Site Survey Instruments at Dome A, Antarctica

Zhaohui Shang（商朝晖）

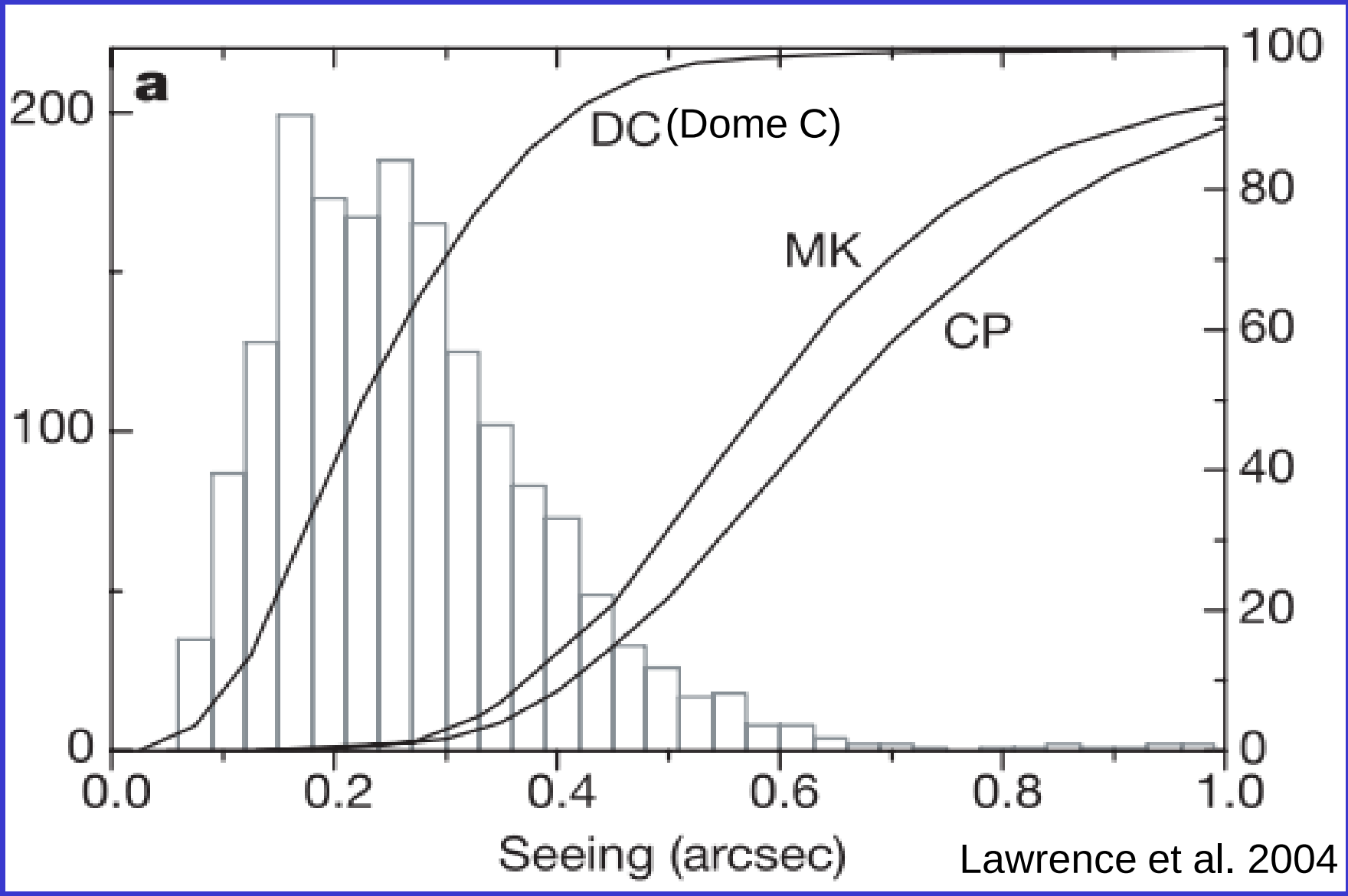
Chinese Center for Antarctic Astronomy

&

Tianjin Normal University

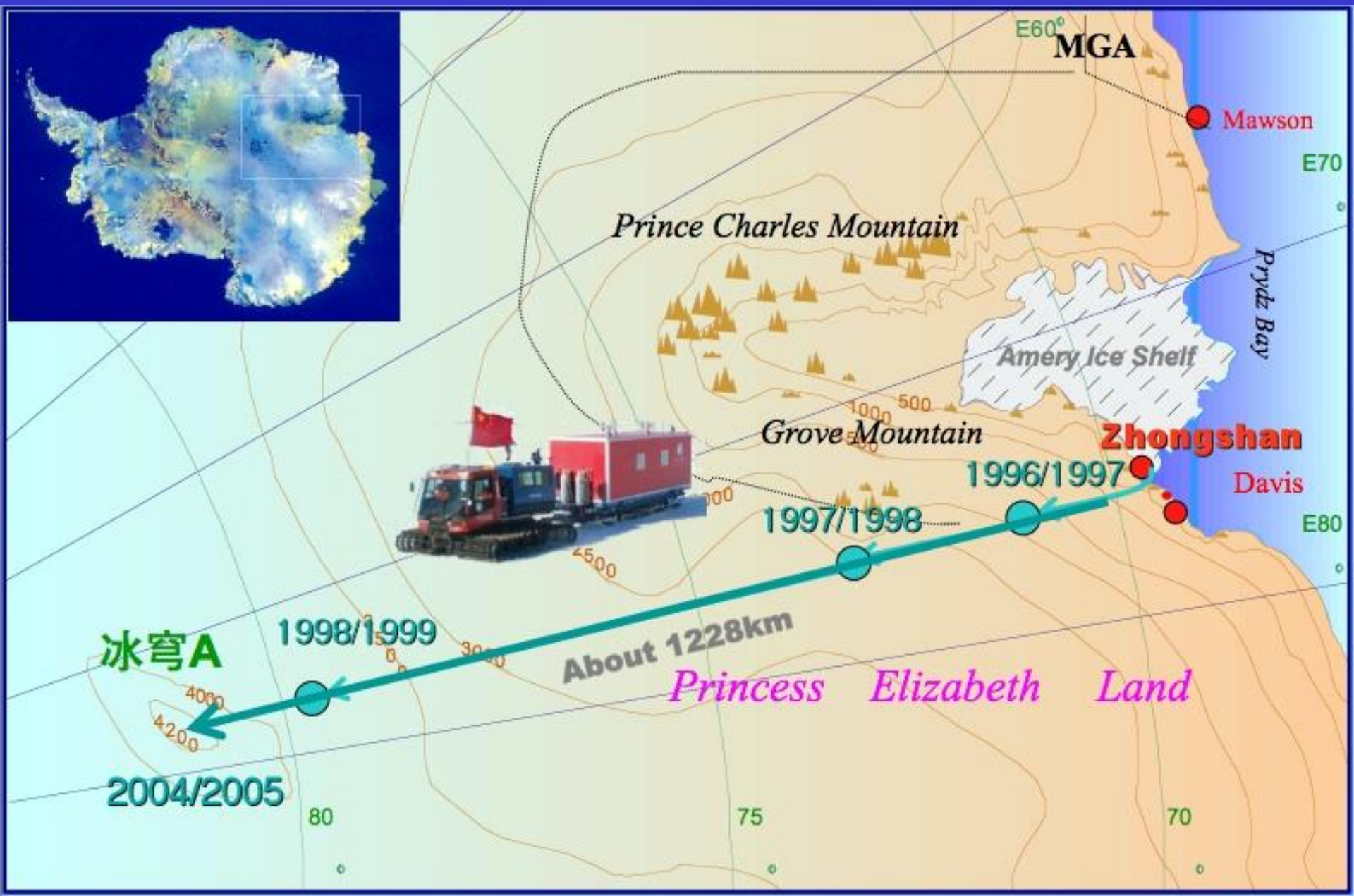
20101220@NAOC

Cumulative seeing probability

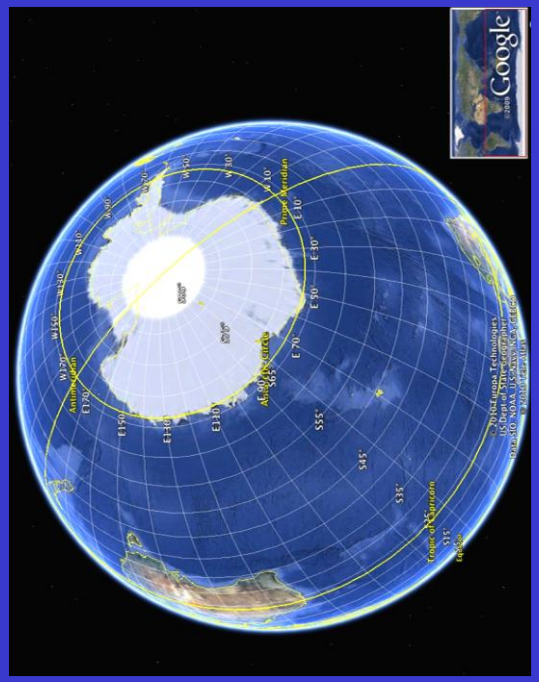


Lawrence et al. 2004

Chinese Antarctic Research Expedition Reached Dome A in Early 2005

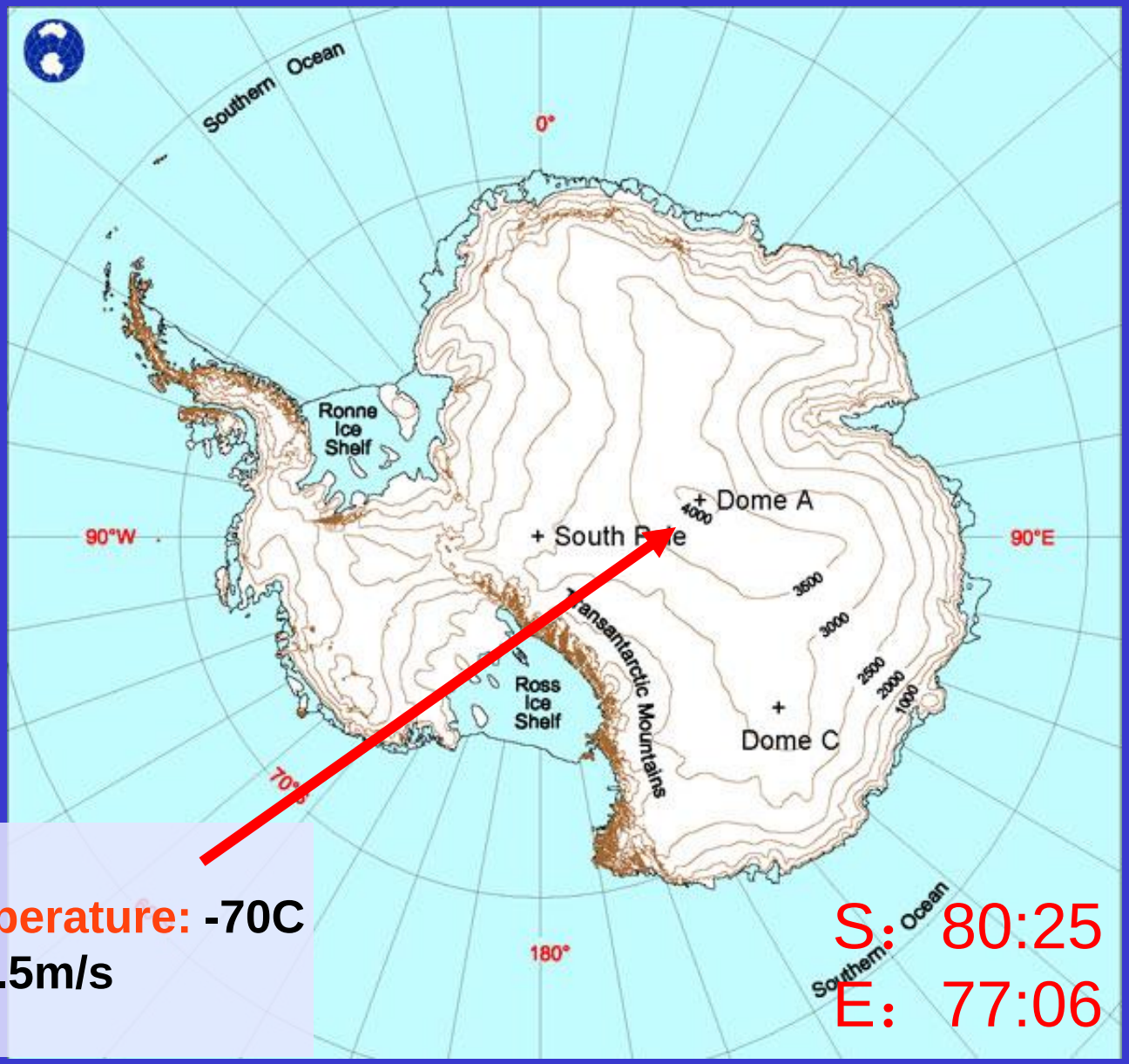


Dome A, Antarctica



Dome A is better:

Altitude: **4093m**
Typical wintertime temperature: **-70C**
Average wind speed: **2.5m/s**
Very Dry

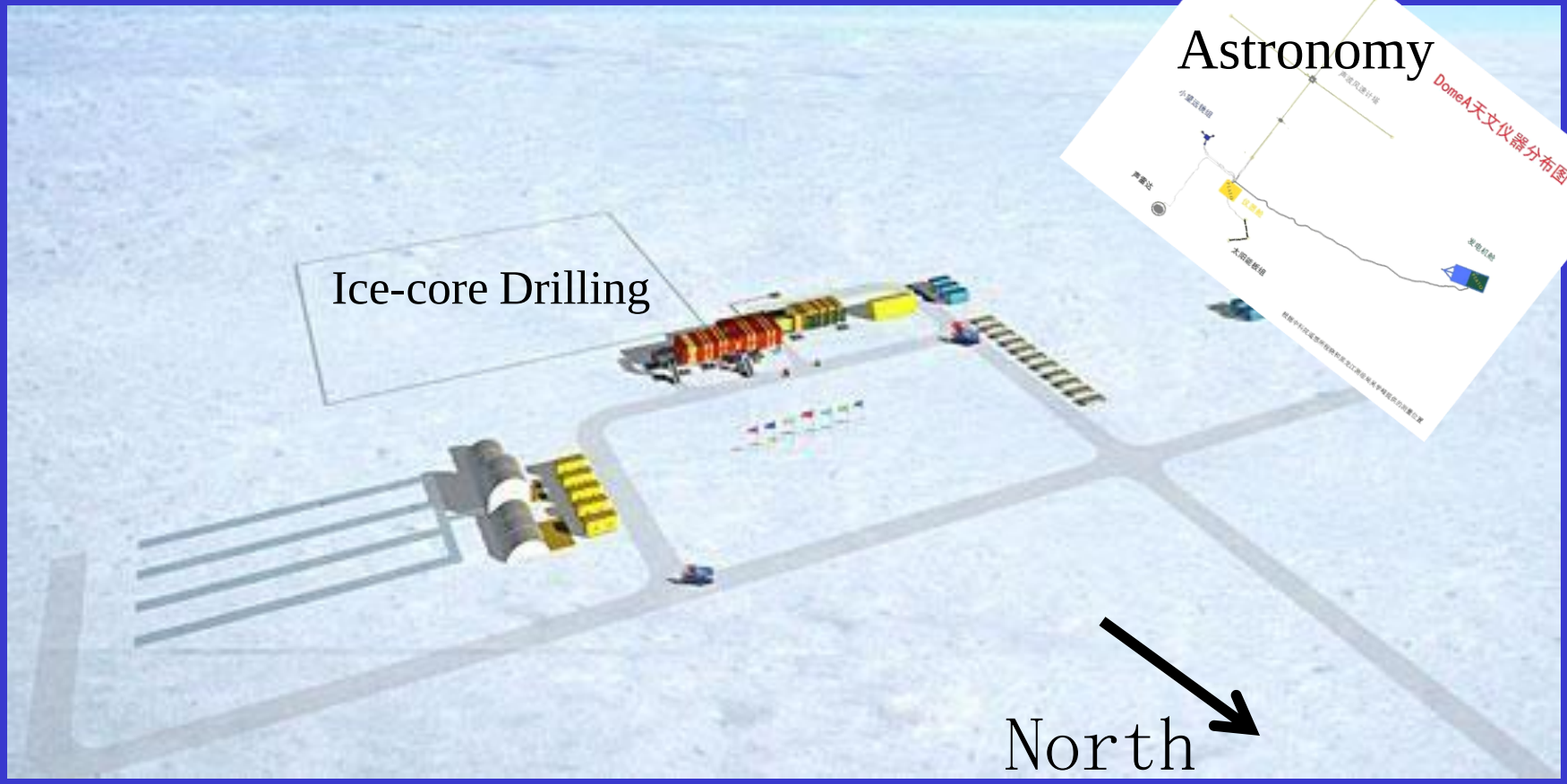



Boring, tough, insane, fun, exciting, …
Traverse from coast to Dome A

Astronomical Site Testing

- Collaborations with Australian and US Astronomers;
- Installed various equipments/instruments (2007/2008);
- Fully automatic operation through the winter;
- Serviced twice (2009-2010);
- Still running.

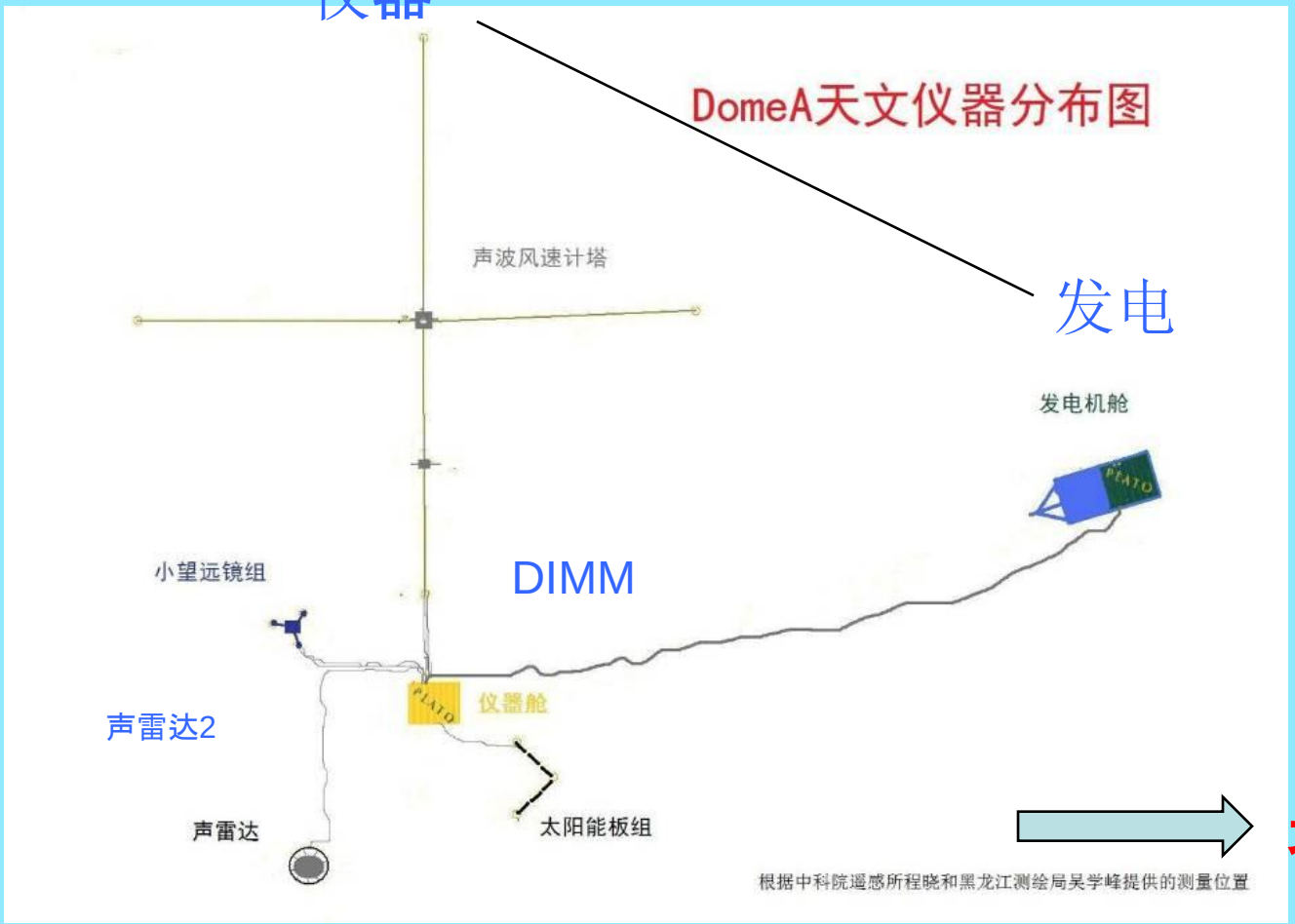
Layout of Kunlun Station (old)



AST3场地

仪器 —————————— 发电

仪器



昆仑站

CSTAR Installation--2008

CSTAR Servicing

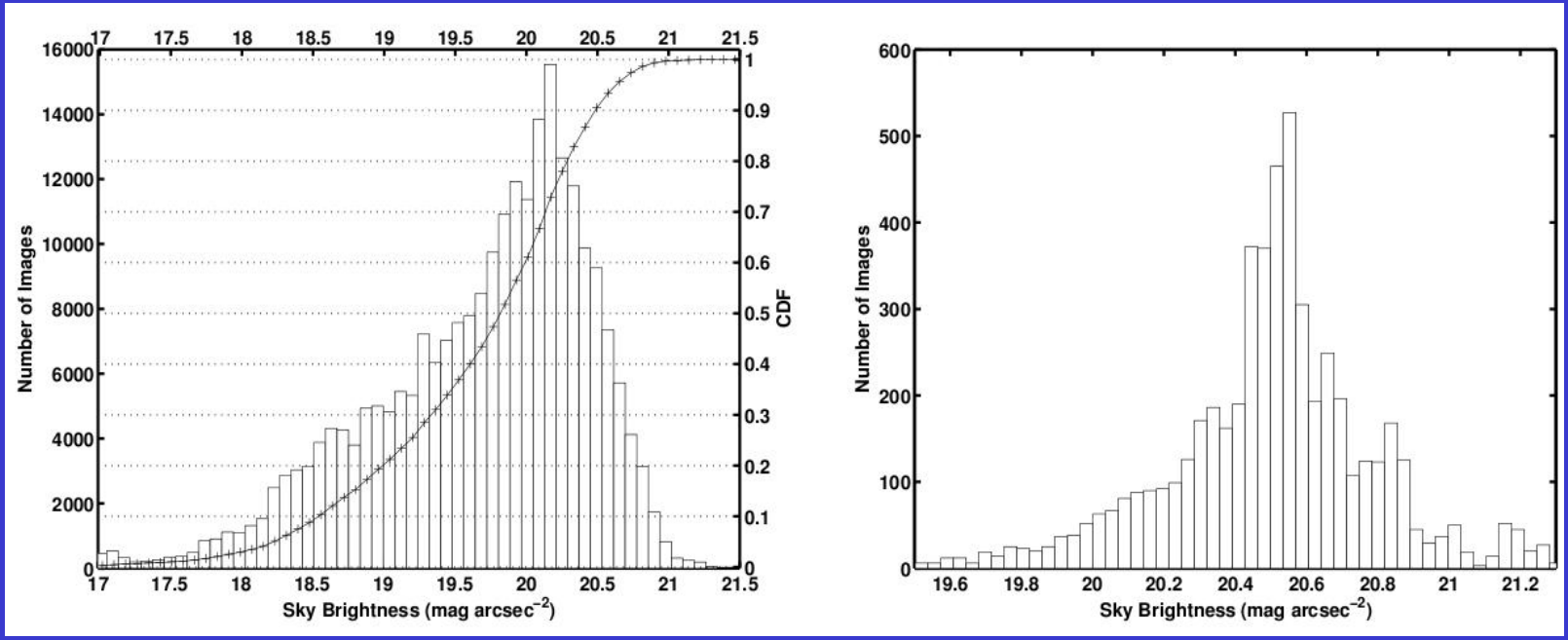
webcam

Chinese Small Telescope Array (CSTAR)

- 4 telescopes
- Apperture: 14.5cm
- Filters: g, r, i, blank
- Focal ratio f/1.2
- CCD 1k x 1k frame transfer
- FOV: ~ 4.5˚ x4.5˚

- Pointing to South Celestial Pole
- one image / 20-30 sec
- Limiting mag: ~ 16

Dome A sky backgroud (Zou et al. 2010)



Distribution of Sky Brightness (i-band)

Dome A		20.5	
La Palm	20.10	Cerro Tololo	20.07
Paranal	19.93	Calar Alto	19.57

Median Sky Brightness (i-band)

Dome A Cloud Coverage (Zou et al. 2010)

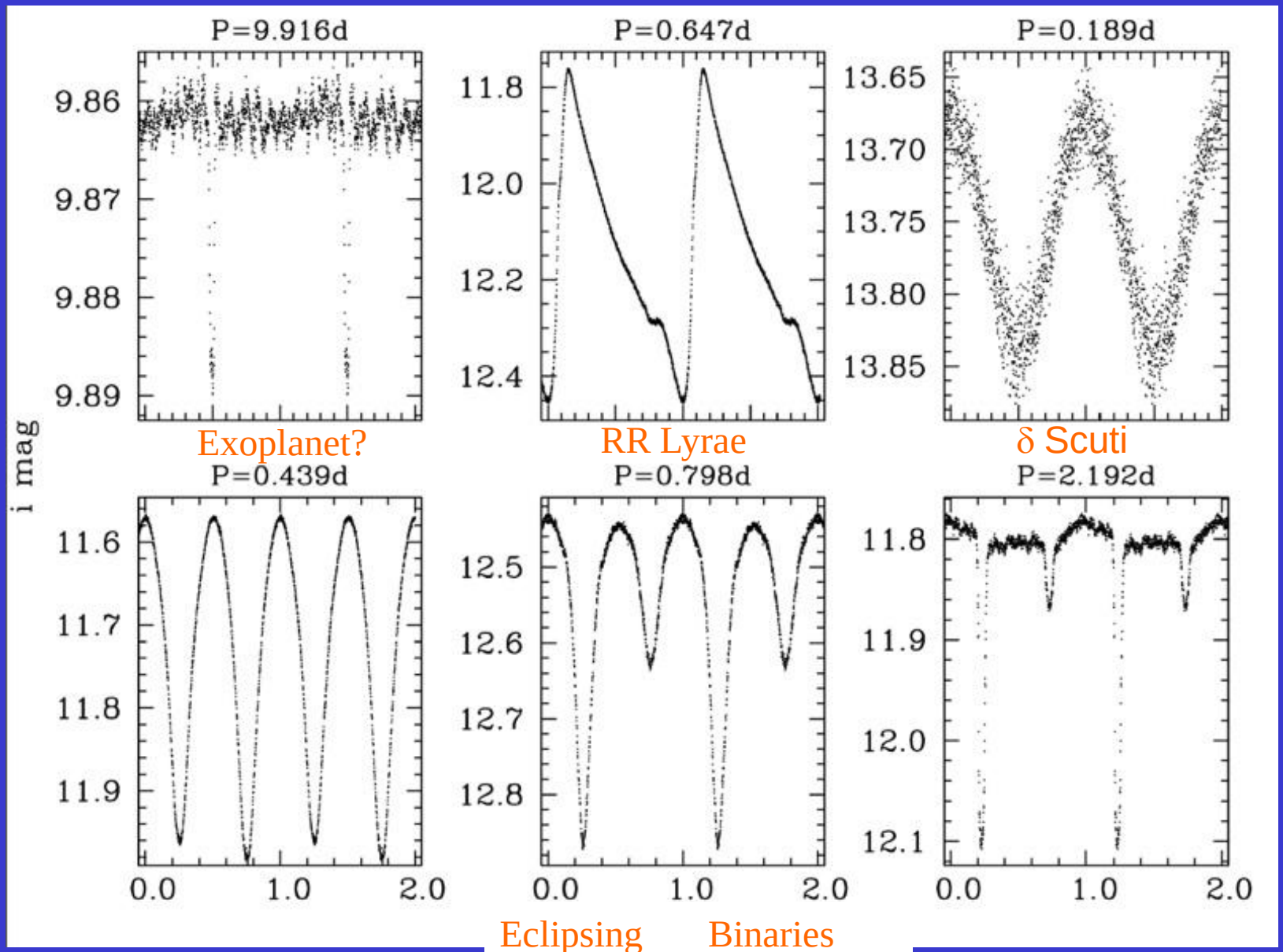
The Comparison of Cloud Cover Between Mauna Kea and Dome A

Mauna Kea (Gemini)			Dome A
Cloud Cover	Extinction (V)	Fraction	Fraction
Any other usable	>3	10%	0
Cloudy	2–3	20%	2%
Patchy cloud	0.3–2	20%	31%
Photometric	<0.3	50%	67%

Notes. The definition of cloud cover is adopted from the Gemini Observatory. For comparison, we use $V - i = 0.07$ in extinction for the different transparencies of these two bands as presented in the text. Note that the term "photometric" as used here is just one kind of cloud cover category and it is different from the normal term "photometric night."

Better than Mauna Kea

Folded Light Curves from CSTAR

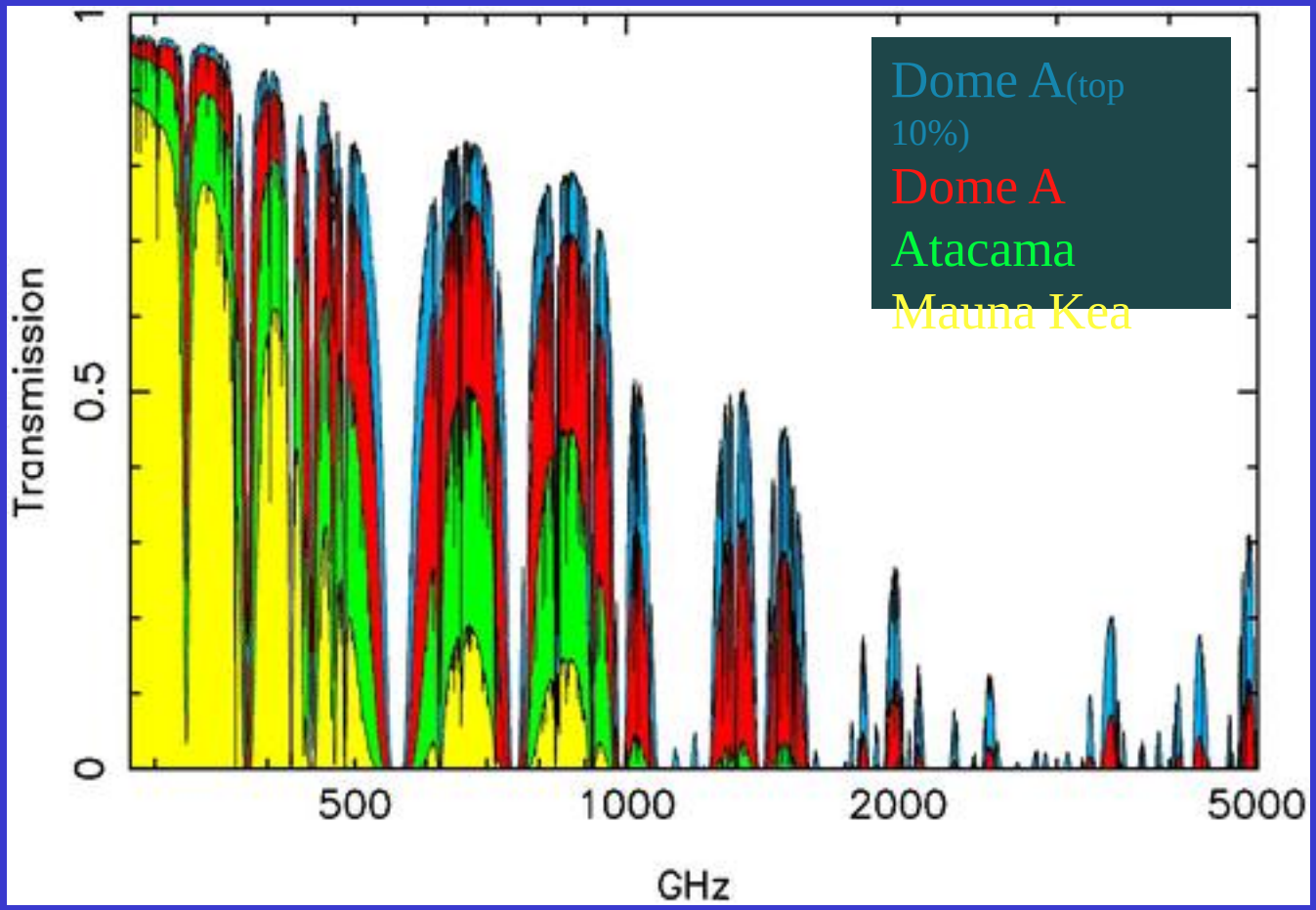


Pre-HEAT（Transmission @Tera-Hz or sub-mm）

- Dry => good for THz

Pre-HEAT（@Tera-Hz or sub-mm）

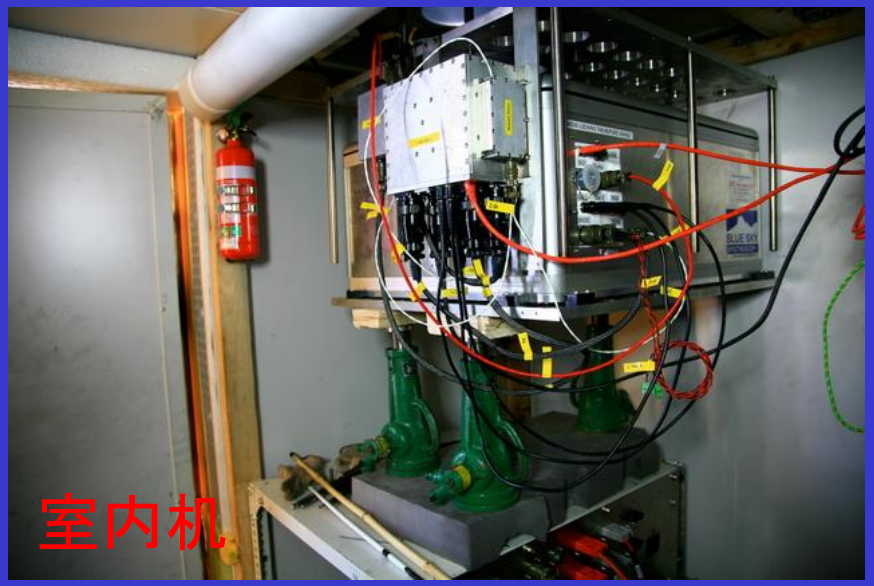
THz Atmospheric Transmission



Yang et al. 2010

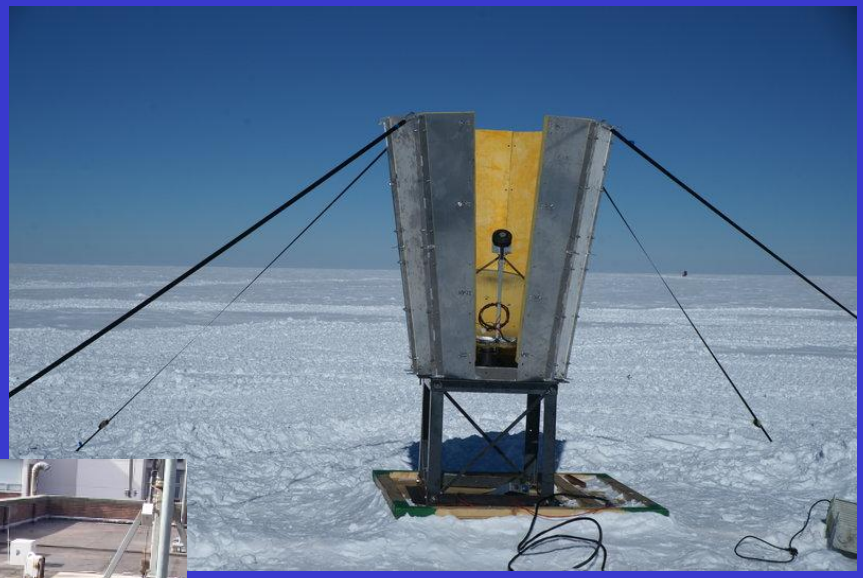
THz FTS (Fourier Transform Spectrograph)

Installed in Jan. 2010



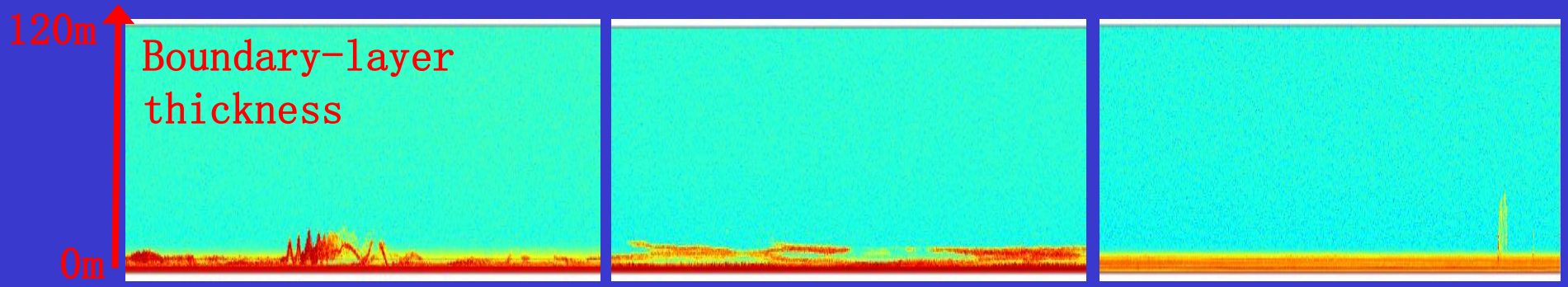
Snodar (Sonic Radar)

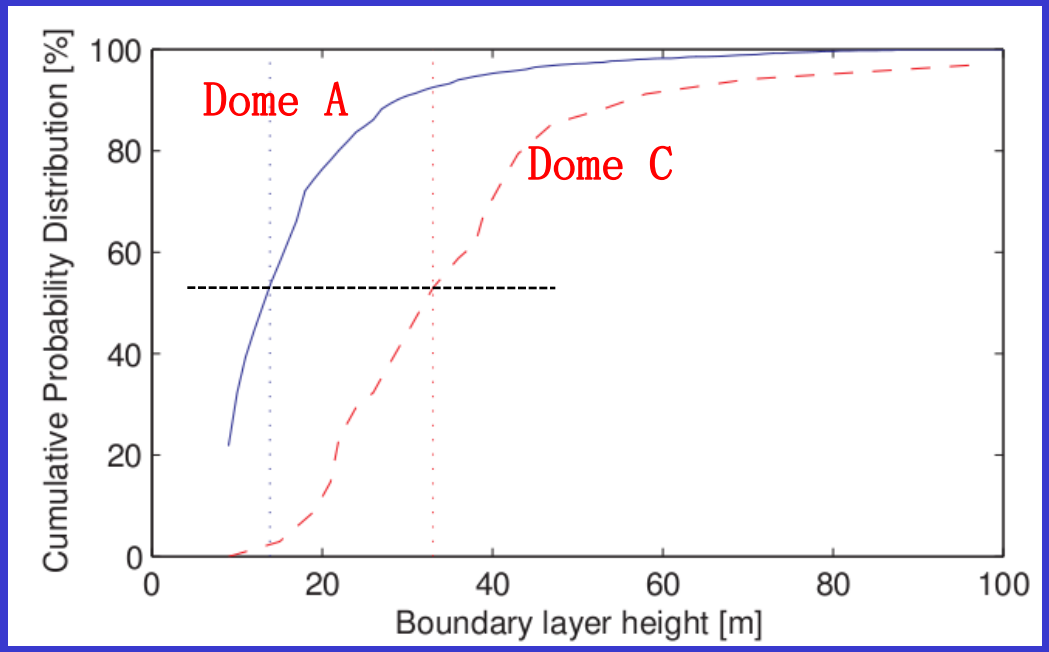
- Measure the atmospheric boundary-layer thickness



Snodar (Sonic Radar)

- Measure the atmospheric boundary-layer thickness (BLT)



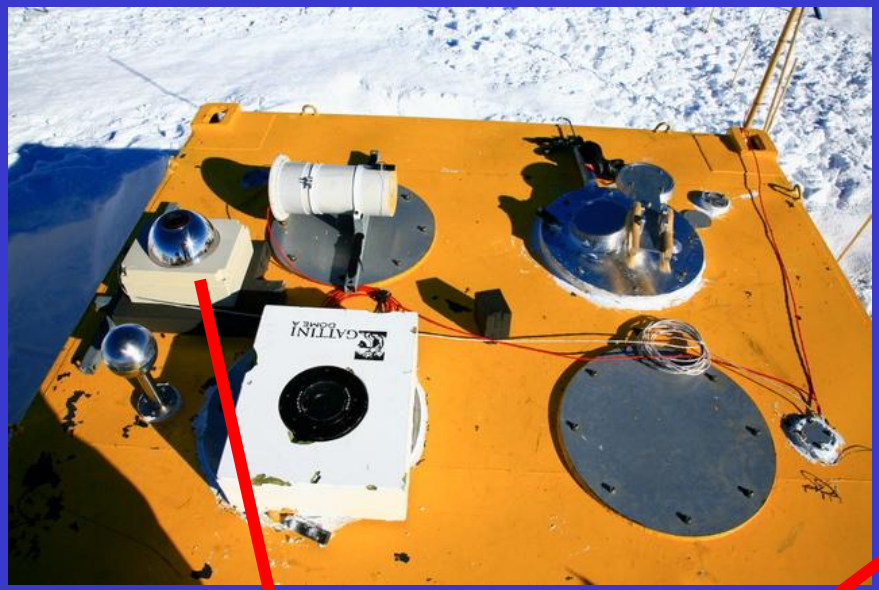


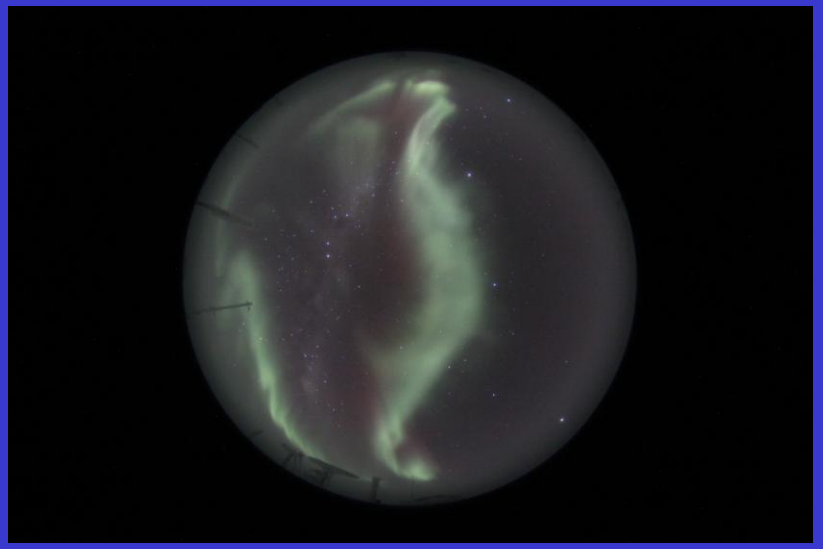
Cumulative Distribution of BLT at Dome A

- Median BLT ~13.9m。
- Lower than any other sites

Bonner et al. 2010

HRCAM (High-resolution Camear)





All-sky images with fish-eye lens

HRCAM (High-resolution Camear)

Status of Site Survey at Dome A

- Low atmospheric boundary layer（～15-20m）
  => better seeing;
- Darker sky background (optical);
- Better THz transmission than other sites;

Current data show Dome A is an excellent site.

On-going and planned projects:

- DIMM, MASS;
- Measure infrared background;
- Monitoring;

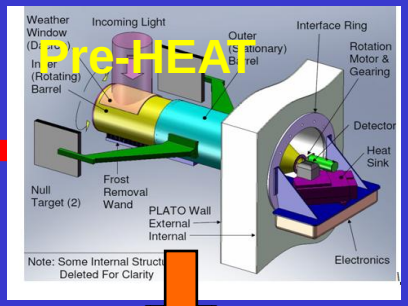
2010. 01. 26

昆仑站—天文项目—其他仪器

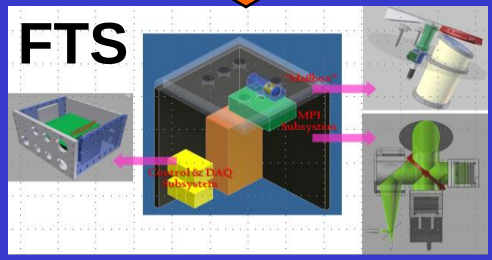
Road Map of Antarctic Observatory

Optical/IR----------sub-mm

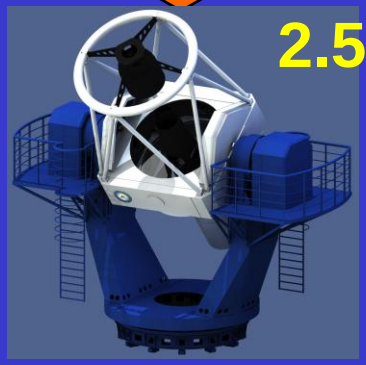
Current =>

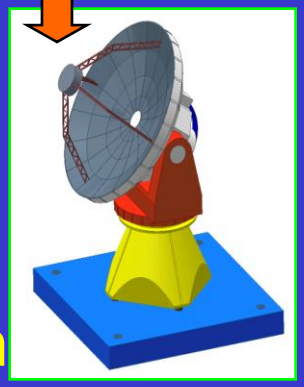


near term =>



mid-term =>

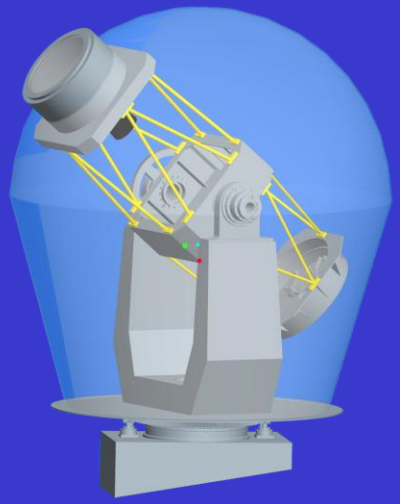




long term =>

… … … …

Antactic Schmidt Telescope x 3 (AST3)



Plan to install one in 2011

… and this is how clear it is at Dome A, BTW.

Thank you !