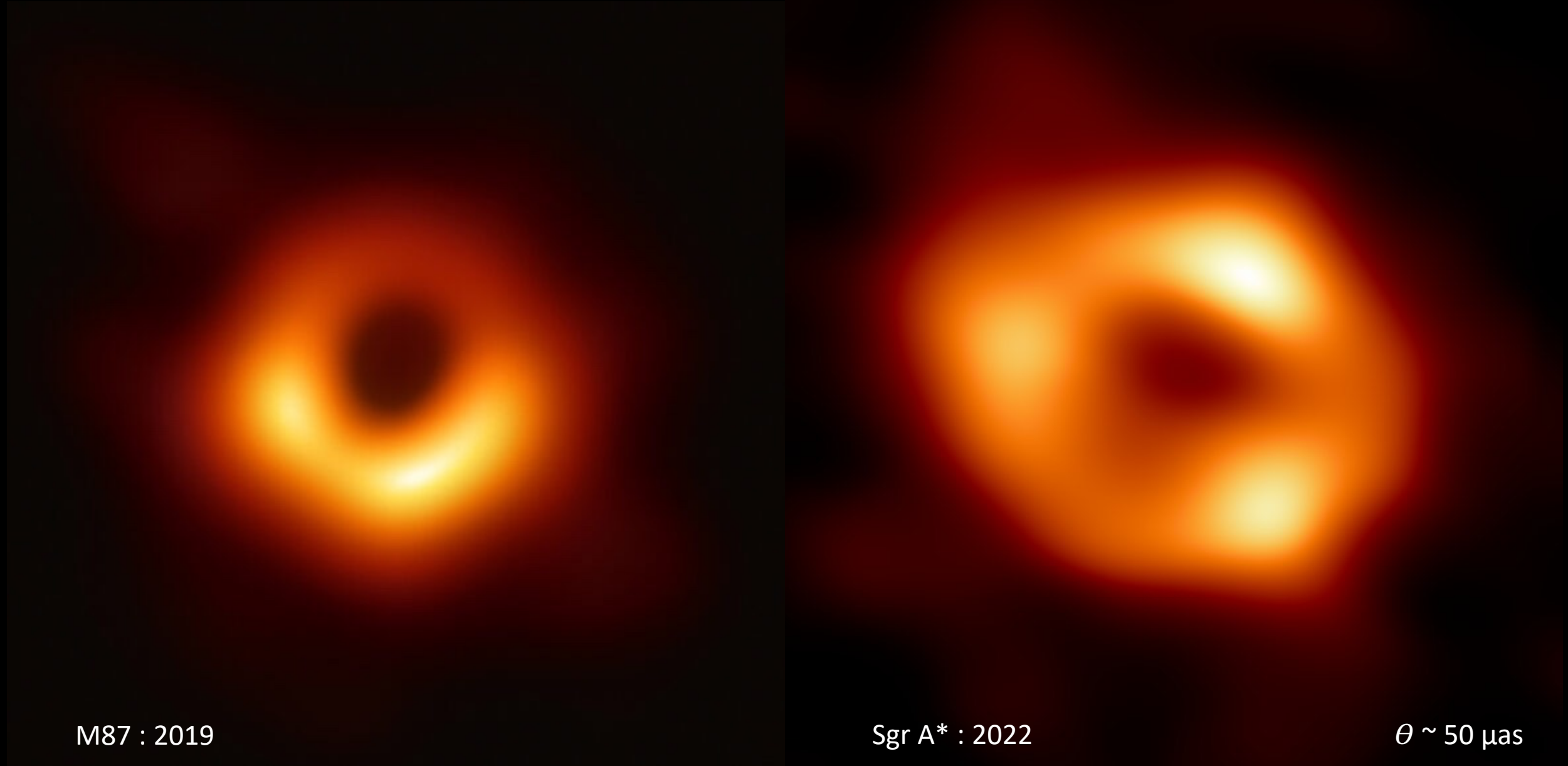


Very Long Baseline Interferometry

- Not easy!
- Atomic clocks to keep time to 1 part in 10^{13} sec (~1 million years)
- Enormous data volumes:
 - SPT records ~0.7 PETABytes per day



EHT Results



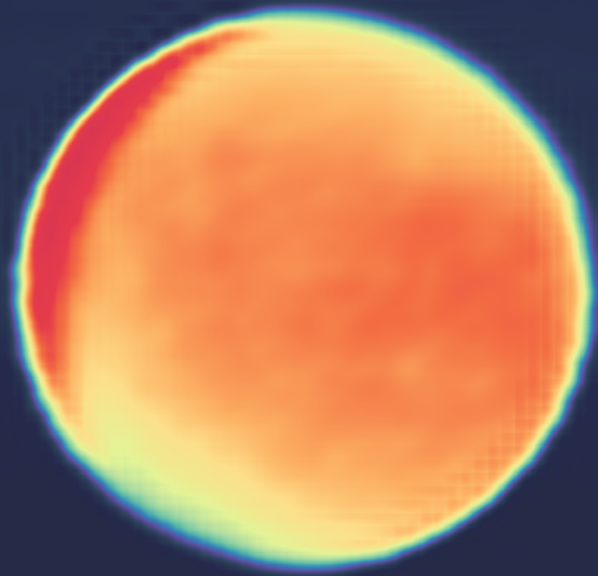
EHT Fun: Moon Rasters!

SPT Moon Raster with EHT iBoB Receiver at 230GHz

UTC : 20220204 05:19

GPS: -89.99 ° , -45.65 °

Elevation : 3 °



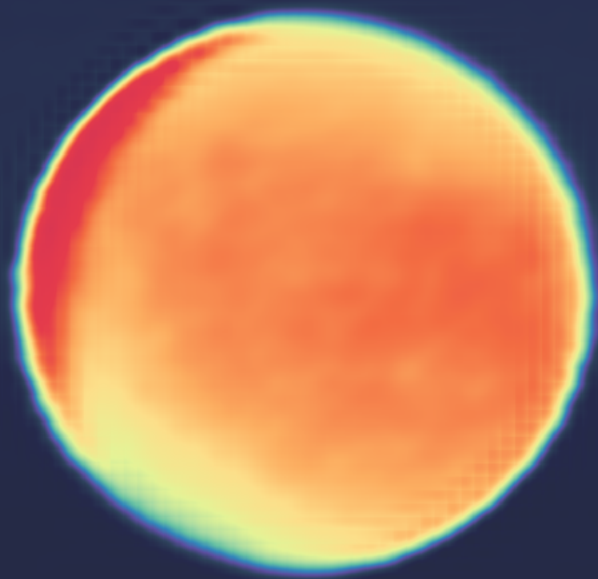
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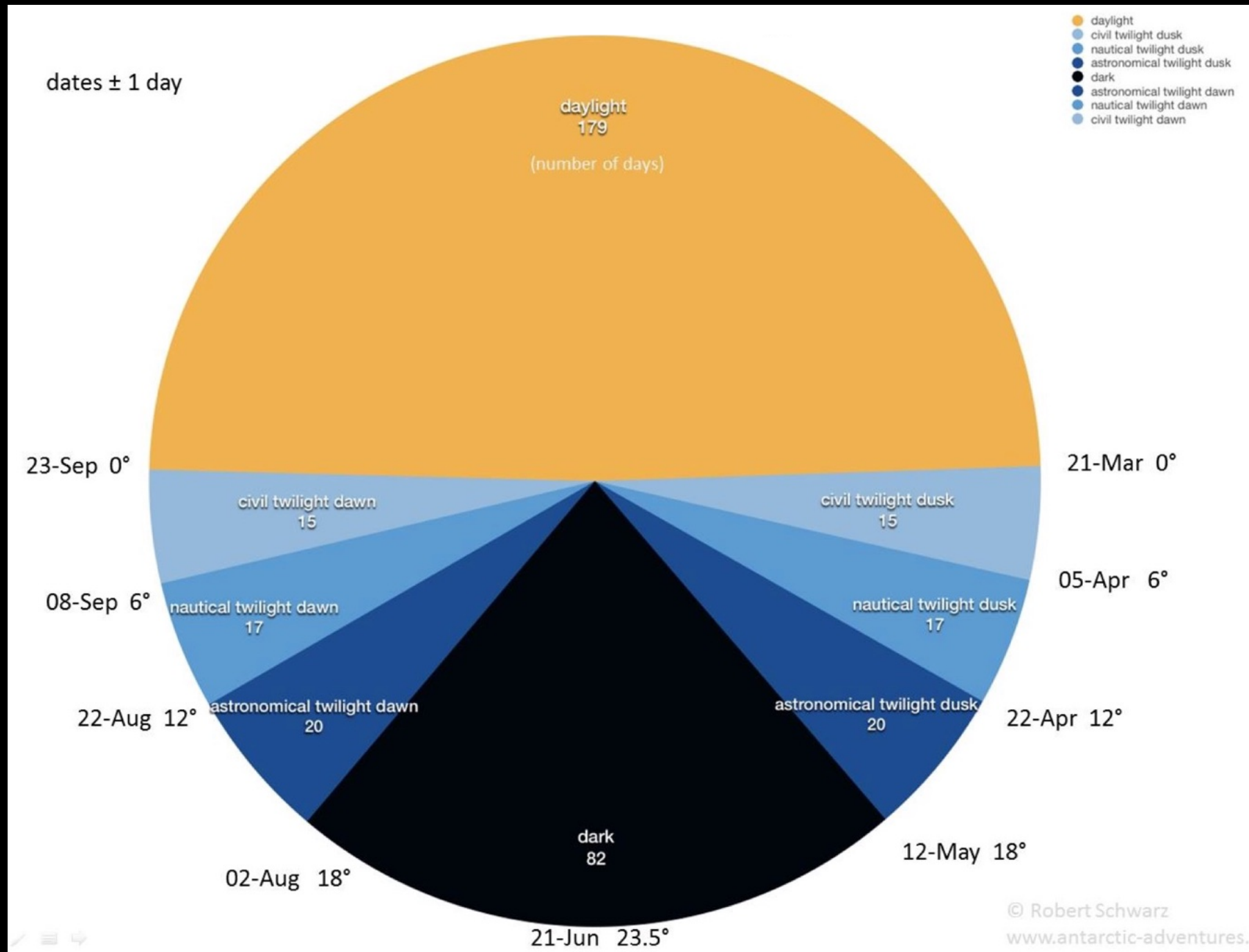
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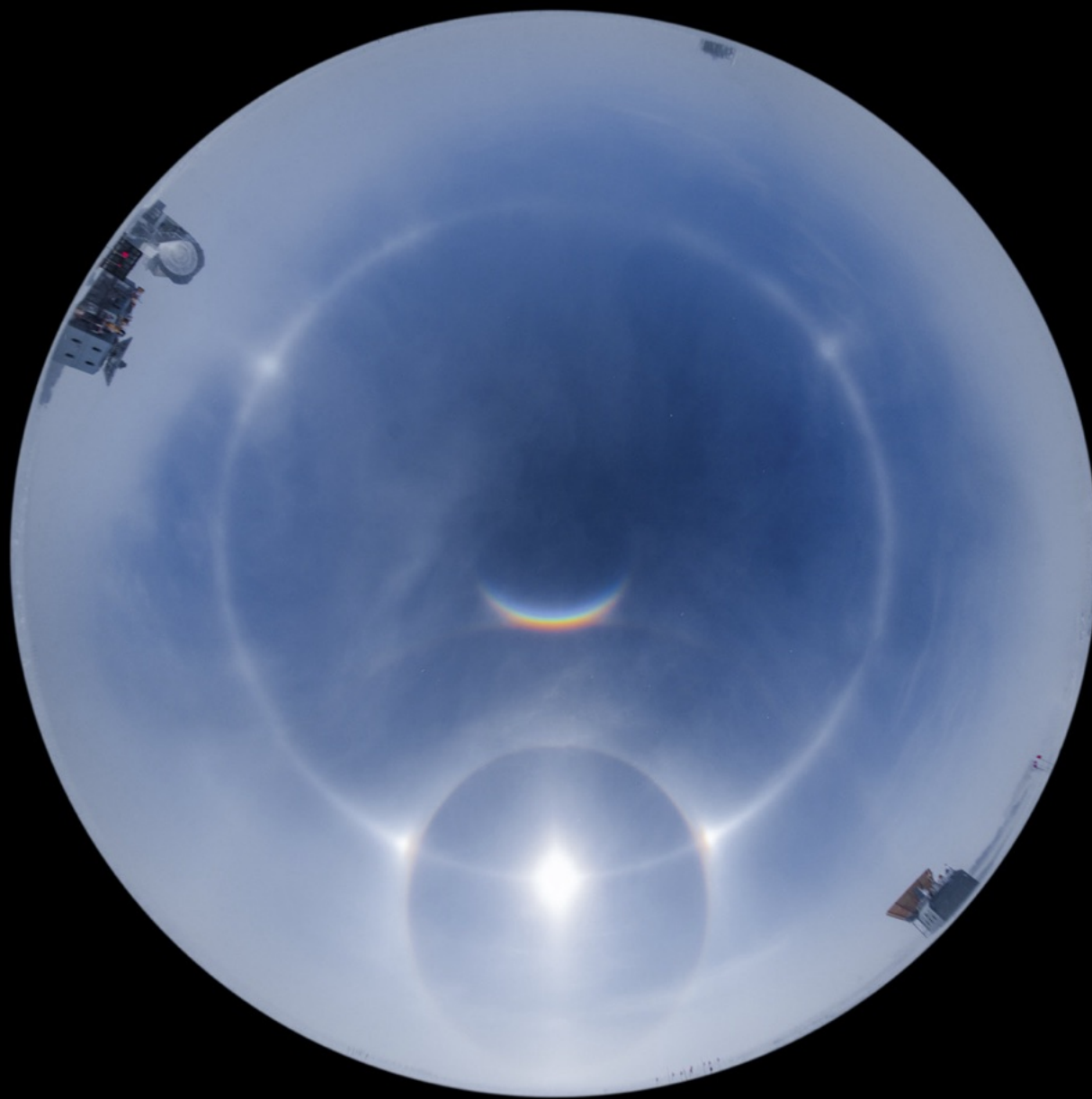
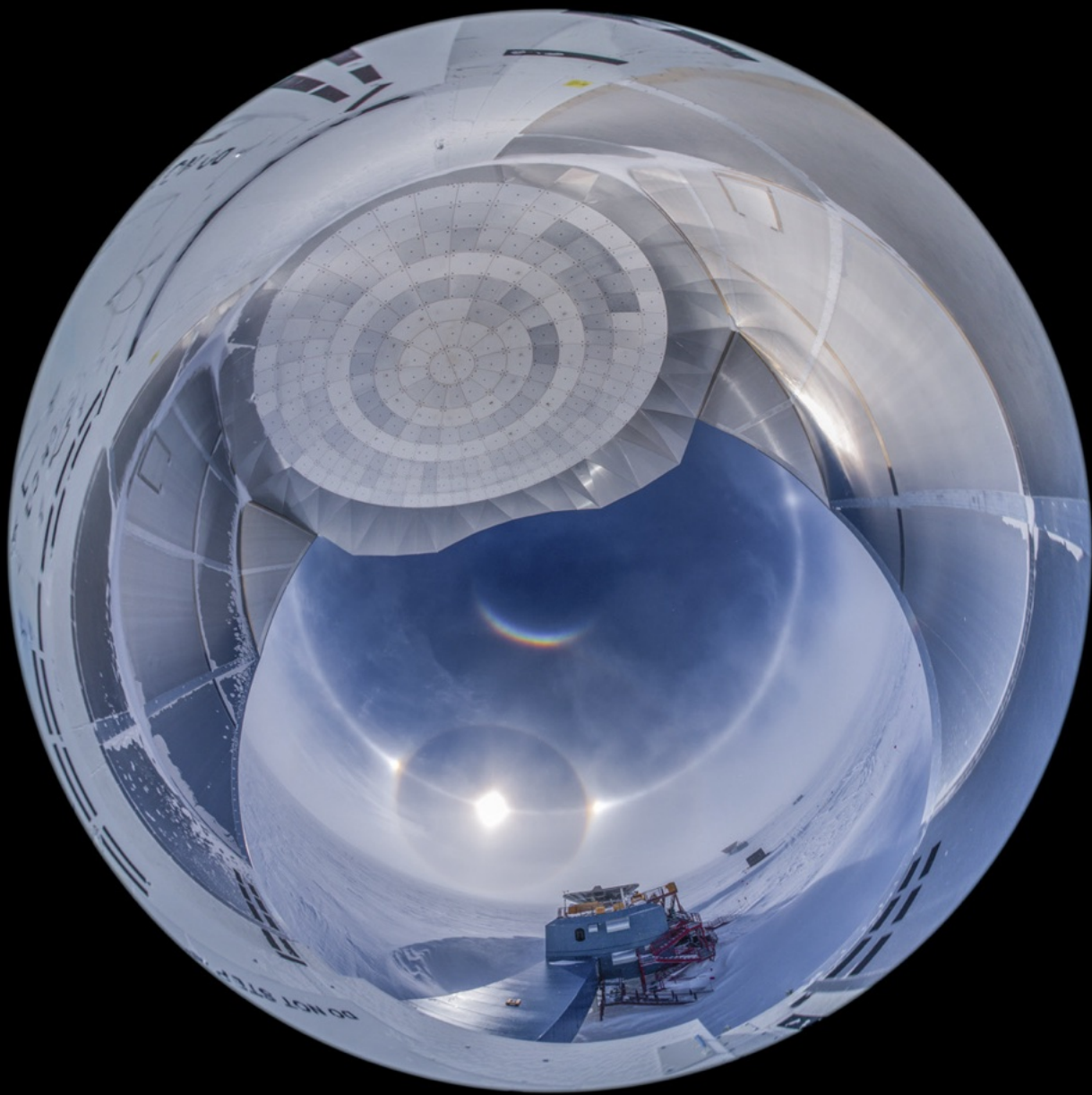
Elevation : 3°



Seasons



























The Community & Life at the South Pole



The Community & Life at the South Pole



Bob Ross Sunday

The Community & Life at the South Pole



South Pole Marathon

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American Football Outside

The Community & Life at the South Pole



Sunday Pizza Bar

Challenges

- Extremely isolated community, with no chance to leave for 9 months
- Food – mostly frozen, supplemented by a small greenhouse
- An appreciable mental decline over the year (“winterbrain”)
- Huge challenge to sleep, and constantly tired
- Tough being motivated

QUESTIONS ?

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