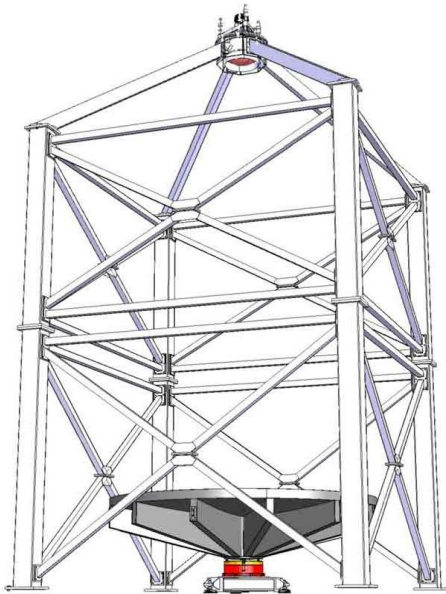




The 4m International Liquid Mirror Telescope project



CASCA, 2012, Calgary

François Finet
Phd student, University of Liège

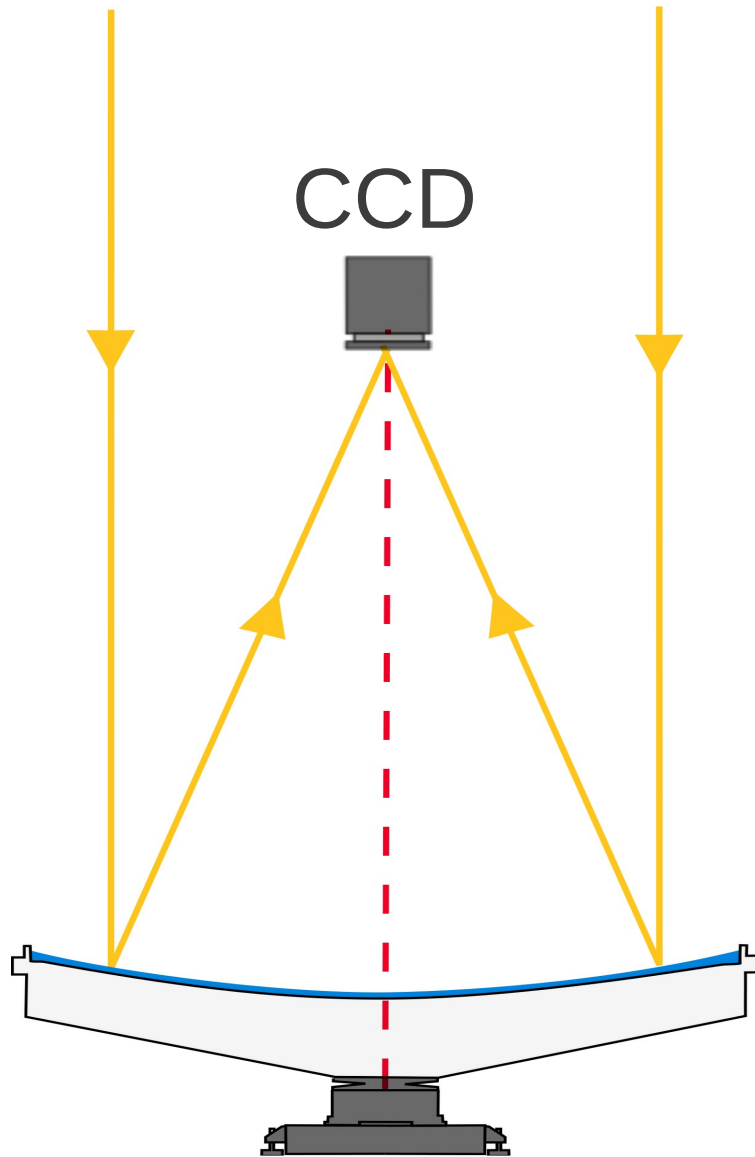


Groups and Financial supports

- PI : Pr. J. Surdej (Ulg)

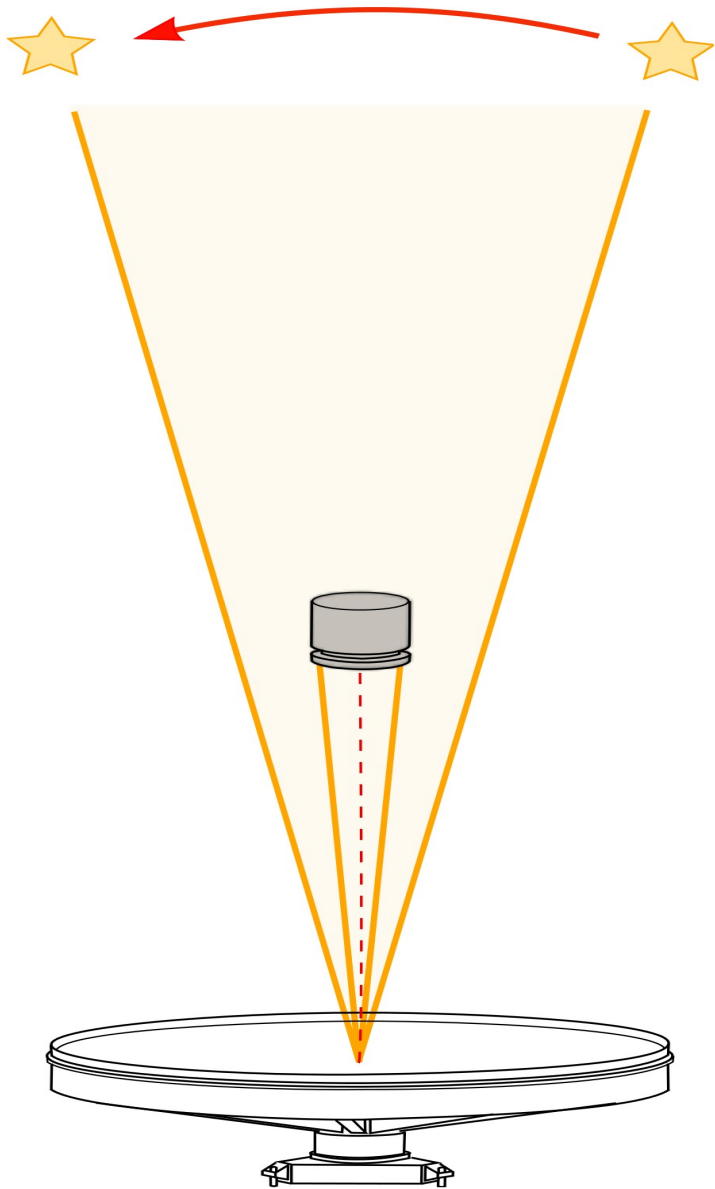


Liquid Mirrors basics

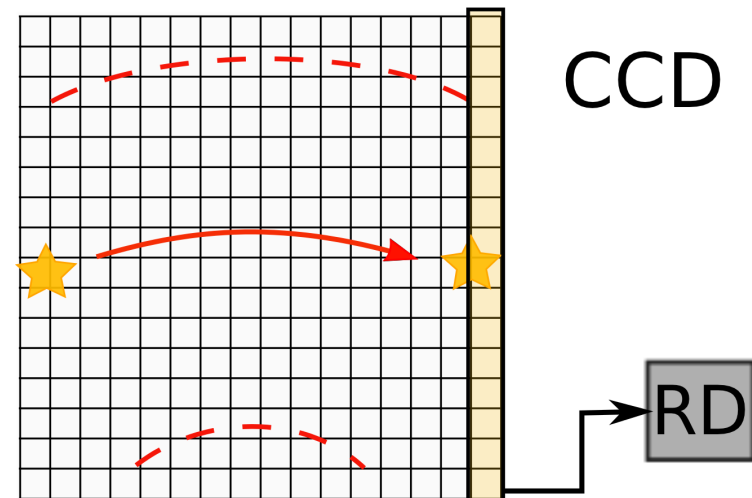


- Liquid Mirror Telescope :
 - Liquid Mirror: rotation+gravity
 - Parabolic shaped mirror
 - CCD Camera at focal point
- LMT characteristics
 - Zenith pointing
 - Accessible sky → earth rotation
 - strip of constant declination,
 - width = with of telescope FOV
 - ~ same strip every night

Imaging with a LMT



- **Zenithal pointing :**
 - Objects in FOV are in constant motion
- **Star tracking :** done electronically
 - Time Delayed Integration (TDI)
 - Integration time fixed by FOV
 - TDI distortion : trajectory curvature, variable velocity



Advantages and Drawbacks of LMT's

- **Advantages**

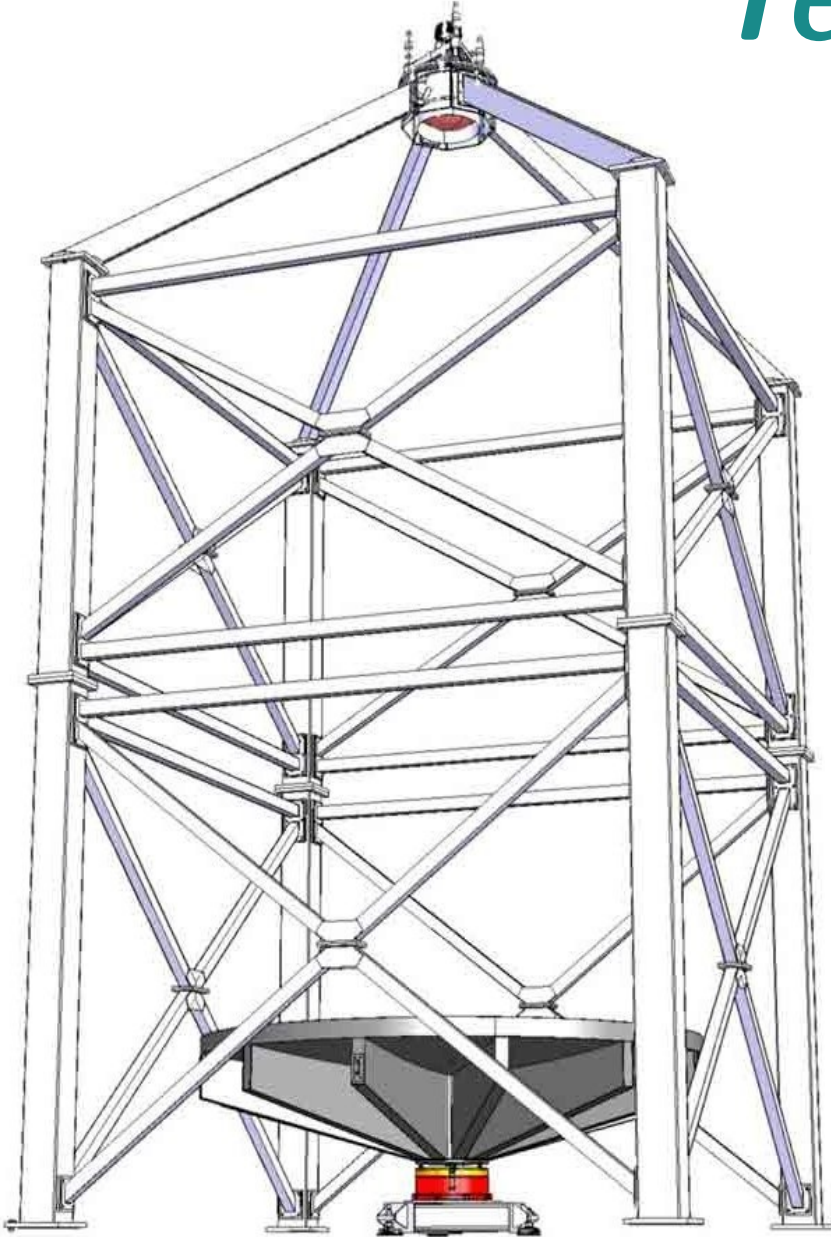
- Cheap technology (1/20 th of classical technology)
- Dedicated to specific astrophysical project
- Seeing and transparency optimal at the Zenith
- Image Co-addition/ Subtraction

- **Drawbacks (?)**

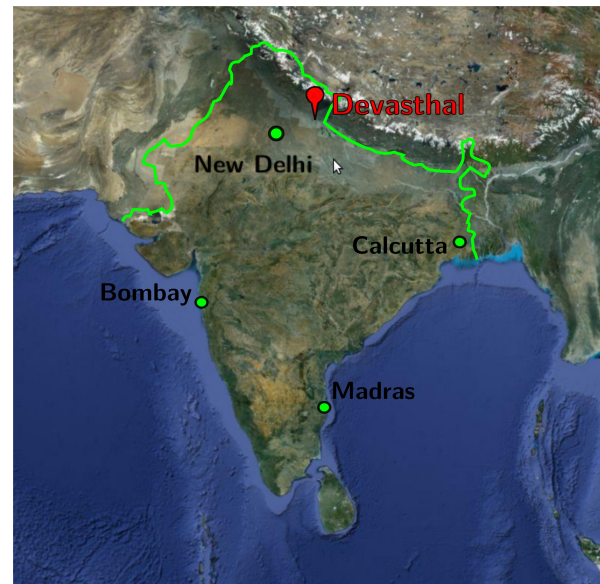
- Zenith pointing only
- Short integration time

The International Liquid Mirror Telescope

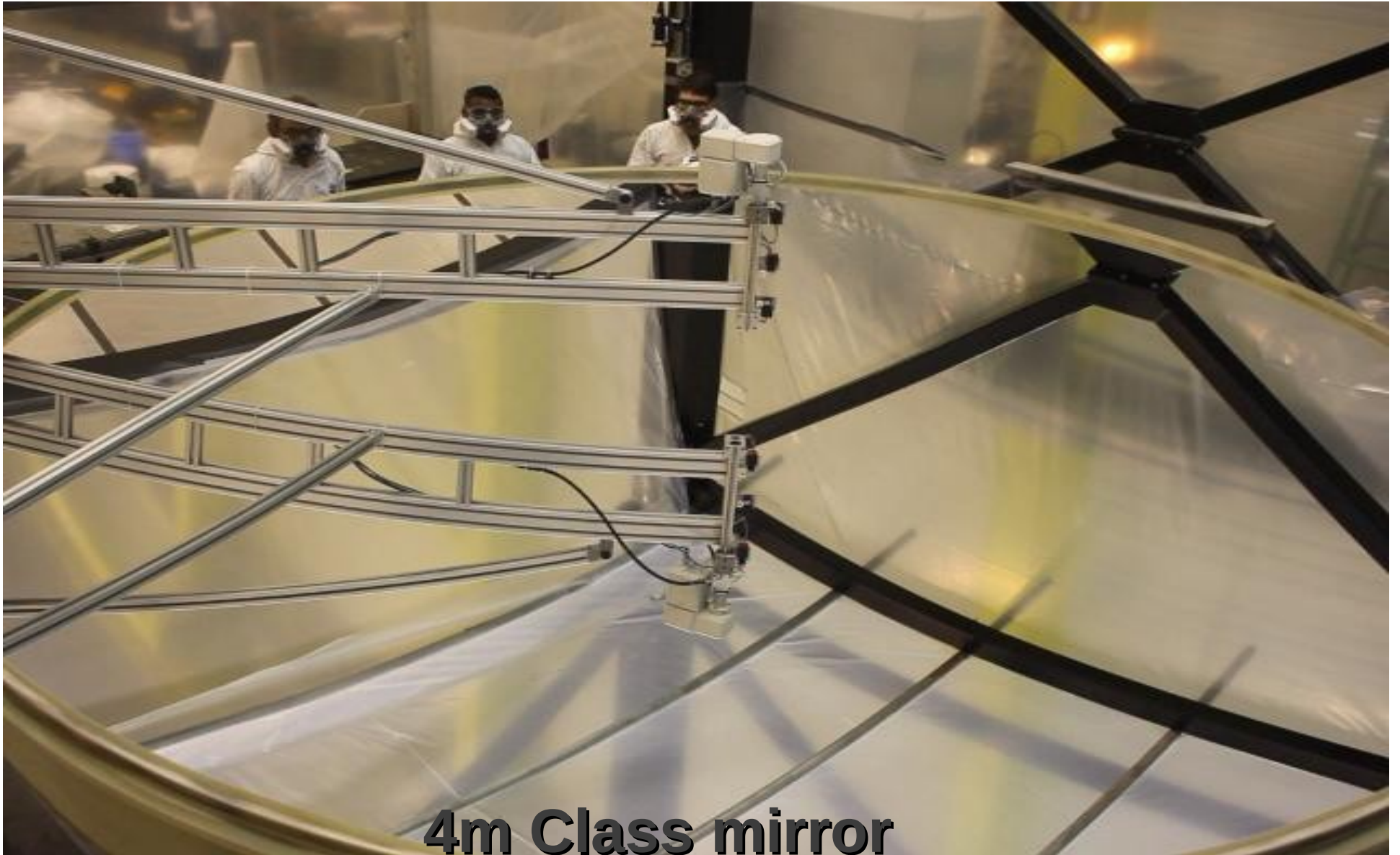
Telescope



- **First light in 2013!**
- **Location : Devasthal (India)**
 - Altitude : 2.450 m
 - Seeing : ~1"
 - +29°21'

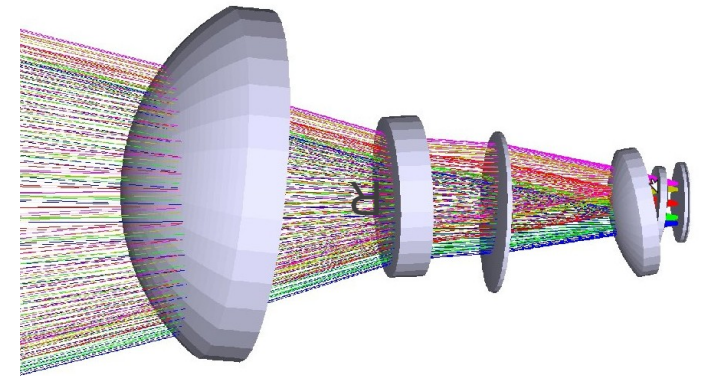
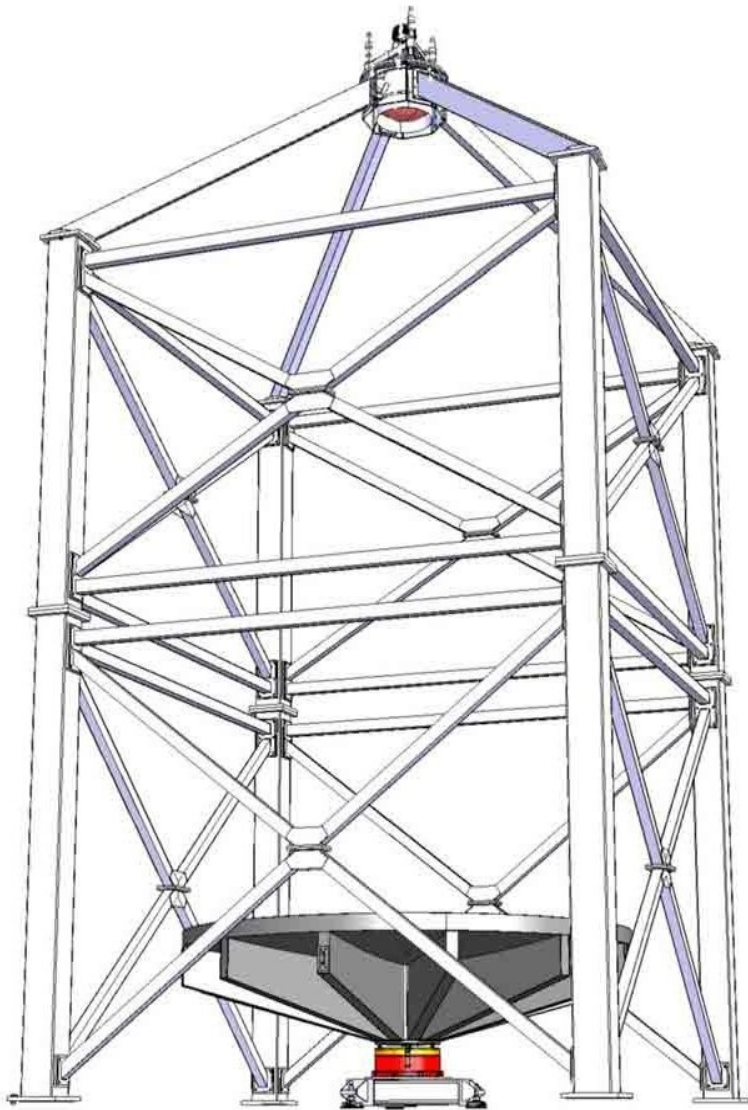


The ILMT mirror



4m Class mirror

The ILMT focal point assembly



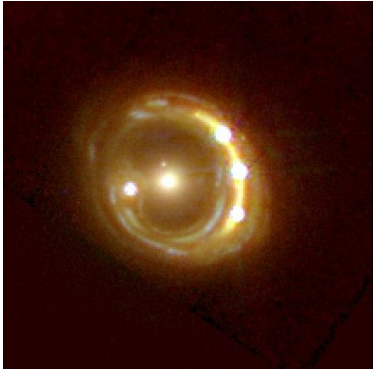
- **4k x4k CCD camera (TDI)**
- **Optical Corrector**
 - Off-axis & TDI aberrations
 - FOV : 30' x 30' (→ 90 s.)
 - Seeing limited
- **Broad-band photometry**
in g,r,i SDSS filters

Photometric variability survey

- **Image same strip** every night
 - Photometry of all objects in the strip
 - down to magnitude $i \sim 22.5$ (90 sec.)
 - ~ 155 sq. deg.
- **Image co-addition:**
 - improves S/N ratio every night
 - very deep survey of a narrow sky band ($i \sim 24.5$)
- **Image subtraction:**
 - astrometric variability
 - photometric variability studies
 - **5 years of photometric variability survey (155 sq. deg.)**

Science Drivers

- **QSO's :**



- Detection : variability + colors ($\sim 27,000$ QSO's $i < 22.5$)
- Photometric follow up
- Gravitationally lensed QSO's (~ 50)

- **Supernovae (Ia):**

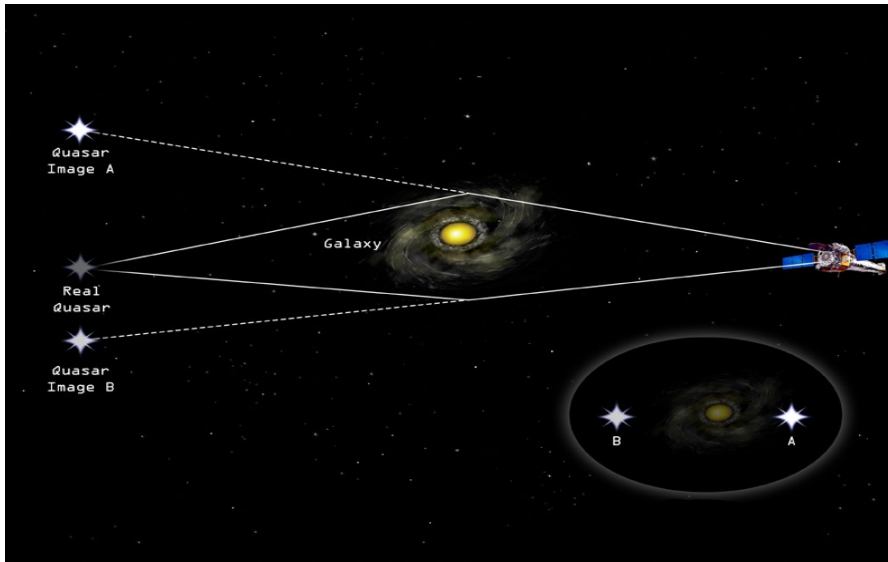


- Canadian and Indian teams
- Detection of 1000 per year ($0.3 < z < 0.5$) , 8000 ($z < 1$)
- Photometric follow-up
- 3.6m Devasthal Observatory Telescope

- **Others :** Galaxies ($\sim 1,500,000$),...

Science with Gravitational lenses & the *ILMT*

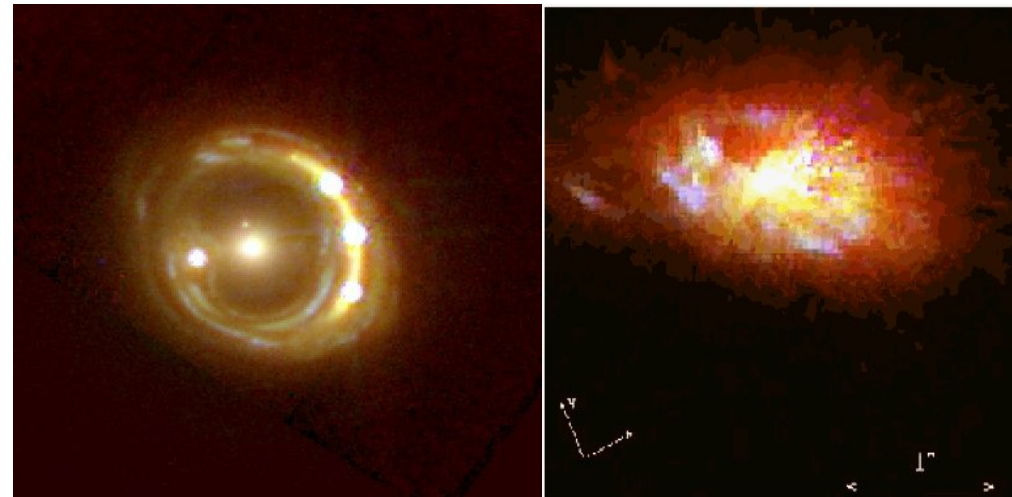
- **Gravitational lenses :**



- Time delays \rightarrow Hubble constant
- Micro-lensing, deflector structure study
- QSO structure,...
- Statistical study of GL

- **DB ready to use...**

- 5 years of photometric follow up
- For all objects in the strip



Thank you!

<http://www.aeos.ulg.ac.be/LMT/>