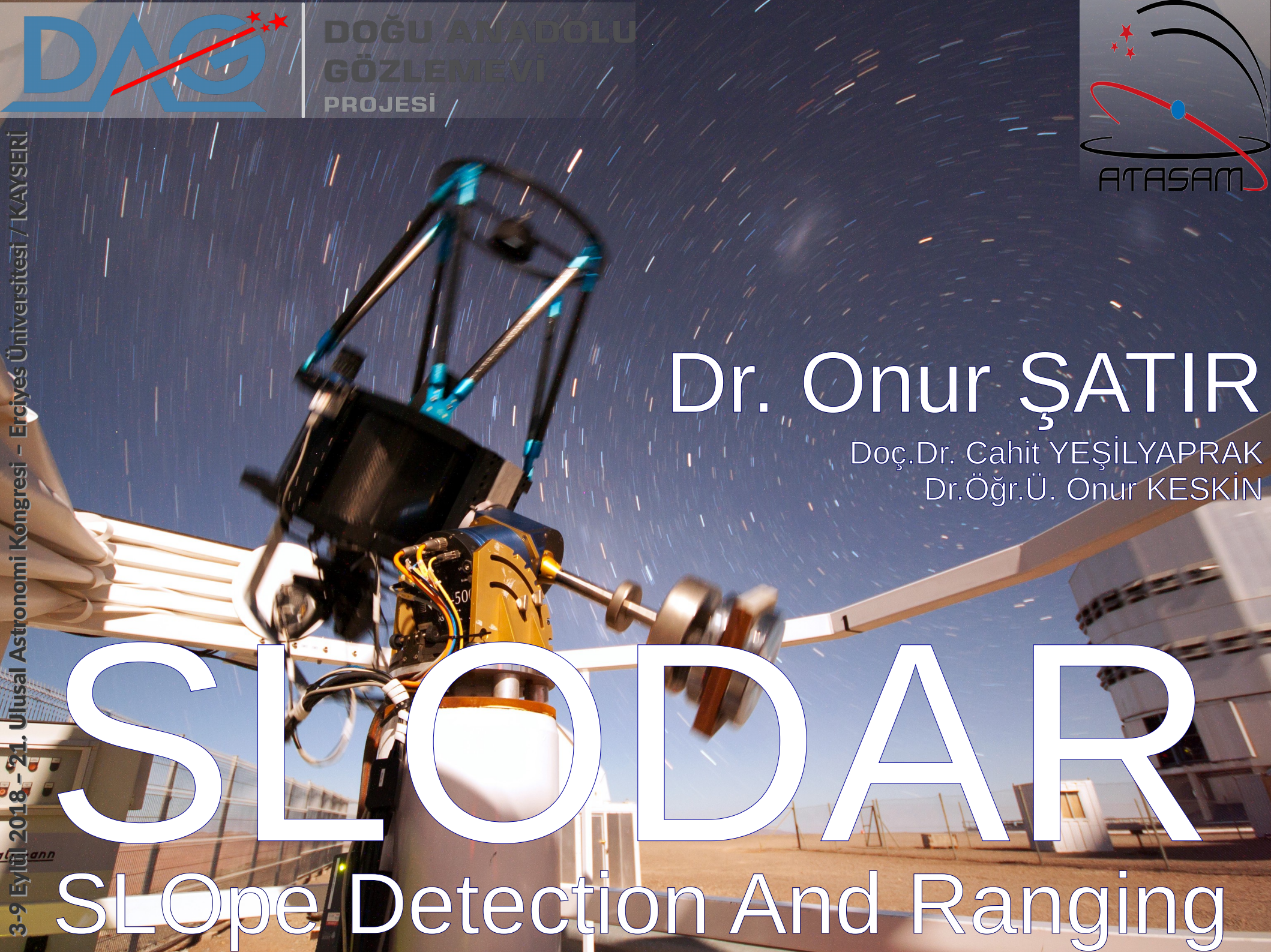
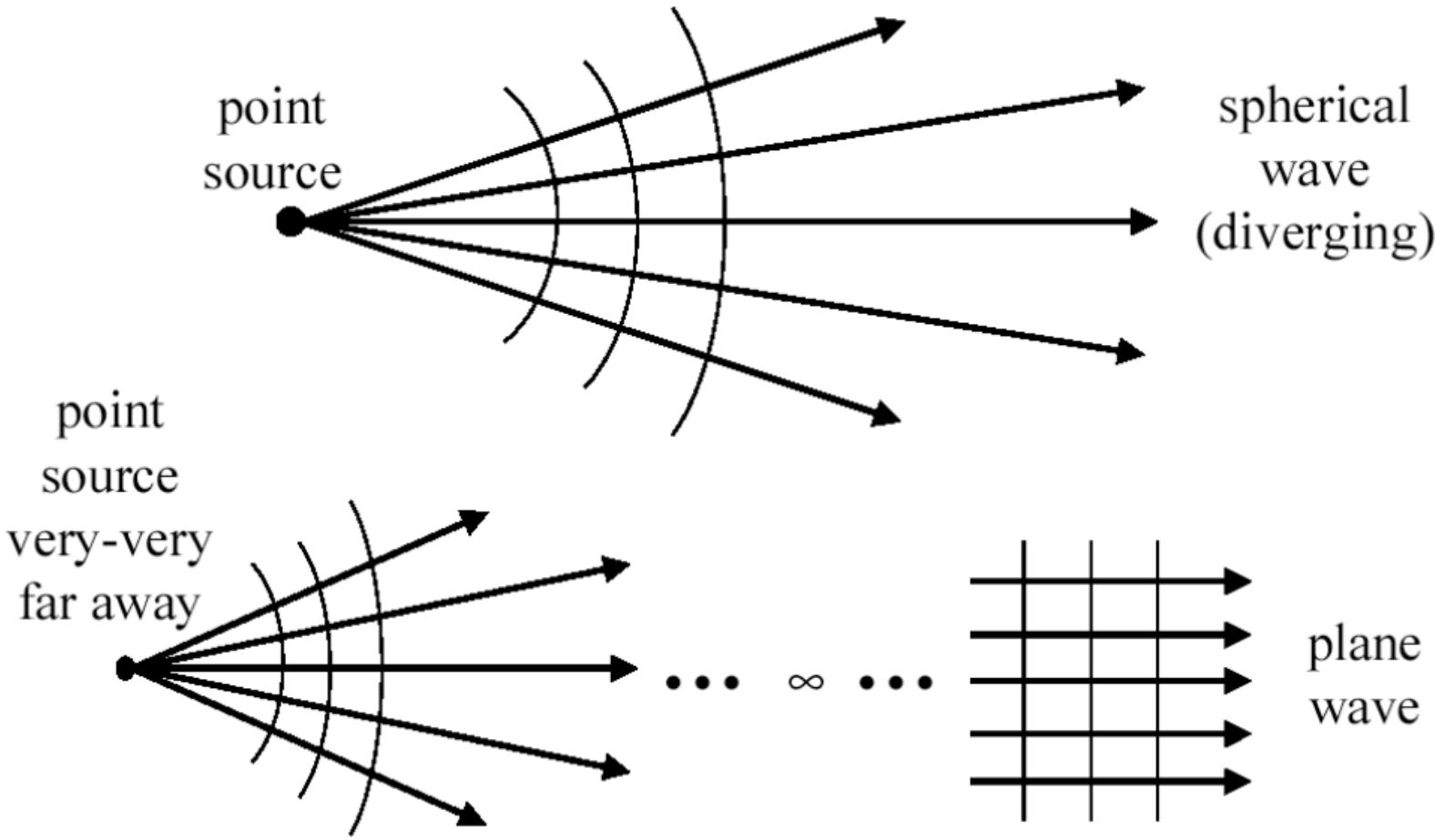
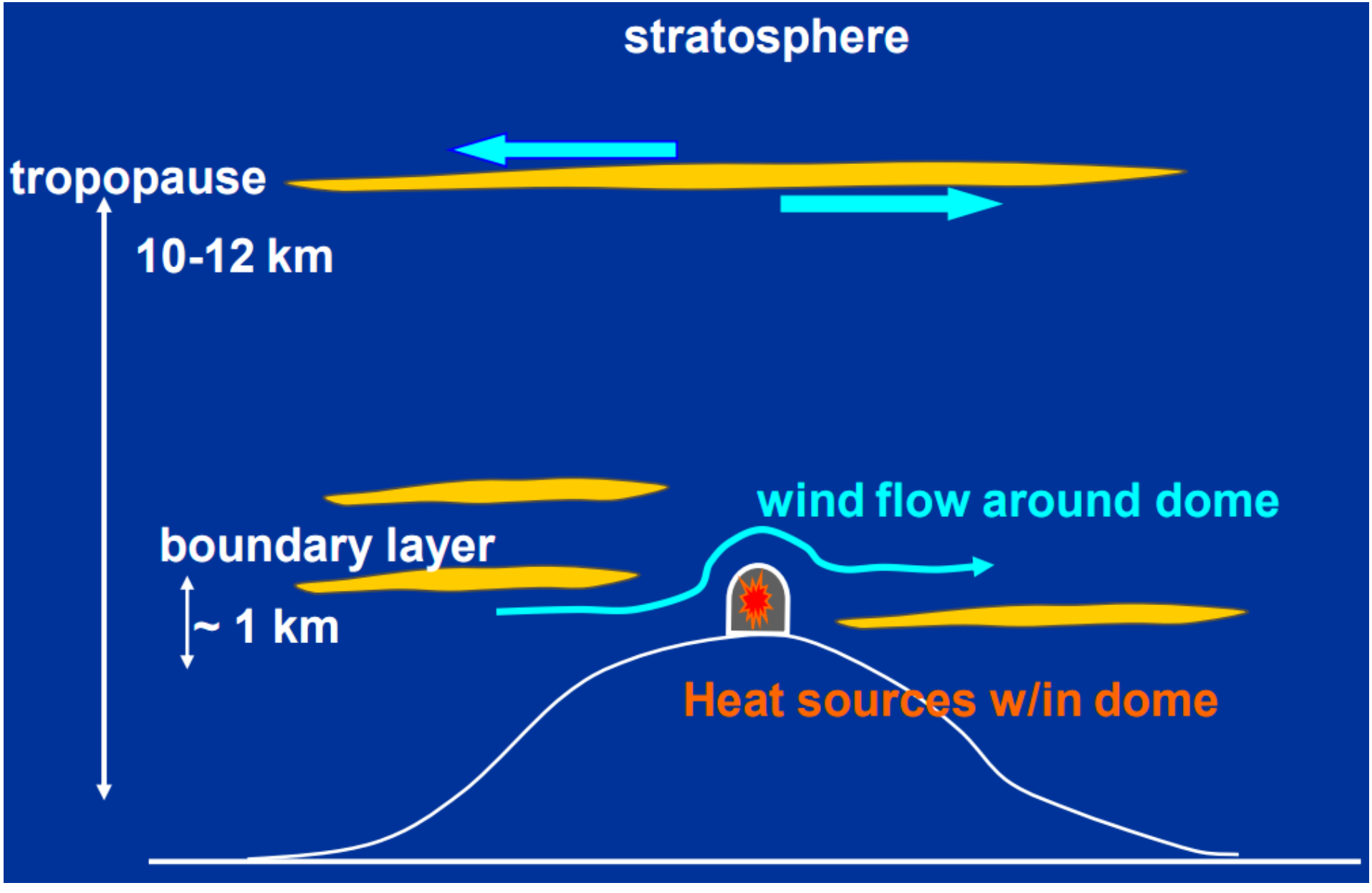

DOĞU ANADOLU
GÖZLEMEVİ
PROJESİ
ATASAM
Dr. Onur ŞATIR
Doç.Dr. Cahit YEŞİLYAPRAK
Dr.Öğr.Ü. Onur KESKİN
SLODAR
SLOpe Detection And Ranging
3-9 Eylül 2018 – 21. Ulusal Astronomi Kongresi – Erciyes Üniversitesi / KAYSERİ

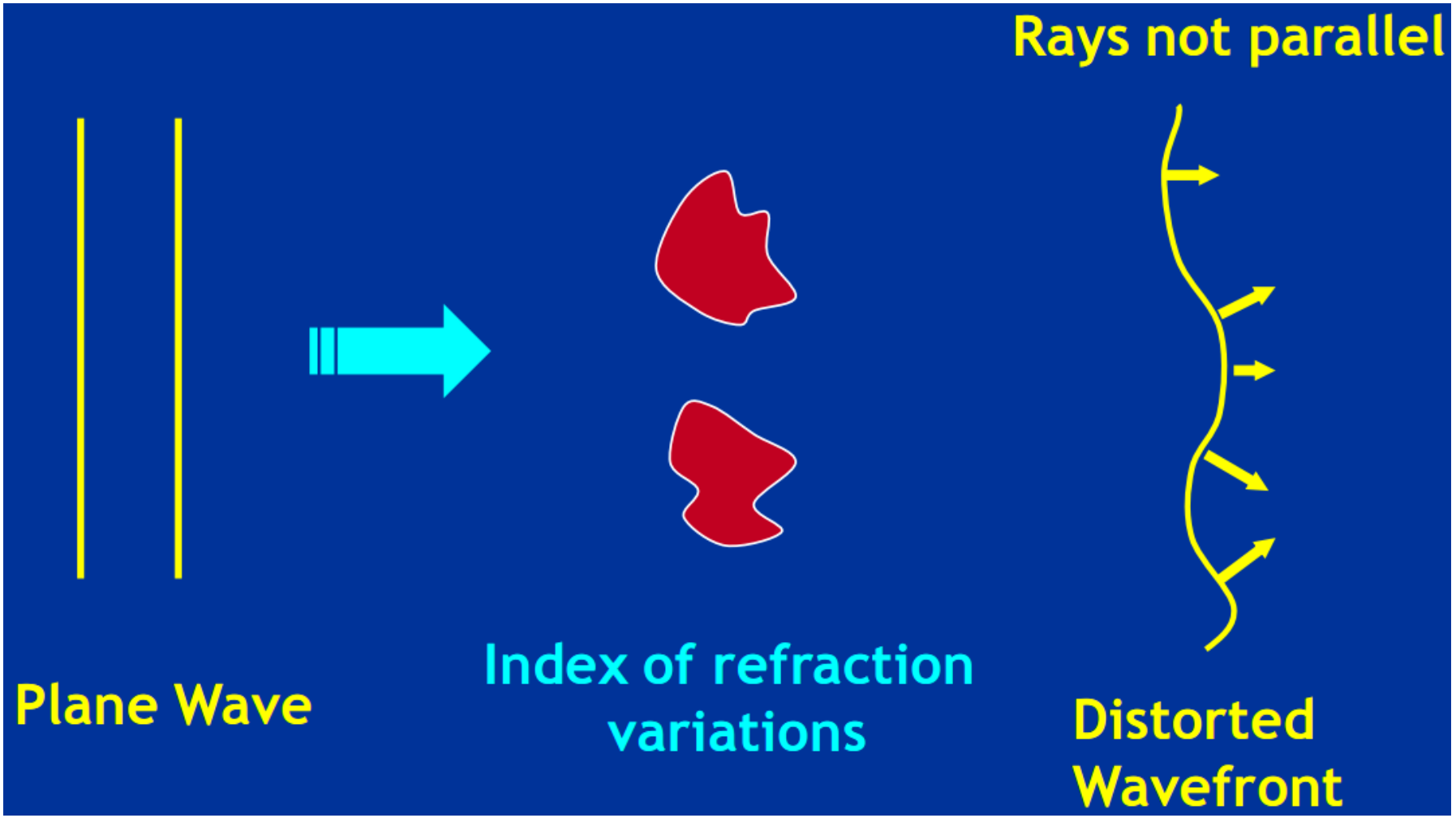
Turbulence


point
source
spherical
wave
(diverging)
point
source
very-very
far away
∞
plane
wave

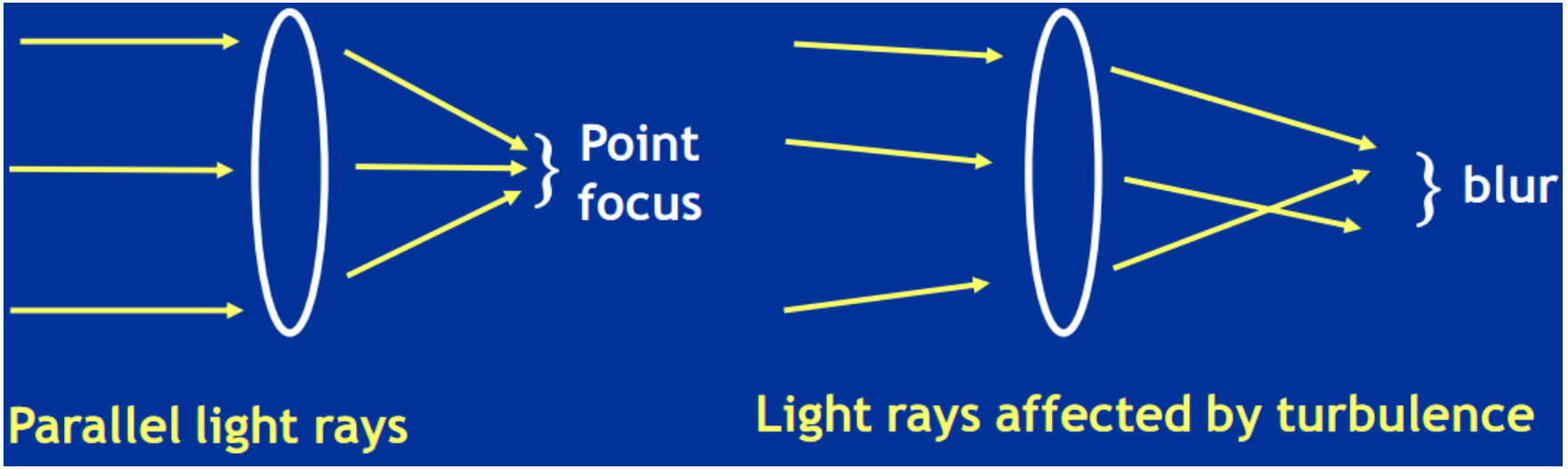
Turbulence


stratosphere
tropopause
10-12 km
boundary layer
~ 1 km
wind flow around dome
Heat sources w/in dome

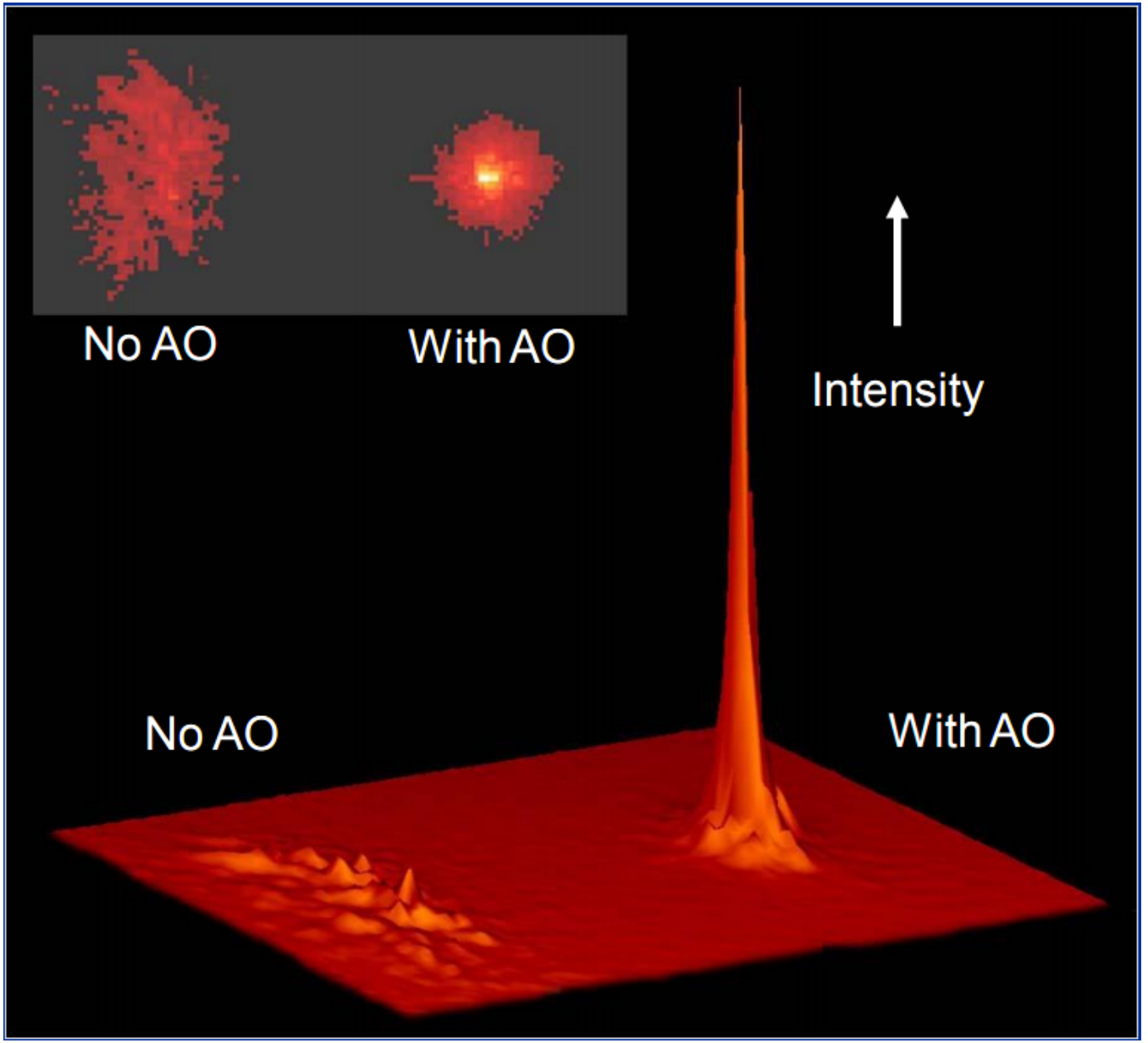
Turbulence


Rays not parallel
Plane Wave
Index of refraction variations
Distorted Wavefront

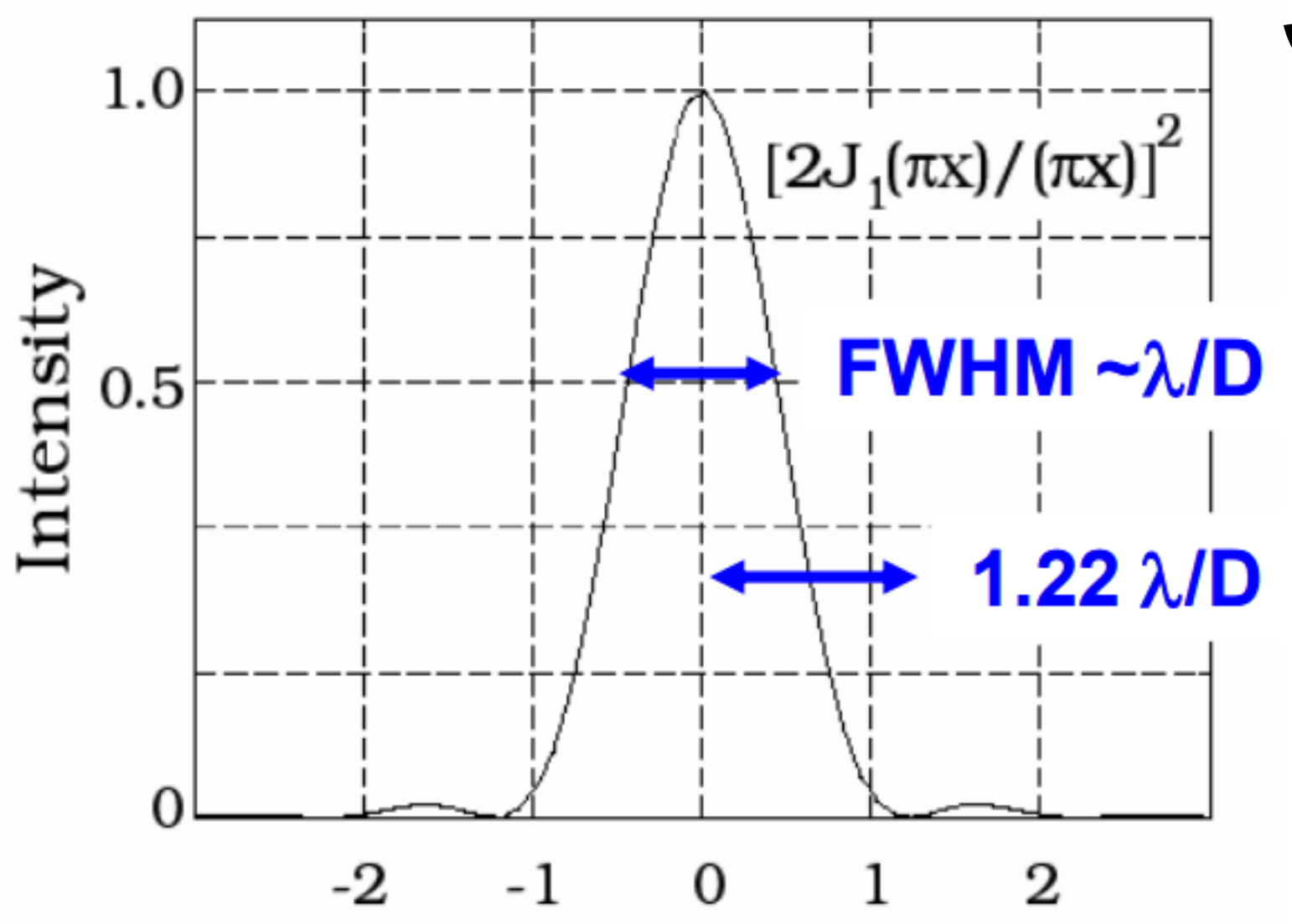
Turbulence


Point
focus
blur
Parallel light rays
Light rays affected by turbulence

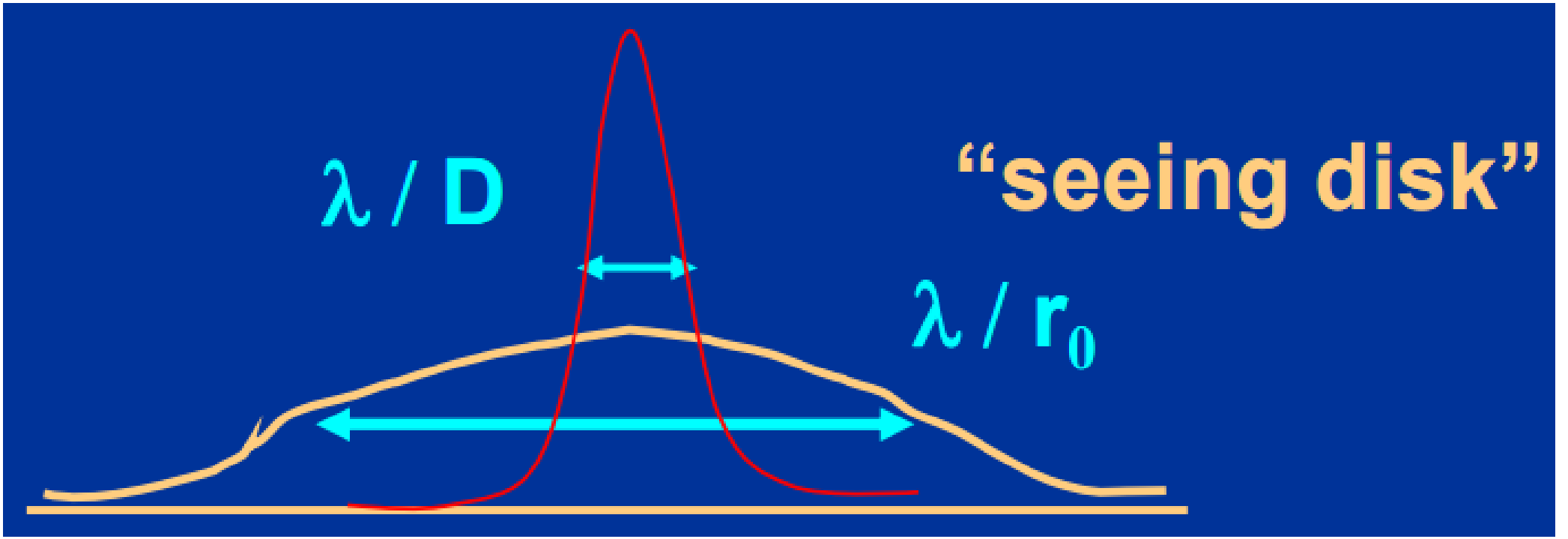
~~Turbulence~~



Seeing



Seeing

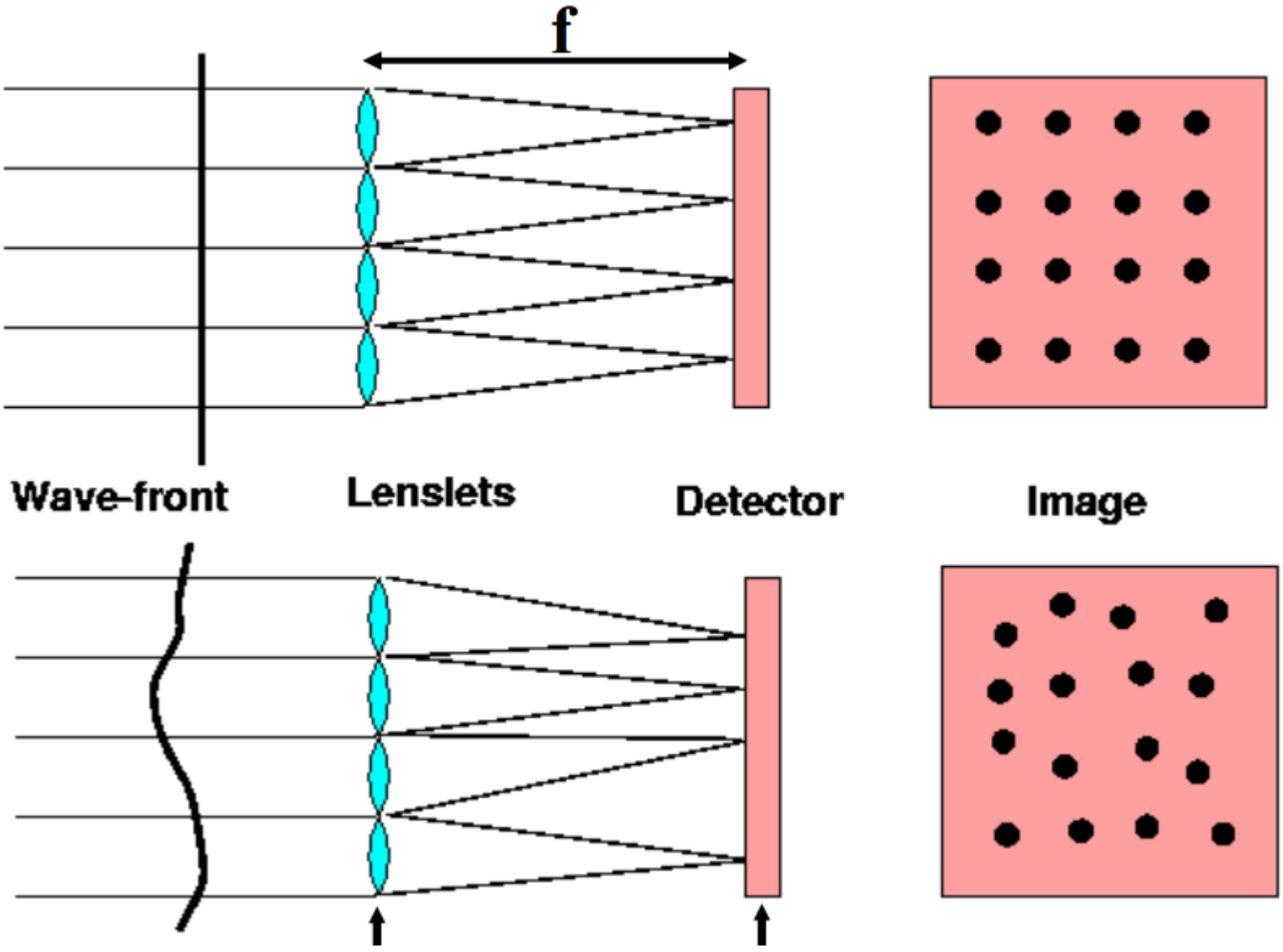


SLODAR (Slope Detection And Ranging)

- Observe double stars
- Shack-Hartmann wavefront sensor(s)
- Recover $C_n^2(h)$ from the WFS data
- Estimate the altitude, strength and velocity of each turbulent layer

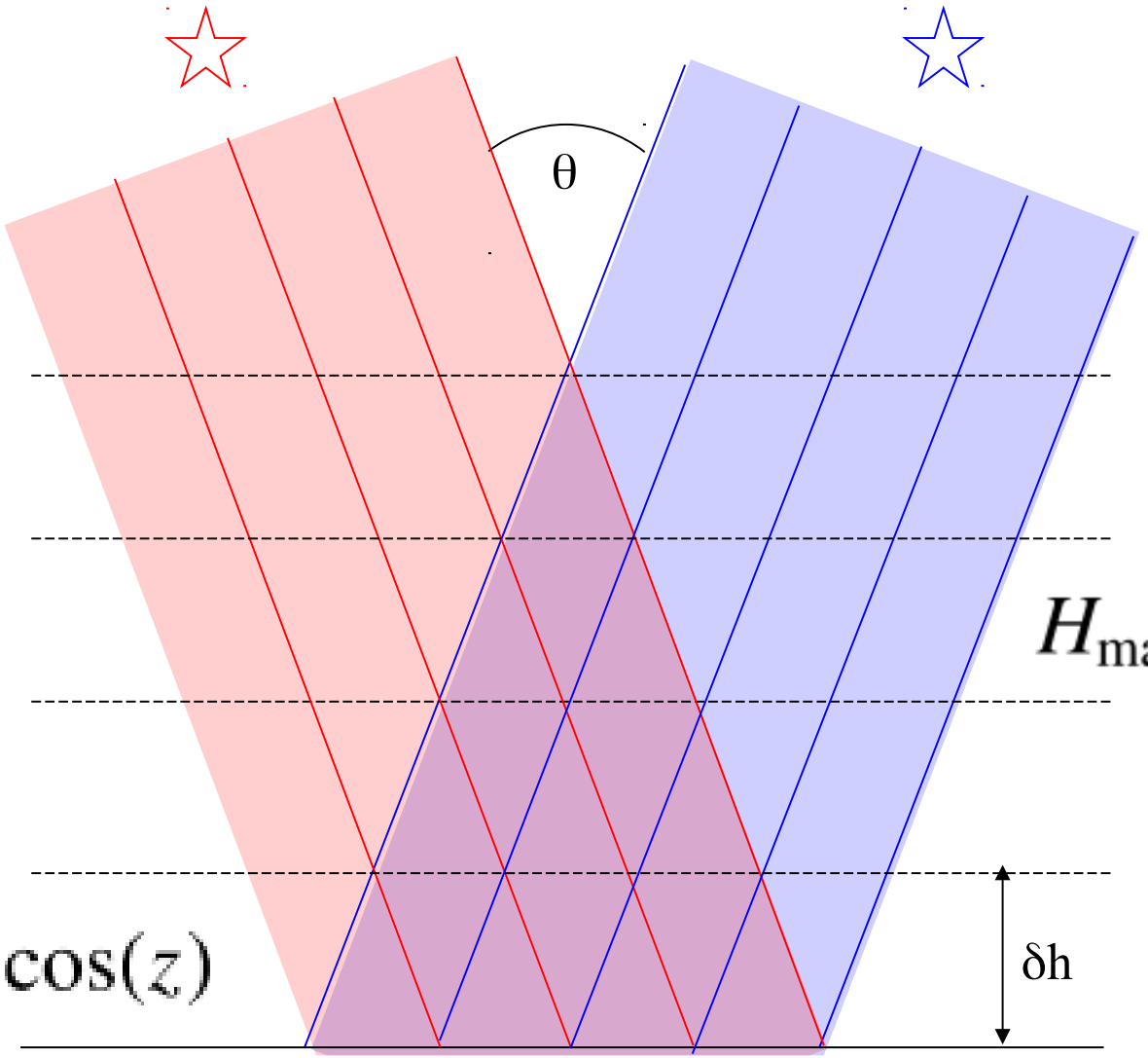
SLODAR

SLOpe Detection And Ranging



SLODAR

SLOpe Detection And Ranging



$\delta h \propto d/\theta$

$$H_{\max} = n_{\text{sub}} \delta H$$

$$\delta h = \frac{D}{n\theta} \times \cos(z)$$

SLODAR

Telescope diameter (m)	Subaperture size (cm)	Wide mode separation range (arcmin)	Narrow mode separation range (arcsec)	Limiting V-magnitude
0.5	6.0	2.0 – 12.0	8.8 – 17.6	6.5
0.6	7.2	1.7 – 10.0	7.3 – 14.7	7.2
0.7	8.4	1.4 – 8.6	6.3 – 12.6	7.8
0.8	9.6	1.3 – 7.5	5.5 – 11.0	8.4
0.9	10.8	1.1 – 6.7	4.9 – 9.8	8.8
1.0	12.0	1.0 – 6.0	4.4 – 8.8	9.3

- Larger wavefront sensor (WFS) subapertures. The 8x8 WFS geometry remains the same so the subaperture width scales linearly with OTA diameter. Larger light collecting area means fainter targets can be used.
- The target double star separations that can be observed are narrower with a larger OTA.
- Both of the previous points contribute to coarser vertical resolution and therefore a higher maximum altitude for turbulence profiling.

SLODAR

CFAI developed the SLODAR (SLOpe Detection And Ranging) technique for characterization of the vertical profile of atmospheric optical turbulence.

SLODAR is a crossed beams method based on observations of double stars using a Shack-Hartmann wavefront sensor. The optical turbulence profile (OTP) is recovered from the cross-correlation of the wavefront slope measurements for the two stars.

SLODAR systems, based on small telescopes (typically 50cm aperture) , have been employed for characterization of the optical turbulence at the Paranal, ORM (La Palma), Mauna Kea and SAAO observatories. These studies have mainly concentrated on characterization of the 'ground layer' of turbulence in the first kilometer above the site, relevant to the development and application of ground-layer and multi-conjugate adaptive optics systems.

Publications describing the details of the SLODAR technique and its applications can be found here.

SLODAR Installations

- ESO Paranal Observatory
- La Palma
- Bhoyun Observatory, South Korea
- Previous Durham SLODAR Installations
- SLODAR installations and development by other groups

ESO Paranal Observatory

Durham CfAI has developed the SLODAR technique in partnership with the European South Observatory (ESO) over the last decade. The automated SLODAR turbulence profiler at the ESO Paranal observatory in Chile is currently being upgraded to support the operation of the new Adaptive Optics Facility (AOF) at the VLT. The profiler is optimised to measure the optical turbulence in the first few hundred meters above the site.

Kurulacak olan DAG-SLODAR'ın neredeyse ikizi

La Palma

The automated SLODAR system at La Palma supports operation of the Canary adaptive optical system at the William Herschel telescope.

The system is based upon a robotic 0.5m telescope which can also operate in photometric mode, for applications such as transient astronomy.

Bizimki DAHA BÜYÜK olacak! 😜

Şaka bir yana, 60cm ana ayna hariç tüm özellikleri neredeyse aynı olacak.

Specs of the SLODAR OTA @ La Palma

optics:

optical design	ritchey-chretien
primary mirror	hyperbolic, 500mm diameter
secondary mirror	hyperbolic,180mm diameter (incl baffle)
glass/coating	low-expansion borosilicate glass with enhanced aluminium coating (>96% reflectivity) and SiO2 protective overcoating
system focal length	5000mm
focal ratio	f/10
platescale	41.25 arcsec/mm
optical quality	1/5 lambda ptv, 1/30 lambda rms (whole system)

SLODAR @ La Palma

SLODAR @ La Palma