

Site2010@Kislovodsk

# Seeing measurements at the astronomical observatories in China

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# Outline

- 1 、 DIMM seeing measurements at LAMOST site
- 2 、 DIMM seeing measurements at Karasu site
- 3 、 DIMM seeing measurements at Oma site
- 4 、 Microthermal measurements at Karasu

# DIMM Specifications

Turbulent Layer

Shift  $V_{\tau}$

The screenshot displays a computer interface for telescope control. At the top left, a window titled "CCD Image" shows a dark field with a few bright spots, one of which is highlighted with a red rectangle. To the right of the CCD image is a control panel for "Kalasu829". This panel includes fields for "Exposure Time (msec)" set to 5, "Observatory" set to "kalasu", "Latitude" set to 38° 09' N, and "Longitude" set to 74° 48' W. Below these are fields for "Object Star" (set to "ollLyr") and "Data Directory" (set to "c:/seeing2/data"). A "Frame Number" field is set to 50, and there are "Start" and "Stop" buttons. At the bottom of the control panel is a "Speed Control" section with radio buttons for "Slew", "Find", "Center", "Guide", "Fast Focus", and "Slow Focus". To the right of the control panel is a window titled "Autostar Telescope C..." showing coordinates: "RA: 23:59:59" and "Dec: +89:59:59". At the bottom left, a "Seeing Data" window shows a table with columns for "#seconds", "date", "time", "r0\_V/m", "r0\_V/m", "FWHM\_V/arcsec", and "FWHM\_V/arcsec". The Windows taskbar at the bottom shows several open applications: "Meade AutoSt...", "AutoStar Env...", "CCD Image", "Seeing Data", and "Kalasu829".



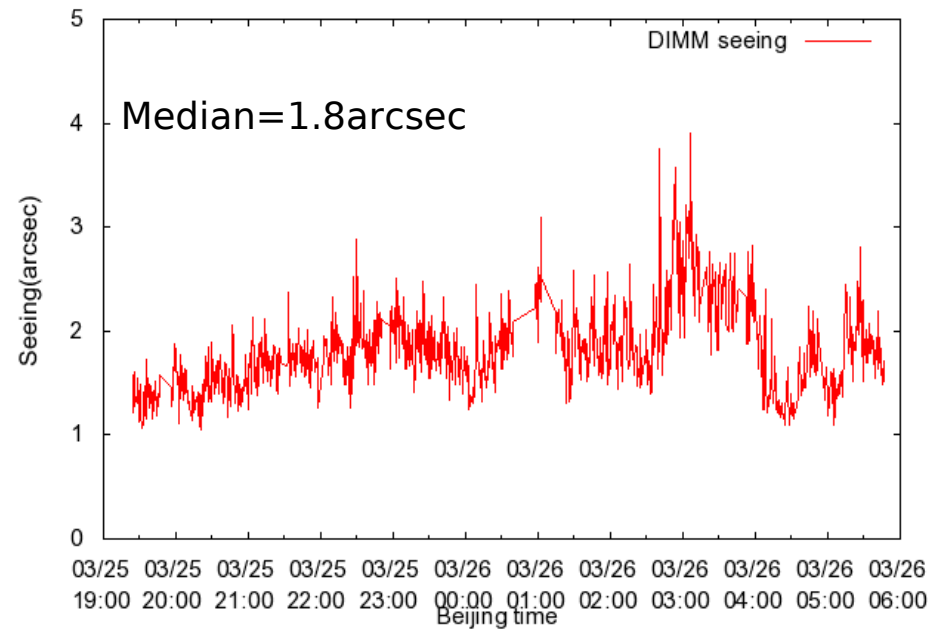
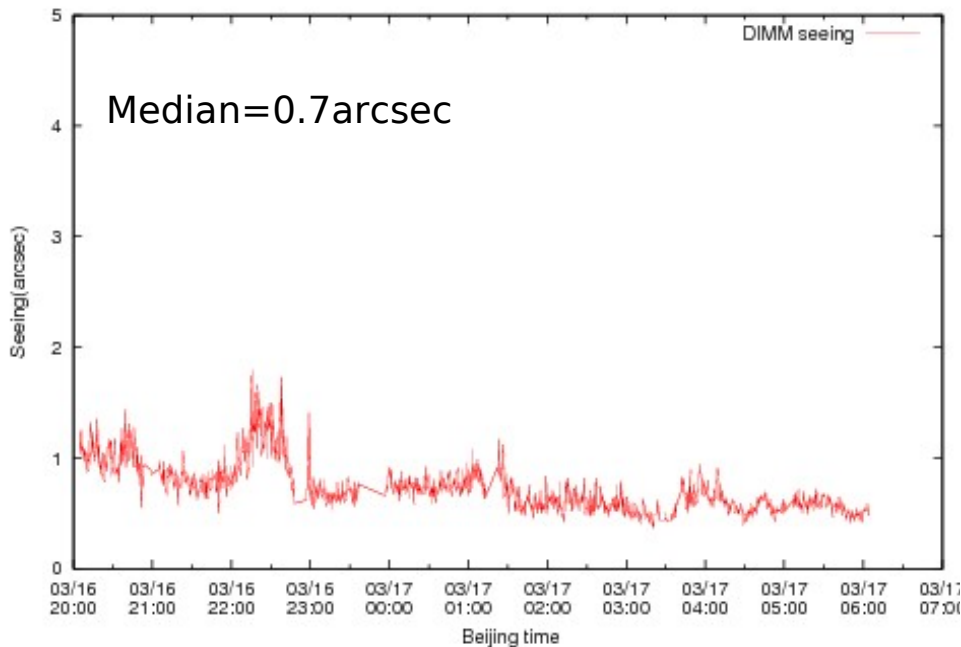
# 1 、 DIMM seeing measurements at LAMOST site

The Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST) is a quasi-meridian reflecting Schmidt telescope constructed with its optical axis fixed in the meridian plane. LAMOST is an innovative telescope with a 4m aperture, a field of view of 5 degrees, and 4000 fibers installed on a 1.75m focal plane . It is located at Xinglong station, 950m above sea level and 170 km northwest of Beijing.



# The good and bad seeing

The seeing condition of this night is the best in the whole run, with 1337 data sets in whole night. The very good seeing level indicates a very stable weather condition during the night.



# Results(1)

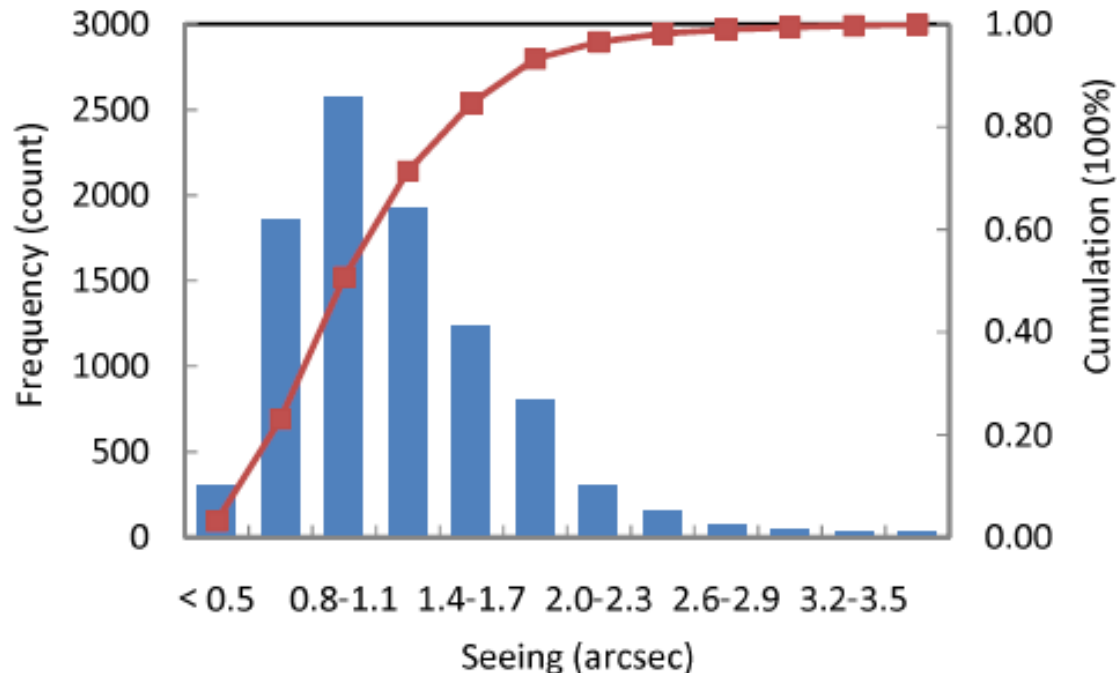
A total of 12 nights of data sets were obtained for the seeing measurements at the LAMOST site. Depending on the weather conditions, we could take at best 1337 data sets during one night, and 123 data sets in the worst case.

Date	Period	Num. data set	Median seeing (arcsec)
Mar-12	21:38-04:20	588	1.47
Mar-13	19:39-03:58	871	1.10
Mar-14	22:15-05:44	989	0.72
Mar-15	20:52-23:56	397	1.22
Mar-16	20:05-06:04	1337	0.71
Mar-17	19:03-06:00	1170	1.11
Mar-21	20:27-22:05	123	1.14
Mar-25	19:24-05:46	1160	1.75
Mar-28	19:53-22:34	219	1.67
Mar-29	19:33-00:48	448	1.33
Apr-24	20:15-04:59	1154	0.91
Apr-25	21:16-05:04	803	1.39

The observing targets for DIMM seeing monitoring are  $\beta$  Gem (1.14 mag),  $\alpha$  Leo (1.35 mag),  $\alpha$  Uma (1.79 mag),  $\alpha$  Boo (-0.04 mag),  $\alpha$  Lyr (0.03 mag),  $\epsilon$  Uma (1.77 mag),  $\alpha$  Aur (0.08 mag).

## Results(2)

- # The total of 9259 valid data sets is used in the analysis.
- # The median seeing in this run is measured to be  $1.1''$  and the mean seeing is  $1.2''$ .
- # A fraction of 25% of the total data sets shows seeing better than  $0.8''$ , and 75% is better than  $1.5''$ .



## Results(3)

The seeing measurements resulting from several campaigns over the last 15 yr.

# Song et al.(1998) carried out four nightly measurements using DIMM in December, 1994.

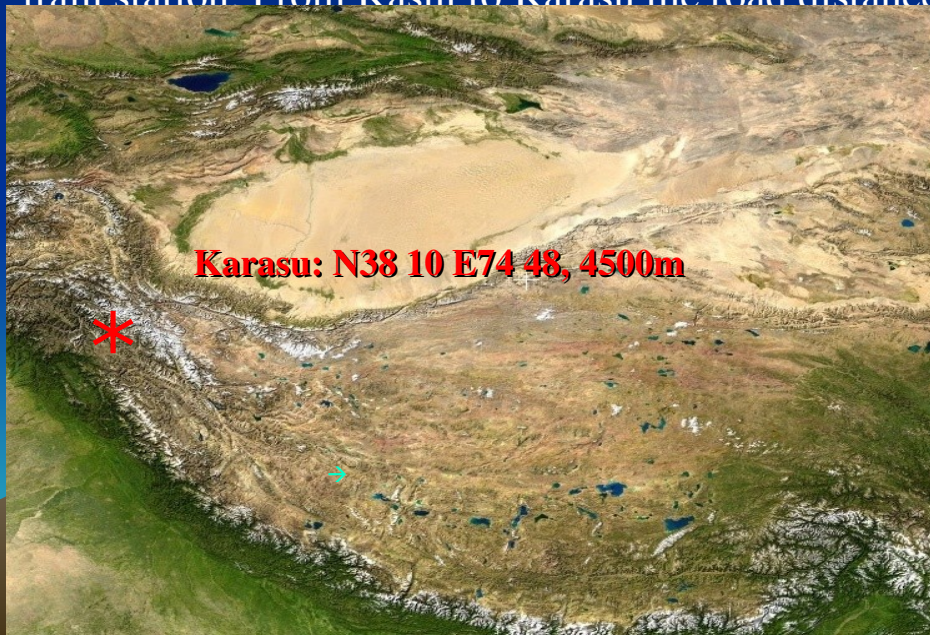
# Liu et al. (2003) calculated statistics on the FWHMs of Polaris images from 1995 to 2001, the FWHM method includes other non-atmospheric turbulence factors in the observing system.

Period	Night	Height (m)	Spring (")	Summer (")	Autumn (")	Winter (")	Reference
1994 Dec.	4	15	–	–	–	1.4	Song et al. (1998)
1995–2001	All	6	3.4	2.9	3.7	3.9	Liu et al. (2003)
2003 Oct.	3	15	–	–	–	1.3	Zenno et al. (2004)
2007 Mar.	12	28	1.1	–	–	–	This work



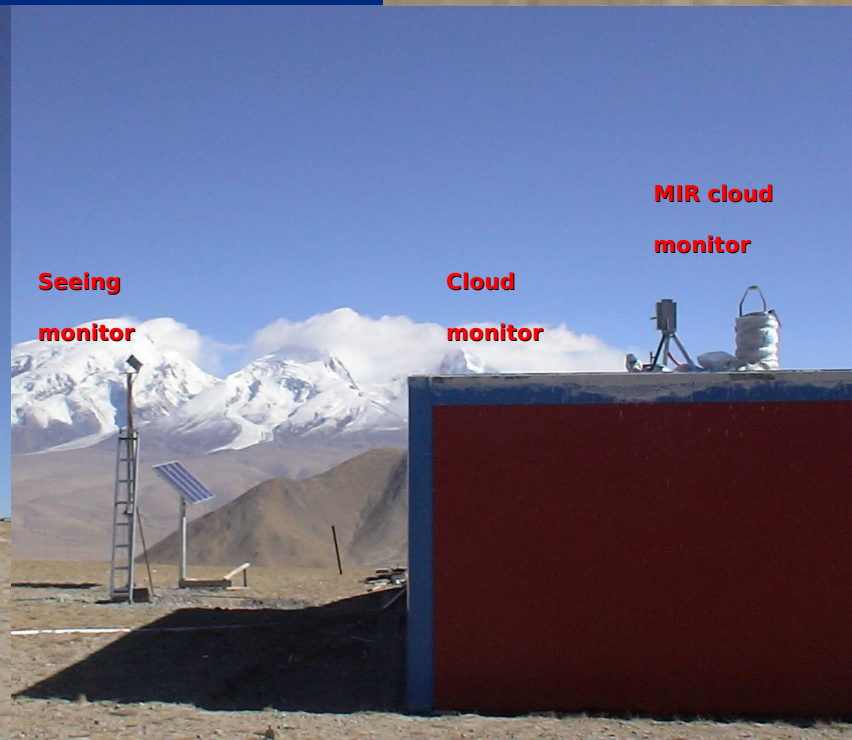
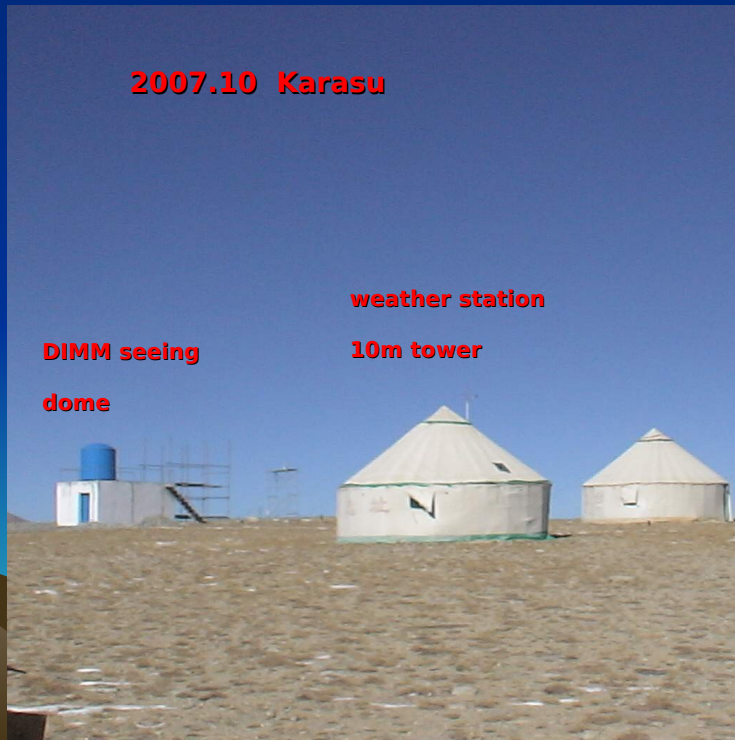
## 2 、 Seeing measurements at Karasu site

The candidate site selected is called Karasu, on Pamirs plateau, N38°10' and E74°48', with **altitude of 4500m**, belonging to Xinjiang Province. The nearest town to Karasu is called Tashkurgan, and the nearest city is Kashi. Kashi, one of the principal cities in Southern Xinjiang, has both airport and train station. From Kashi to Karasu the road distance is 190km



# Observations

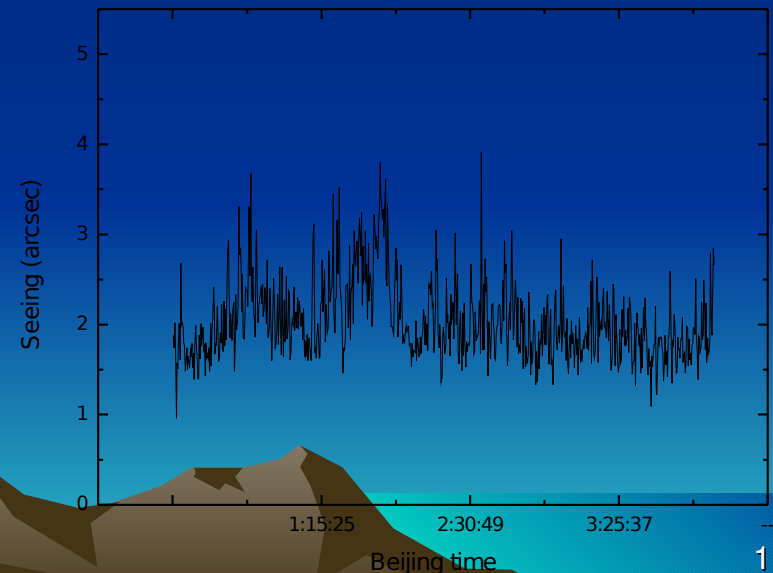
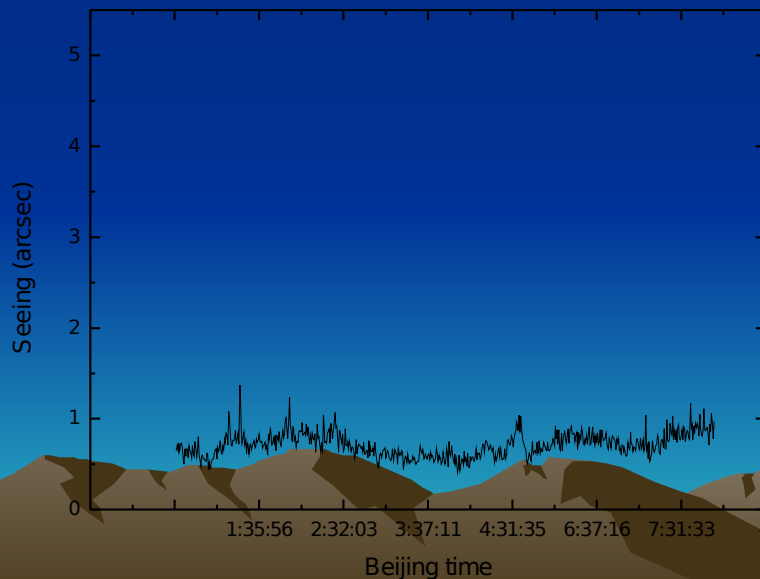
Telescope Diameter : 25 cm  
Exposure Time : 10ms  
Height from ground : 4 meter  
Date : June to November , 2006



# Results ( 1 )

The good seeing is 0.7 arcsec(median)

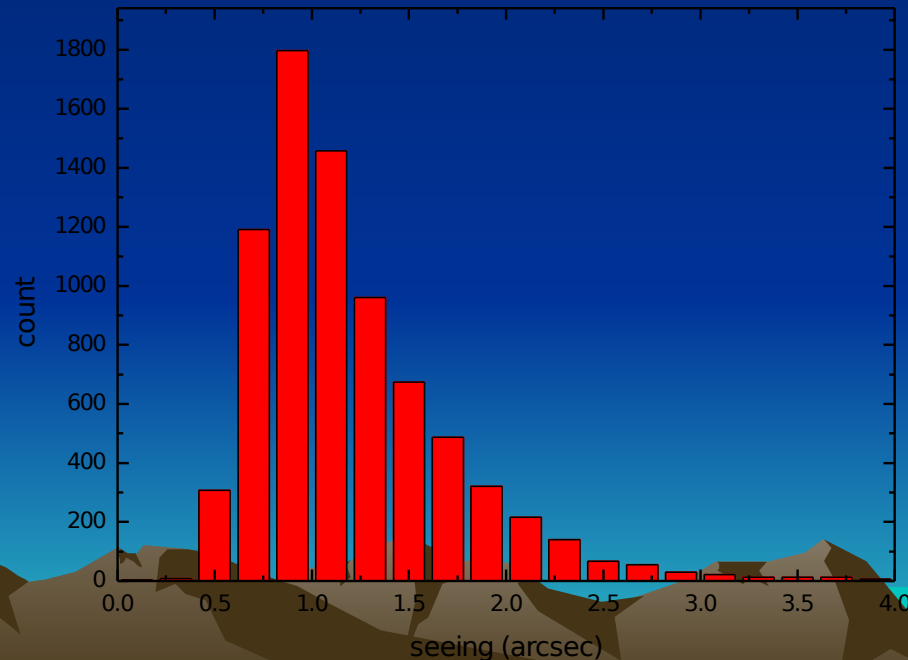
The bad seeing is 1.94 arcsec(median)



# Results(2 )

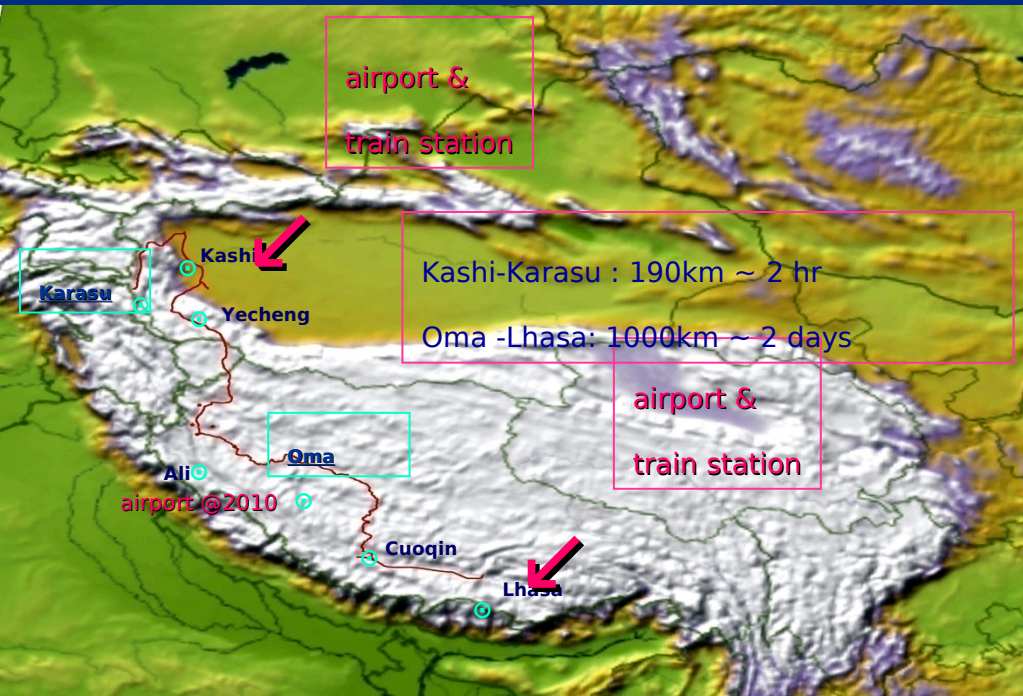
Totally 8292 data sets during 24 nights were obtained at Karasu, The results of seeing statistics show that **the median seeing is 0.96 arcsec at Karasu**, of which 19% is less than 0.8 arcsec, mainly distributed in the

0.5-2.0 arcsec;



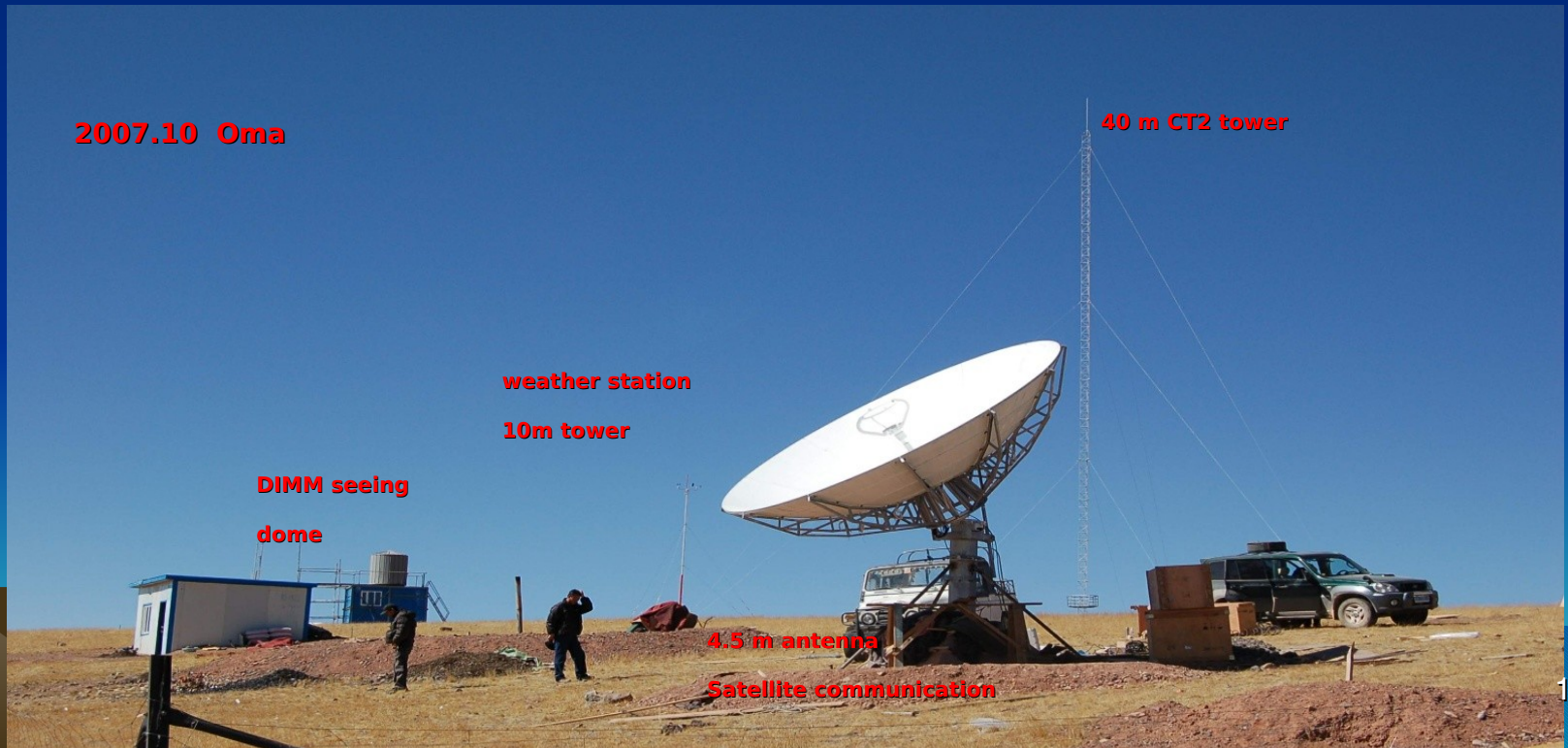
### 3 、 DIMM seeing measurements at Oma site

The other one is known as **Oma**, Ali plateau, Tibet, N32° 32' and E83° 03', with **altitude of 5000m**. To reach Oma site, Ali plateau, one can at first fly to either Lhasa. The road distance from Lhasa to Oma is 1000km, usually 2 days necessary by car.



# Observations

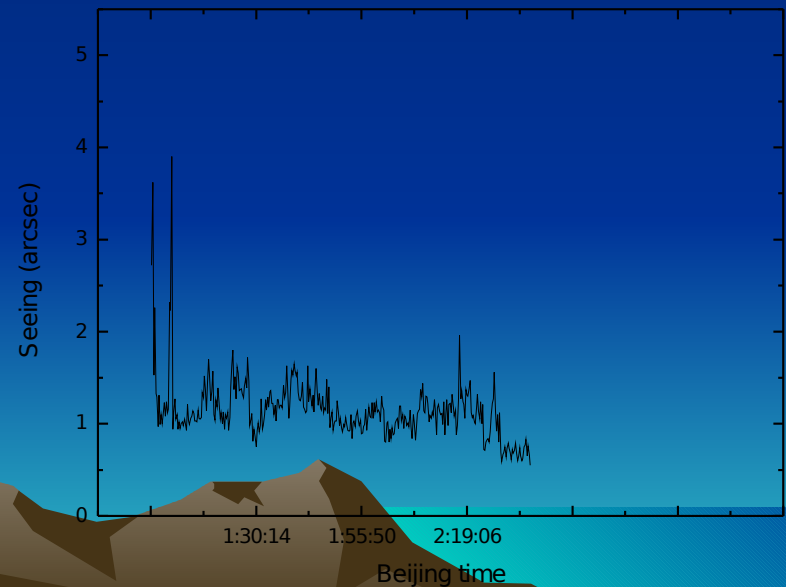
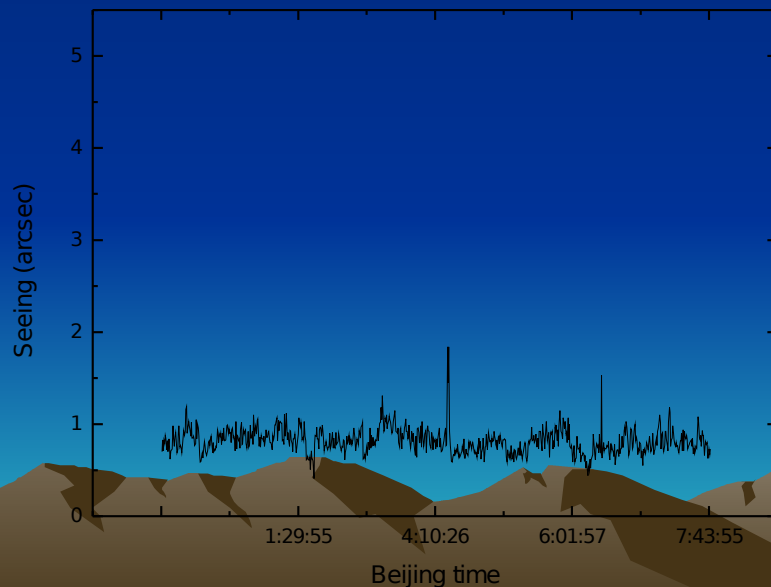
Telescope Diameter : 25 cm  
Exposure Time : 10ms  
Height from ground : 4 meter  
Date : May to September , 2006



# Results(1)

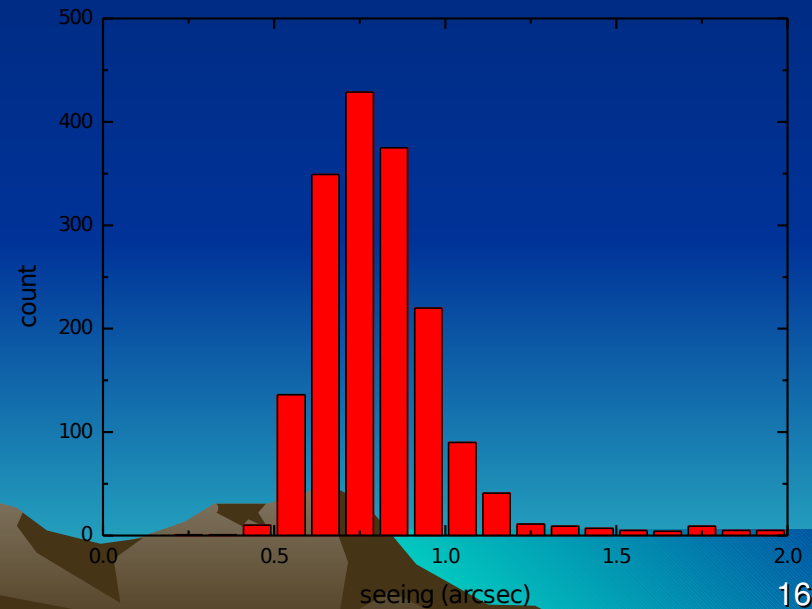
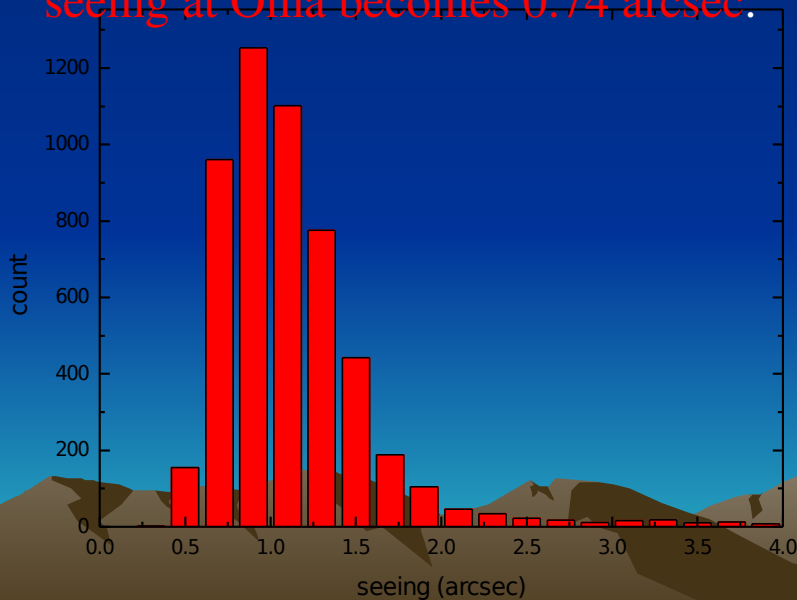
The good seeing is 0.81 arcsec(median)

The bad seeing is 1.2 arcsec(median)



# Results(2)

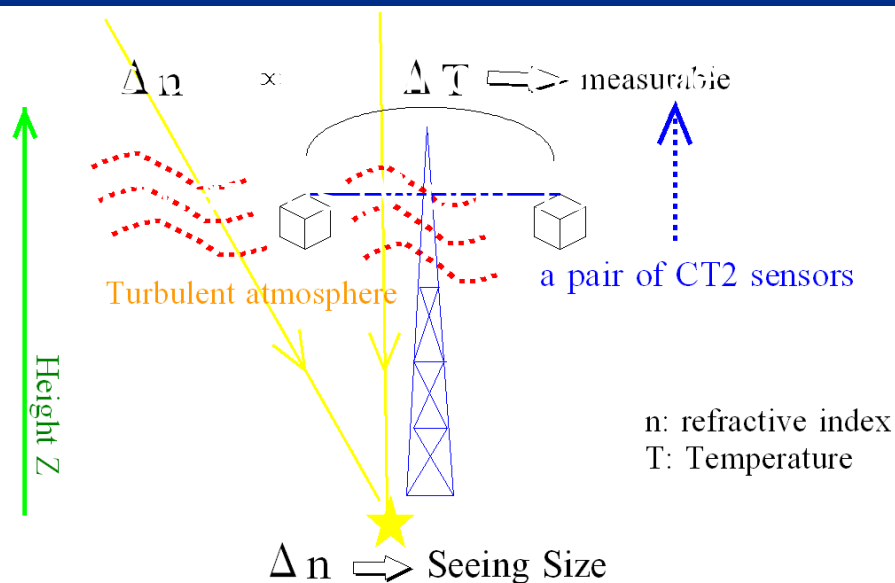
Totally 5540 data sets during 12 nights were obtained at at Oma, the **median seeing is 0.92 arcsec** at Oma, of which 22% is less than 0.8 arcsec. After rejecting the data sets in June-July under the bad weather conditions, the **median seeing at Oma becomes 0.74 arcsec.**



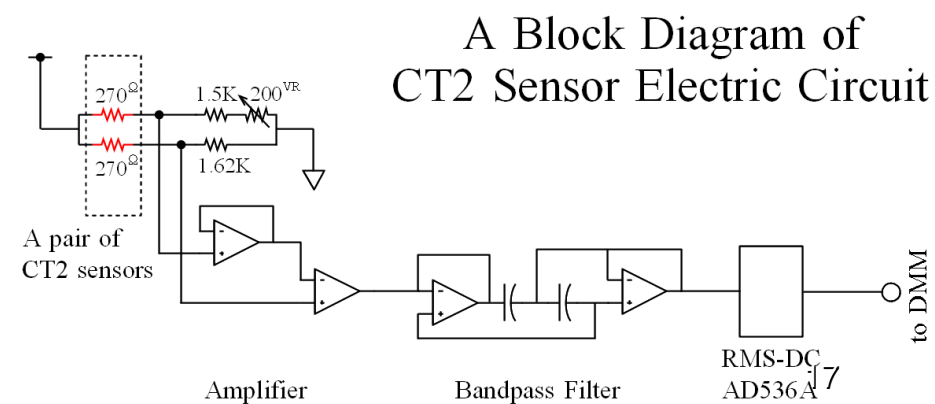


## 4 、 Microthermal Measurements at Karasu

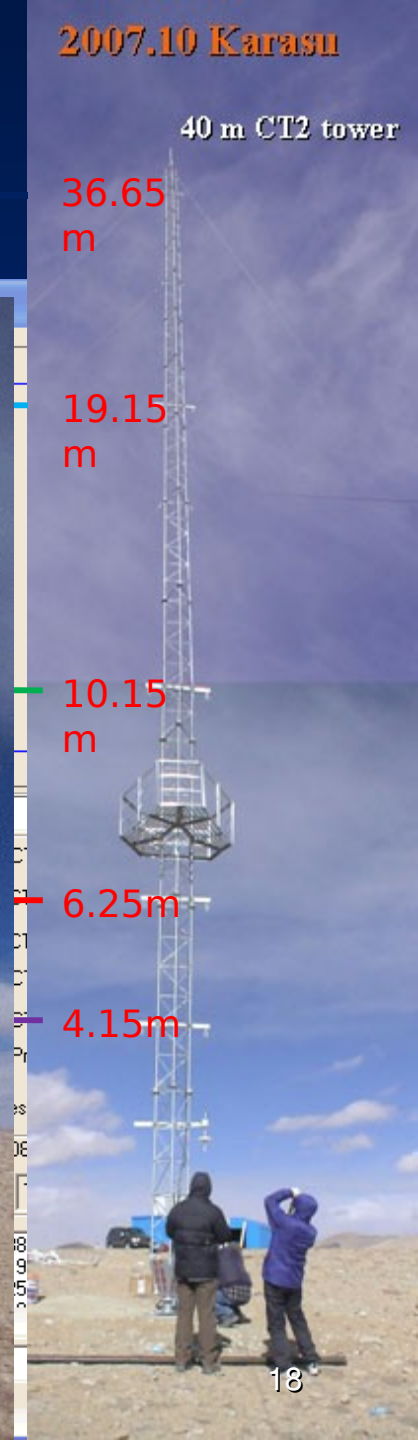
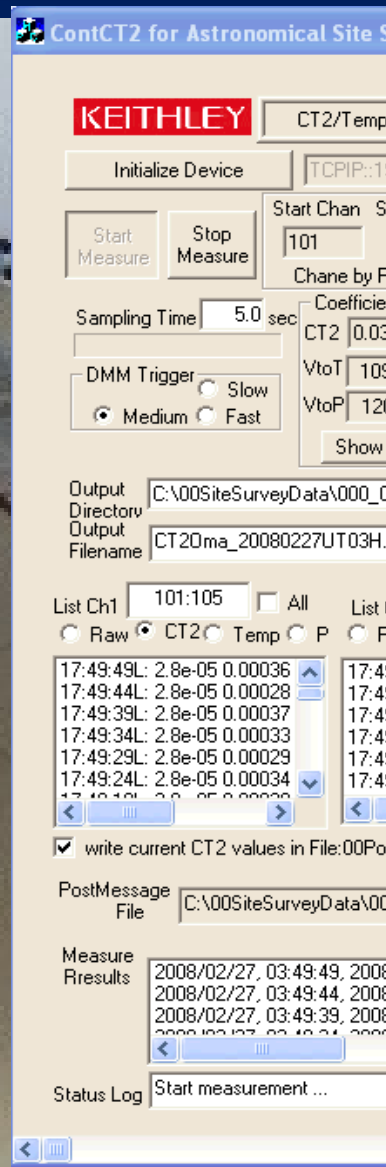
The refractive index fluctuation is related to its thermal fluctuations.  
 The refractive index variations arise from density variations in the air.  
 Assumed that fluctuations are passive under the constant pressure,  
 the refractive index variations arise directly from temperature



$$C_n^2(z) = (7.9 \cdot 10^{-5} \cdot P / T^2)^2 C_T^2(z)$$



# Instruments



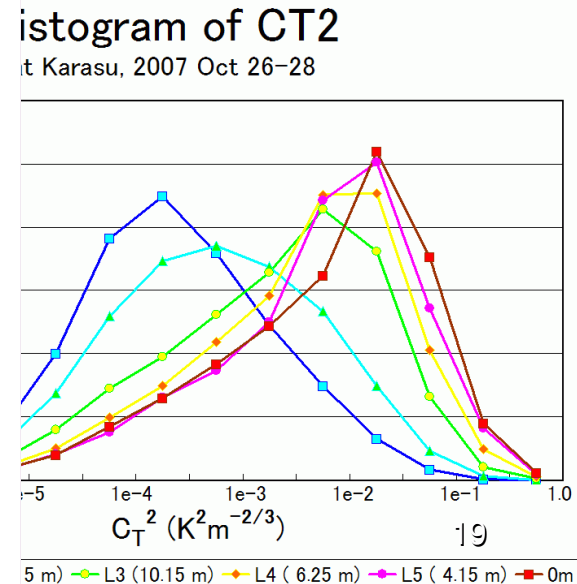
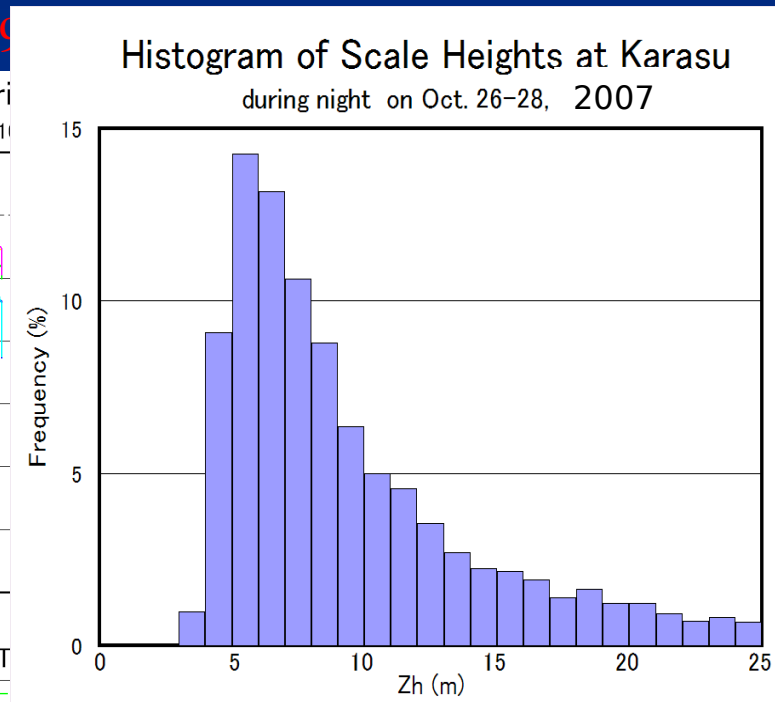
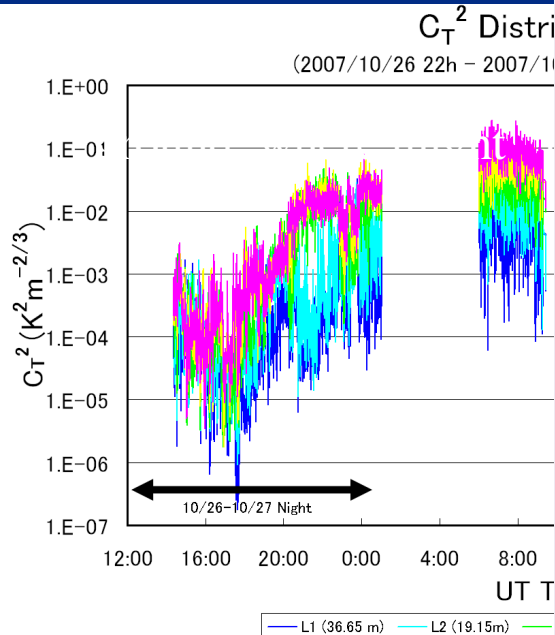
# Results

Microthermal measurements were conducted during Oct 26 and 28, 2007

CT2 values are shown in Fig. 1. Their histogram is shown in Fig. 2,

The Scale heights is 19

er below 19 m above the



Thanks For Your Attention !