Antarctic Survey Telescopes (AST3)
Remote Sky Survey Strategy

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On behalf of:
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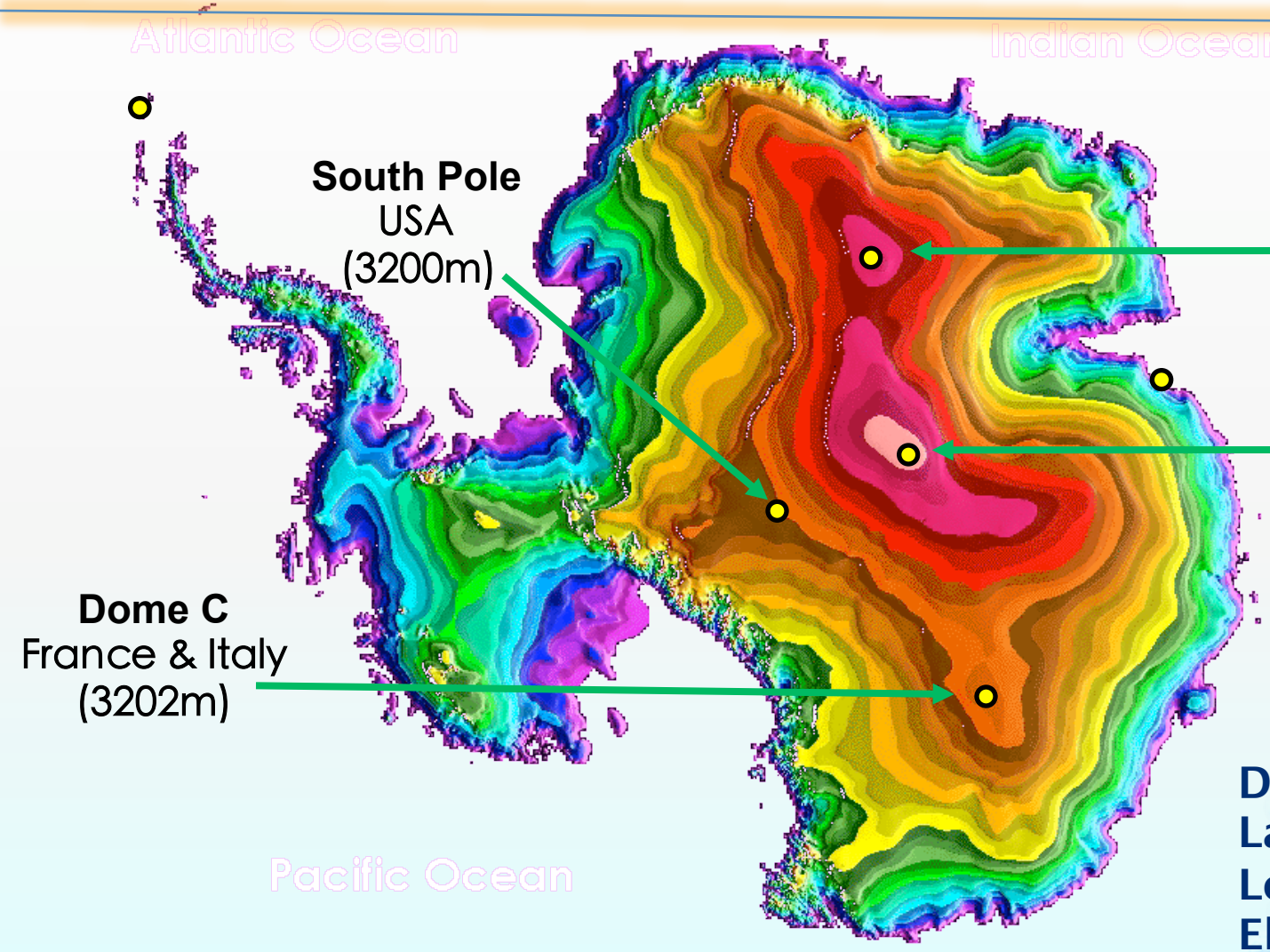
Overview

- Dome A & AST3
- Sky Survey Strategy
  - Sky Background
  - Extinction
  - Aurora & Cloud
  - Cadence
  - Movement of telescope
- Conclusions

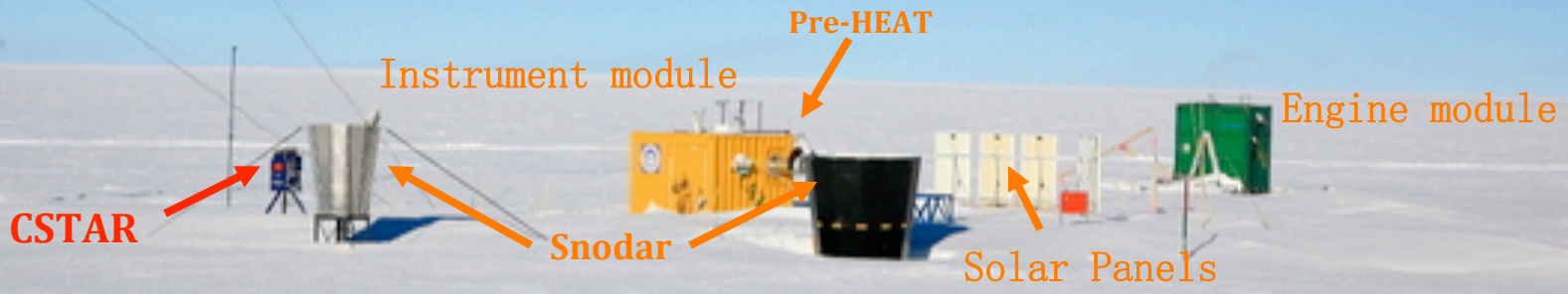
Dome A（南极冰穹A）



Dome A location:
Lat: 80° 25' S
Lon: 77° 06' E
Elev: 4093m

Advantage of Dome A

- Continuous observation during the polar night
- Low temperature (-70°C): infrared observation
- Wind speed (2.5m/s)，stable atmosphere、low boundary layer(Snodar, AWS）
  ==> Good seeing



- Transparency, dark background（CSTAR）
- PWV<75μm: THz observation(Pre-HEAT, FTS)
- Cheaper than Space Mission

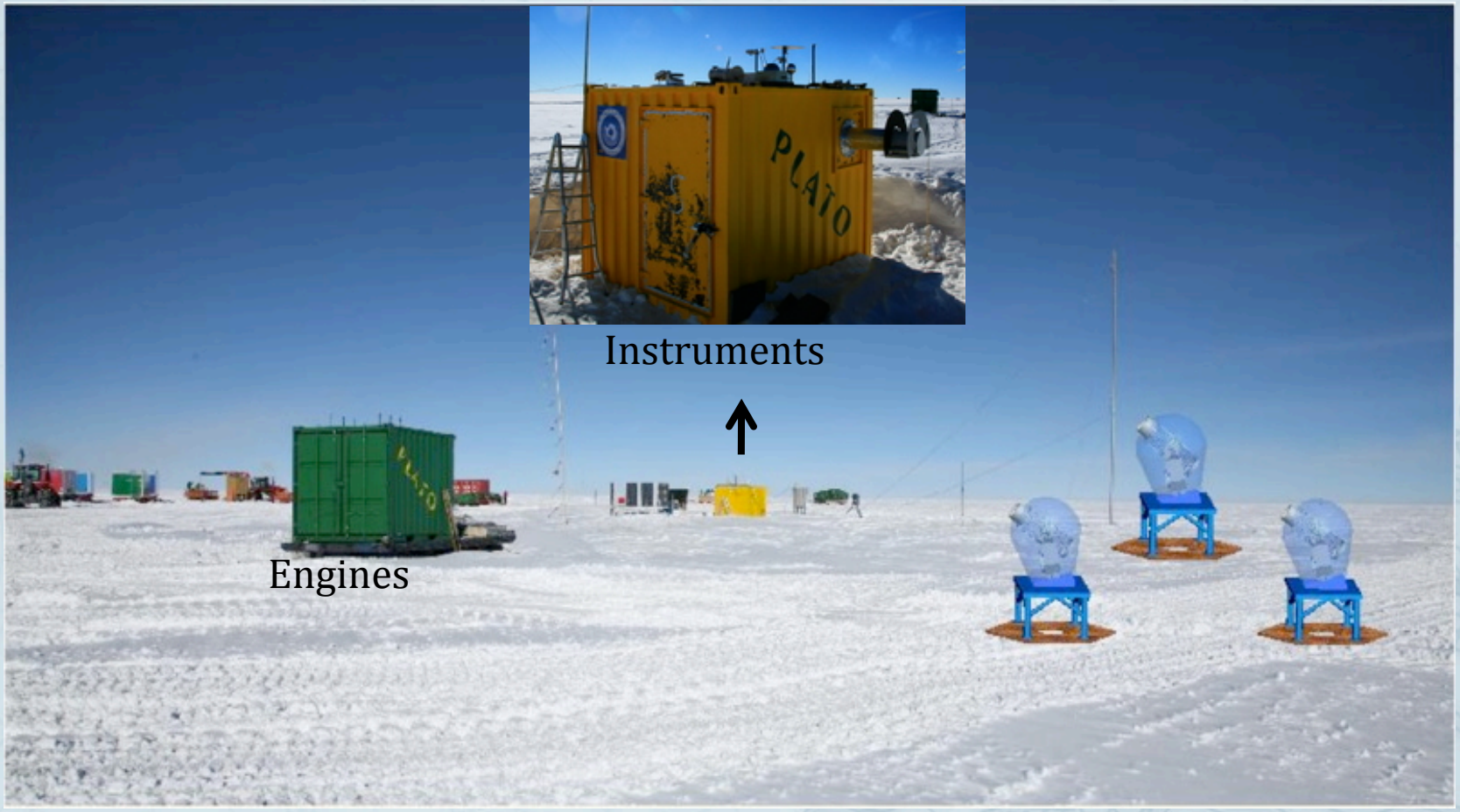
Disadvantage of Dome A

- Difficult to access : Data transmission, maintenance, …
- High requirement for the equipments : temperature, power consumption, …

Antarctic Survey Telescopes (AST3)

- Clear aperture： 500mm, Primary mirror: 680mm
- Wave band: 400nm-900nm (g, r, i filter for 3 telescopes)
- Field of view: 4.3 square deg
- Scale： 1 arcsec/pixel
- Image quality: 80% light energy encircled in 1 pixel
- Total optical length: 2.4m
- CCD: STA1600 , 9micron /pixel, 10K×10K: 5KX10K

Antarctic Survey Telescopes (AST3)



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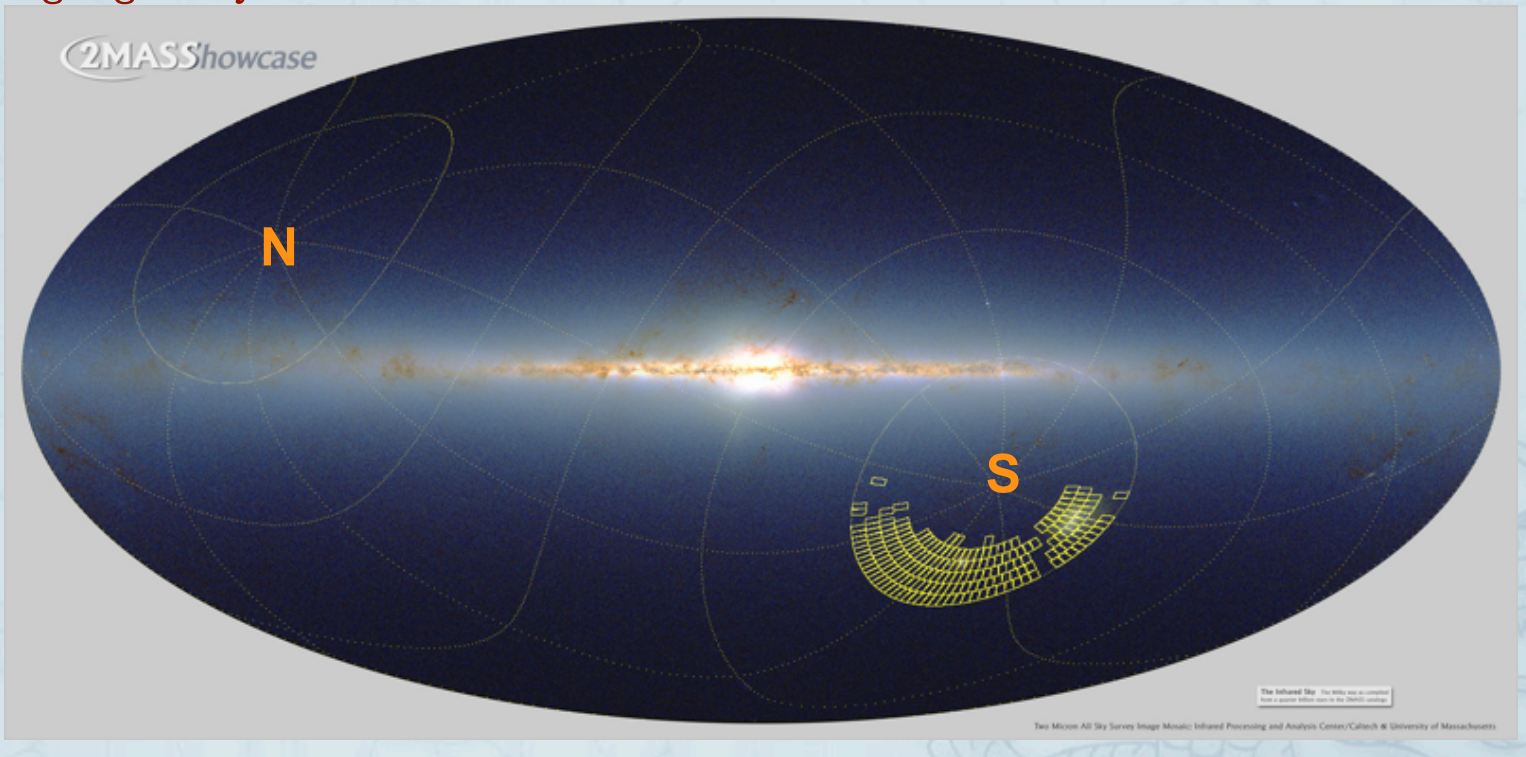
Sky Survey Fields（Supernovae）

Criterion:
1. High galactic latitude
2. Low extinction
3. Large galaxy number

•2000 sq degree
•～500 fields



Credit to: Juncheng CHEN、 Xiaofeng WANG (Tsinghua)

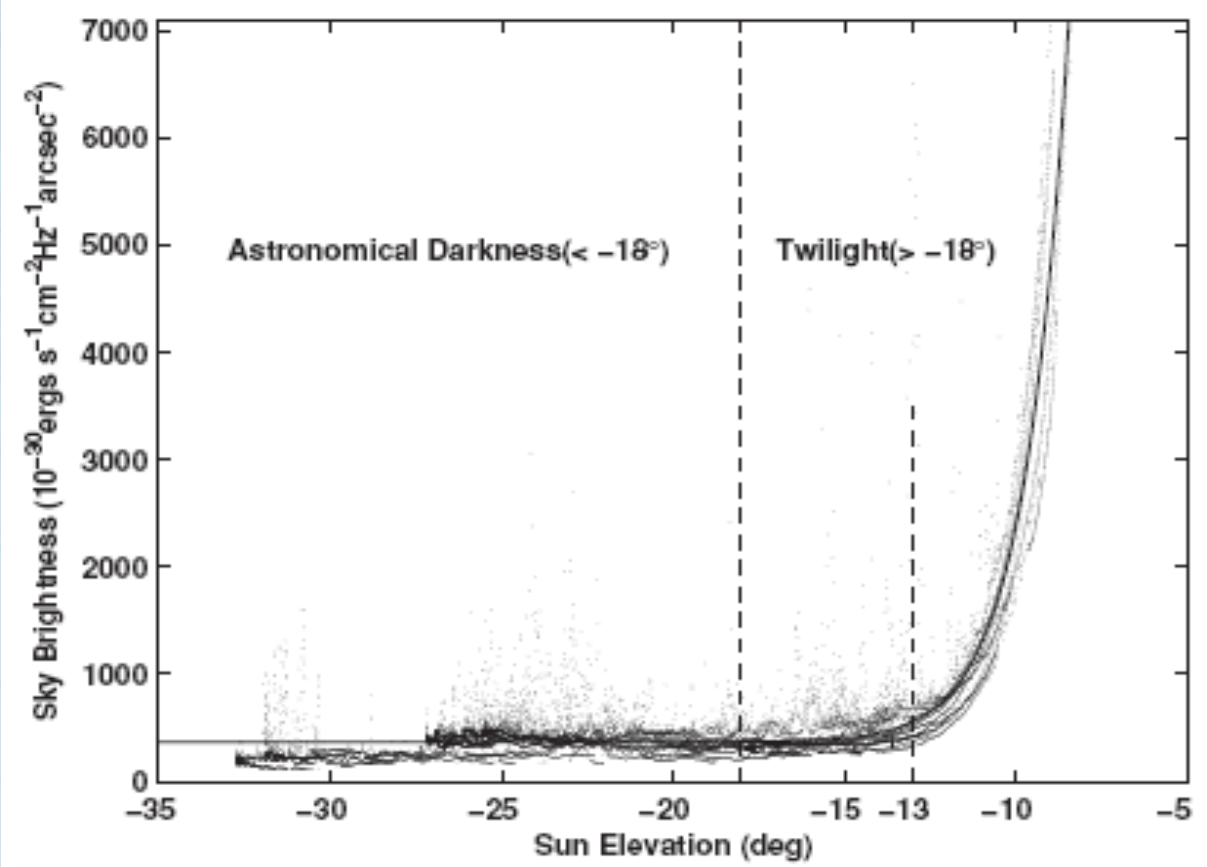
Sky Survey Strategy(SSS)

Select the best field to observe:

- **Dark sky background;**
  - **Sun altitude (twilight)**
  - **Moon altitude & azimuth**
  - **Lunar phase**
- **Extinction;**
- **Aurora、cloud (possibility);**
- **Cadence;**
- **Movement of the telescope.**

SSS–Twilight

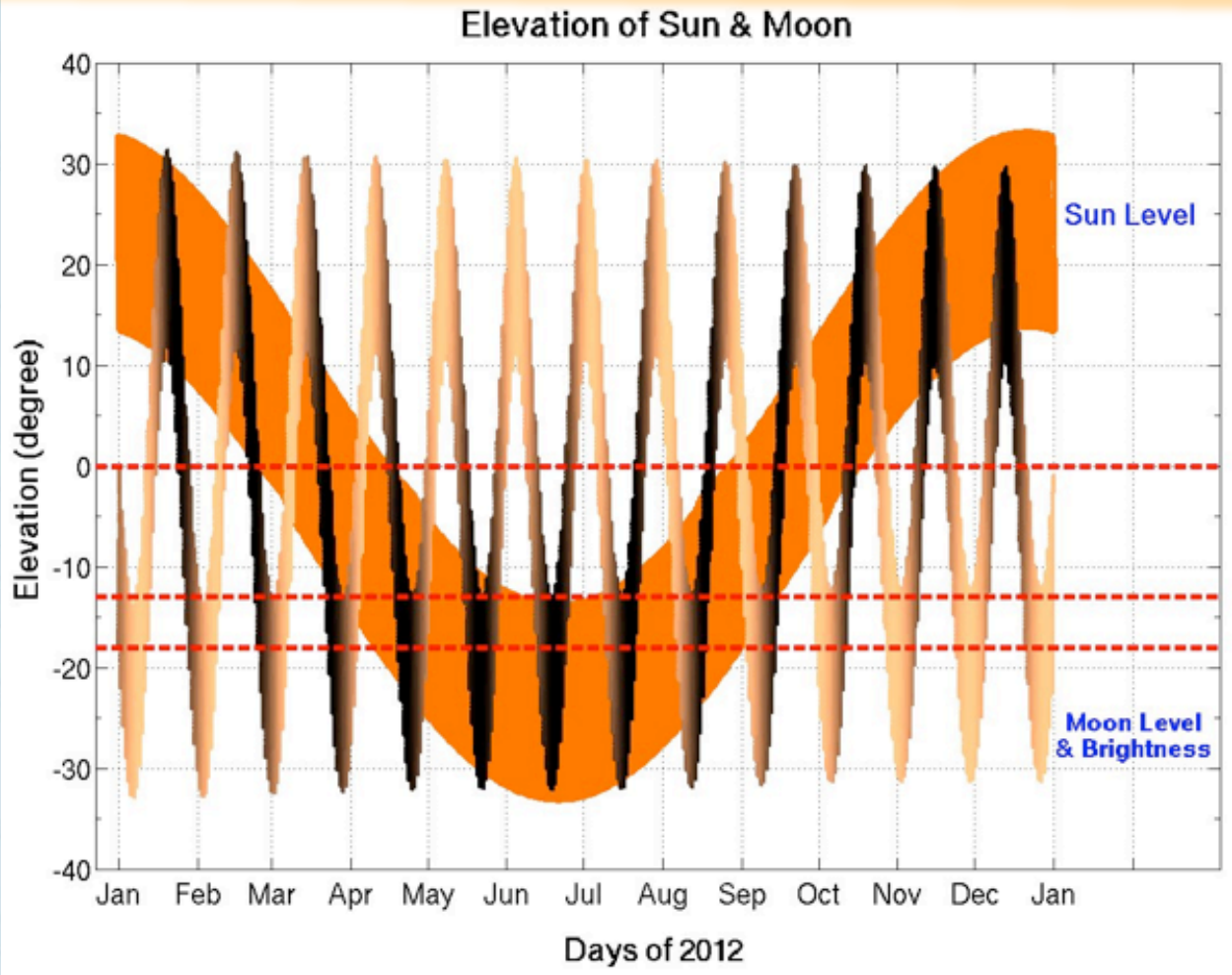
CSTAR result



The Sun altitude of -13° below the horizon is suitable twilight at Dome A

Zou et al. AJ, 2010

SSS - Altitude of the Sun



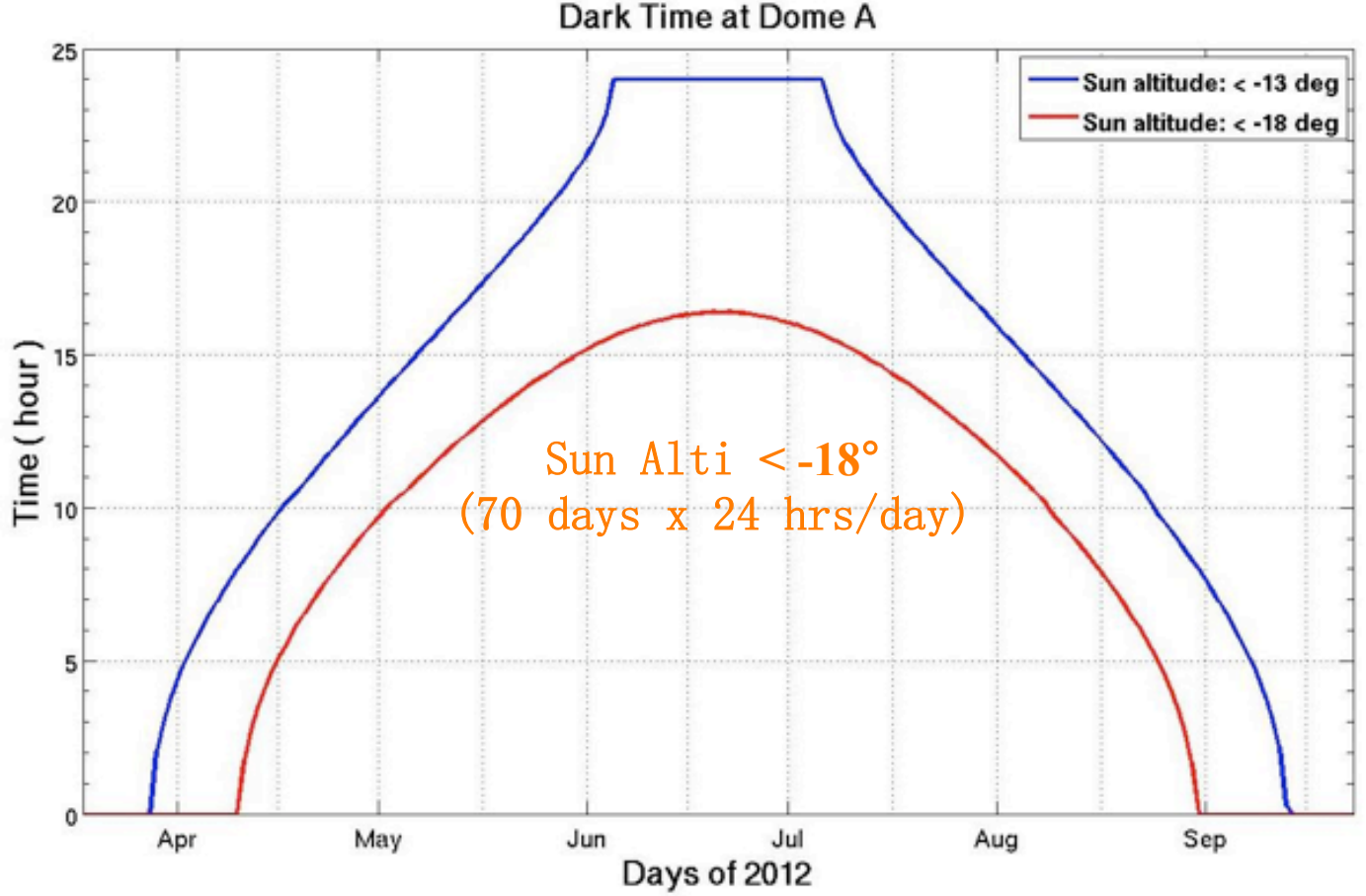
地平线

-13°

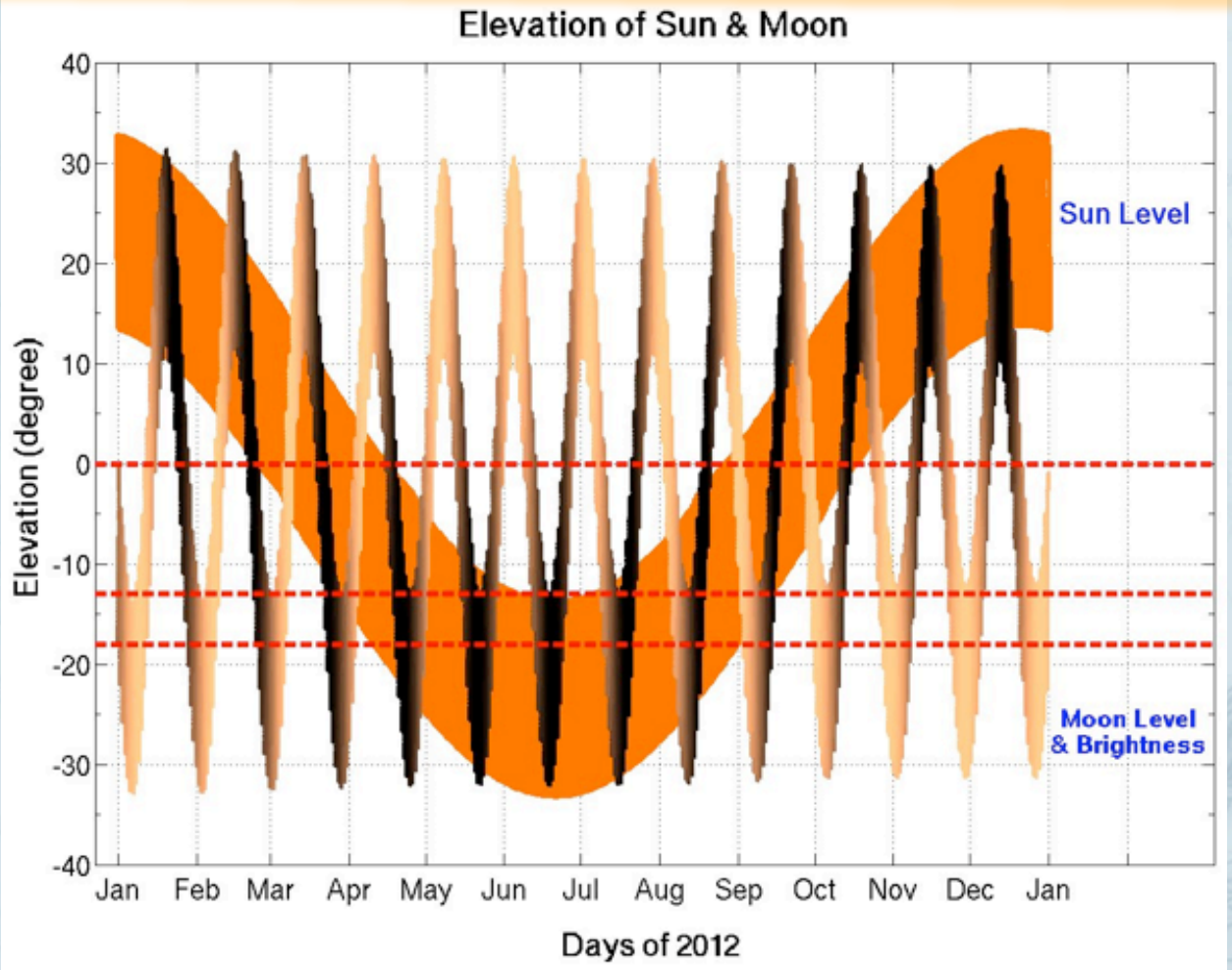
-18° twilight

SSS– Total Observation Time

Sun Alti < -13° (109 days x 24 hrs/day)



SSS - Altitude of the Moon



地平线

-13°

-18° twilight

The largest altitude of the Moon in 2012：＜35°

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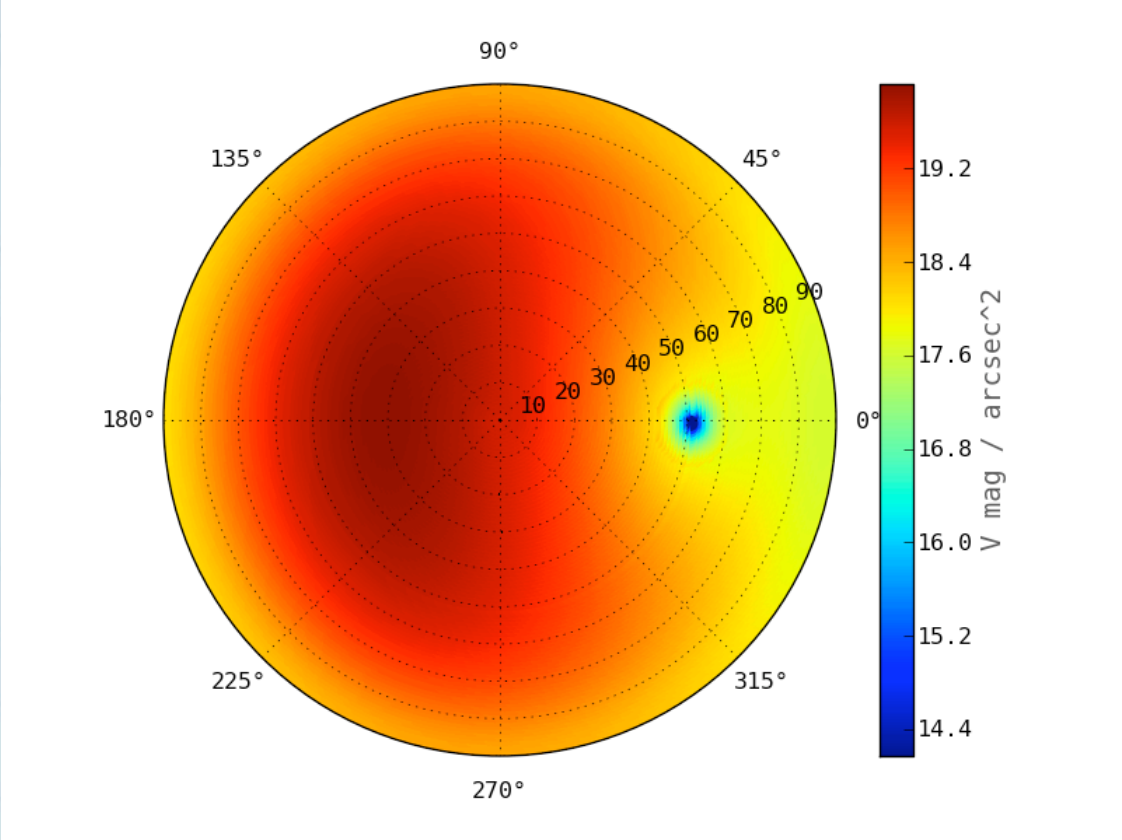
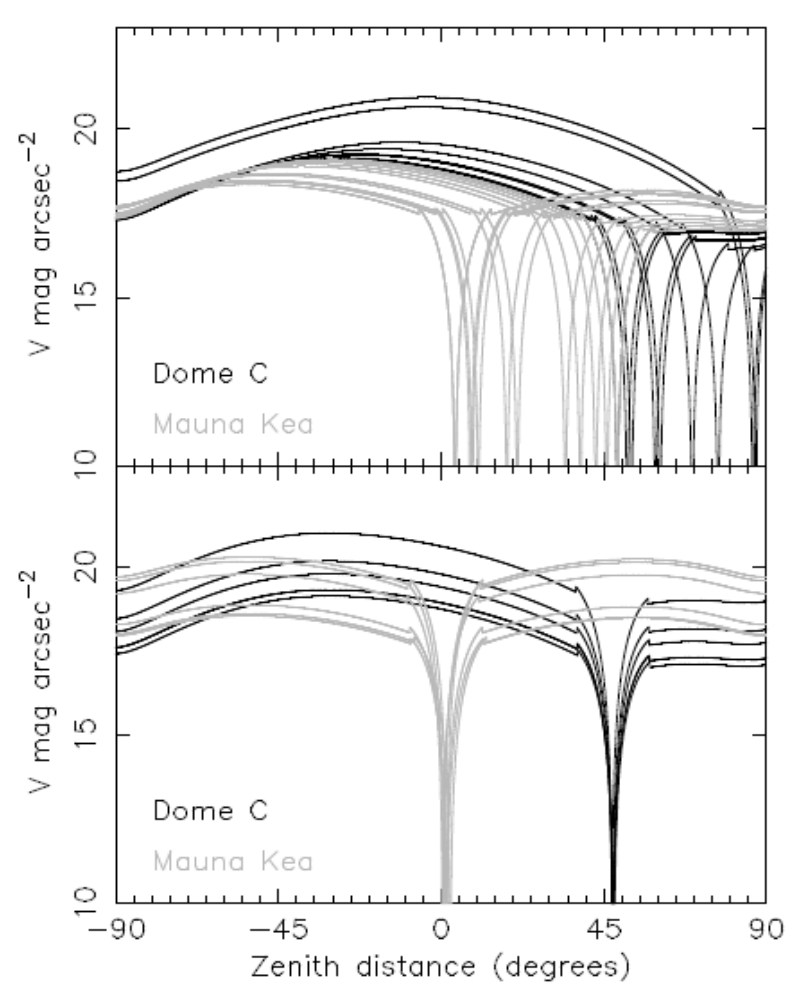
SSS– Moon Azimuth



Zenith distance @ Dome A = 50°
（the worst @ Dome A）

Model :
Krisciunas & Schaefer, 1991
Credit to: Geoffrey Sims

Moon Contribution to background



Kenyon & Storey, 2006

Full Moon reaches its highest altitude in each month (in 2005). Each curve represents a different month.

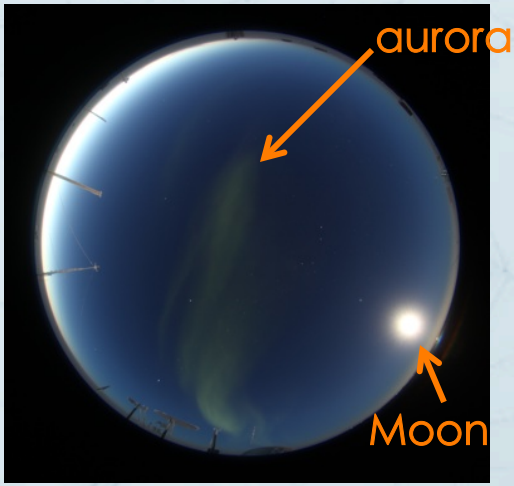
Moon reaches its highest altitude in each month (in 2005), regardless of phase.

Model : Krisciunas & Schaefer, 1991

Sky Survey Strategy

Select the best field to observe:

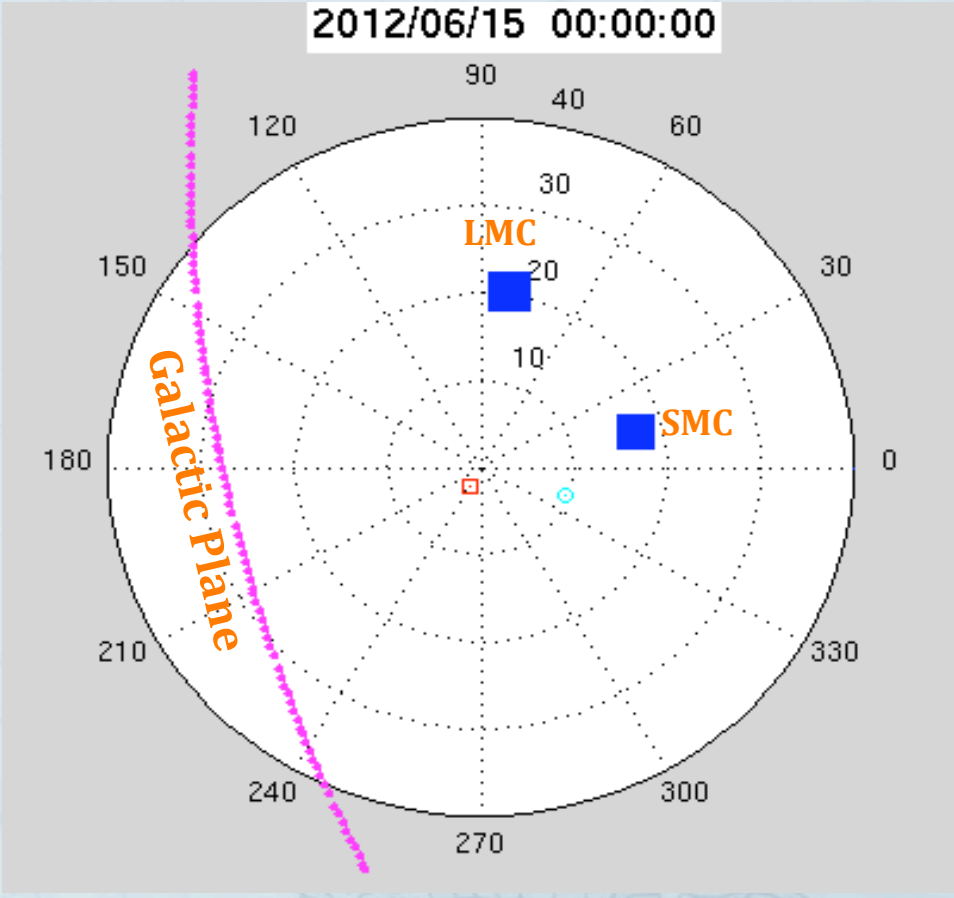
- **Dark sky background;**
- **Low extinction（air mass）;**
  - **Zenith distance < 30°**
- **Aurora、cloud (possibility);**
- **Cadence;**
- **Minimize the movement of the telescope.**



HRCAM

SSS - Simulation

- Galactic latitude > -25°
- Sun Alti < -13°
- Zenith distance < 30°
- Minimize the movement



Conclusions

- Good Sky Survey Strategy → More Data (> 10T)
- CSTAR & AST3 → Center for Information & Computing, NAOC, CAS

Thank CVO & LOC !

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