DEMONSTRATING THE SUB-NM SENSITIVITY OF PYRAMID WFS FOR SPACE AO

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Context

Next generation space telescopes

Typical REQUIREMENTS:

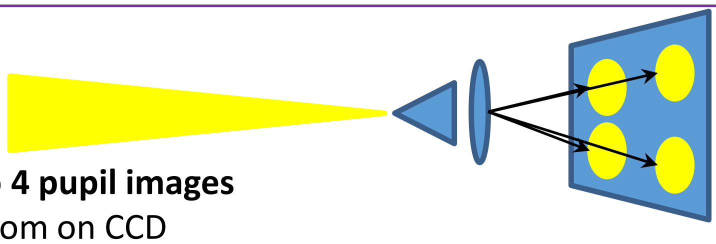
- > 8 m diameter
- Diff.- limited in V
- Coronagraphic contrast: 10^{-10}
- WF stability: < 1 nm

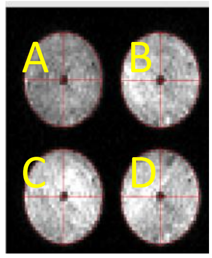
→ Active control of optical surfaces:

PSF sensing: a mainstream approach. But:
-Mode signatures entanlged (at focal plane)
-overwhelming bias signal

Pupil plane, Pyramid WFSensor: Demonstrated to be more sensitive than SH at low spatial scale

Pyr - WFS





Glass pyramid at telescope focus
Light from the guide star split into **4 pupil images**
Camera lens to adjust position/zoom on CCD

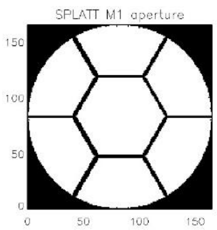
- Intrinsically sensitive to phase steps (diff. piston)
- Highest sensitivity at low orders (for coronagraphy)

Pyr-WFS for space Active Optics?

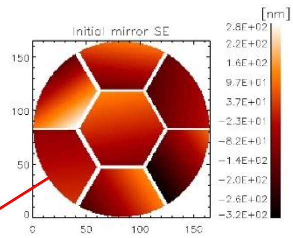
→ Sensitivity in quasi diffr. limited regime?
→ WF stability after loop convergence?

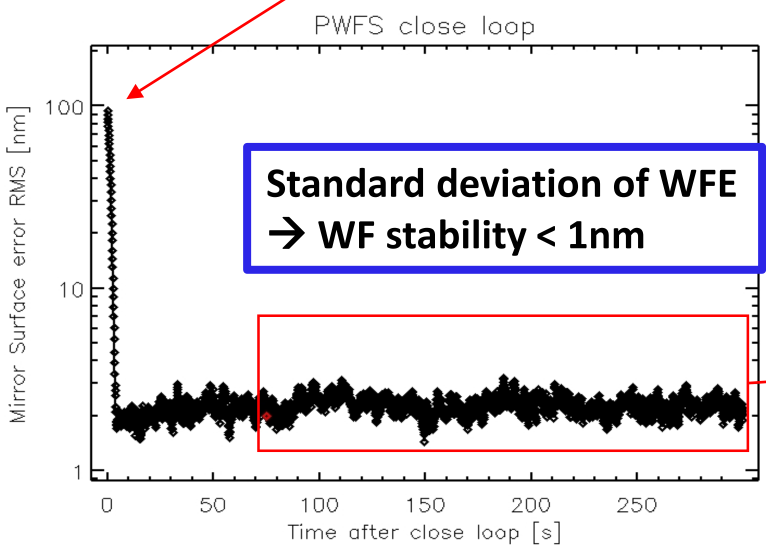
The SPLATT simulations

SPLATT pupil



SPLATT offset





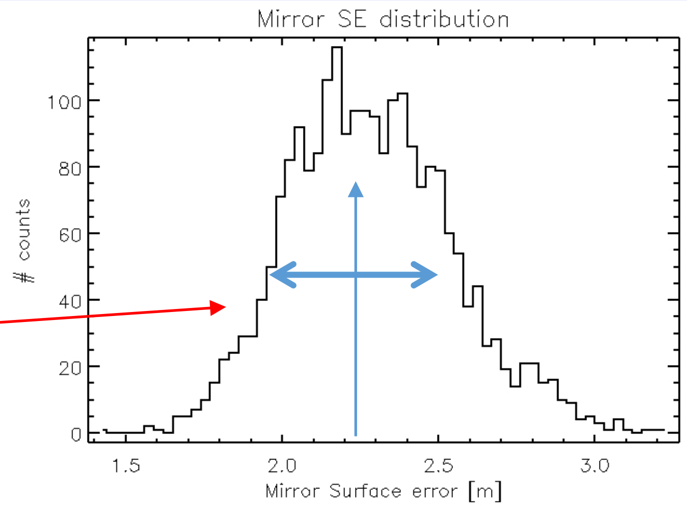
Numerical code integrating:

- Segmented-deformable primary mirror
- Pyr-WFS
- Control loop

Specific test case:

- M1 diameter: 2.04 m
- # segments: 7
- #act./segm: 19

Act. Influence functions; PyrWFS calibration; control law; quality indicators.



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