

Practical Adaptive Optics

General Emphasis:

1. Present and future of Adaptive Optics
2. Elements of AO
3. AO observations and data.

Why Practical “AO”?

1. General scaling rules for systems and data.
2. Extract useful knowledge with wider application:
 - a. Optics and Imaging
 - b. Statistical Processes
3. Useful approaches to AO observations

Course Outline

1. Introduction (1)
 - a. Basic AO ideas
 - b. Imaging systems.
2. Geometric optics (2)
 - a. Pupil and focal planes
 - b. Aberrations
3. Physical optics. (3-4)
 - a. Scalar Diffraction
 - b. Fourier Optics (N)
4. Image Quality (5)
 - a. Measures of image quality
 - b. Integrating geometric and physical optics (N)
5. The Atmosphere (6-7)
 - a. Effects of Turbulence
 - b. Turbulence profiling.
 - c. Describing turbulent phase errors
 - d. Statistical concepts.
 - i. Power spectrum
 - ii. Structure function
 - iii. Scintillation
6. Elements of Adaptive Correction:
 - a. Strategies (8)
 - i. Shack-Hartmann Systems
 - ii. Curvature Systems
 - b. Wave Front Sensing (9-10)
 - i. Slope Measuring Wave Front Sensors
 - ii. Curvature Wave Front Sensors
 - c. Wave Front Correction (11-12)

- i. Traditional deformable mirrors
 - ii. Curvature deformable mirrors
 - iii. MEMS deformable mirrors
 - d. Control Theory (13)
 - e. Residual wave front errors. (14)
 - i. Measurement Noise
 - ii. Fitting errors
 - iii. Non-Common path errors
 - iv. Bandwidth induced errors
 - v. Chromatic errors
- 7. The Future of AO (15)
 - a. Science Drivers
 - b. Multi-Conjugate AO
 - c. Multi-Object AO
 - d. Ground Layer AO

Numbers in parentheses refer to class number and N refers to supplemental notes.