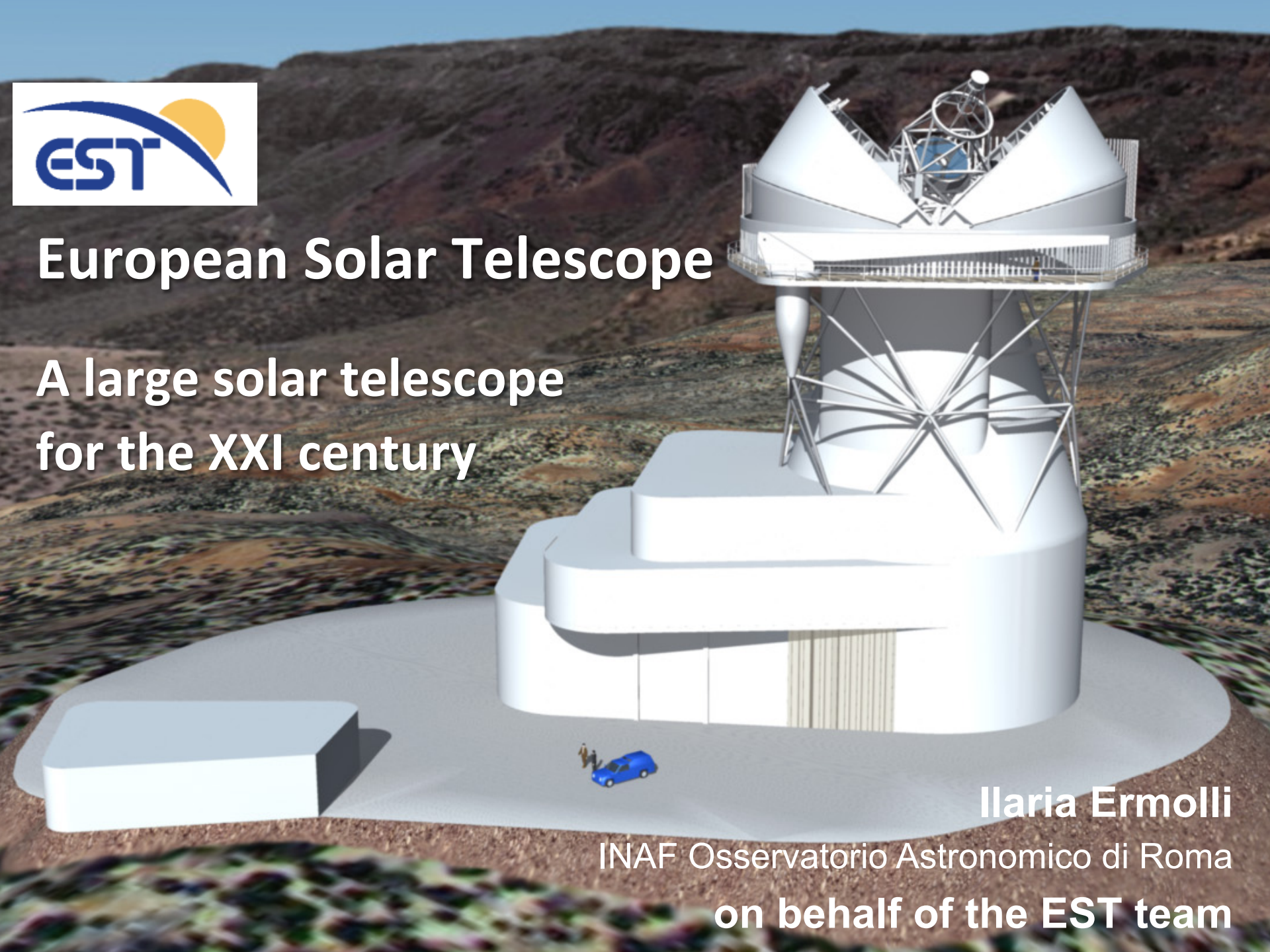
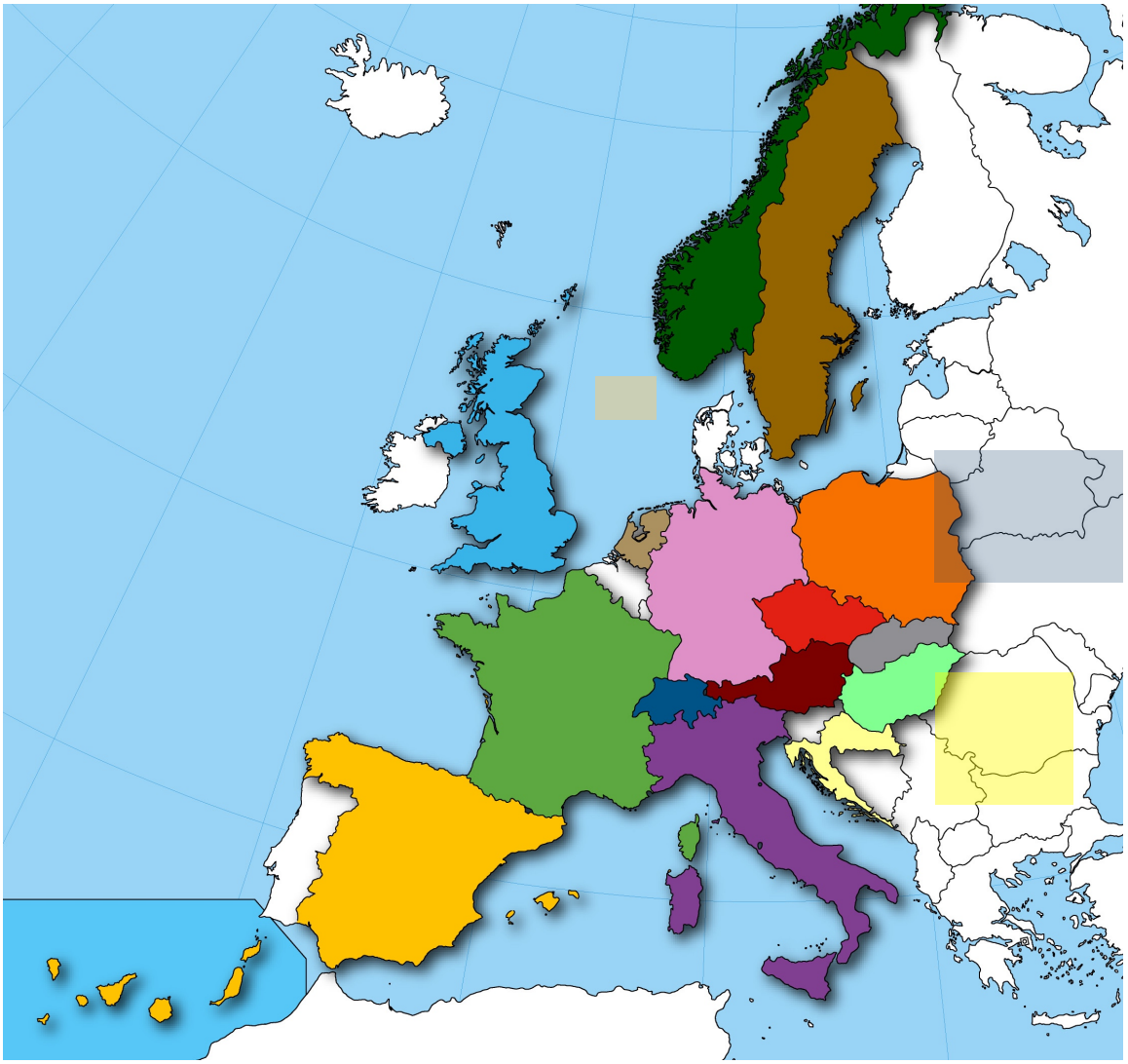


European Solar Telescope

A large solar telescope for the XXI century

Ilaria Ermolli
INAF Osservatorio Astronomico di Roma
on behalf of the EST team

PI: Manuel Collados Vera, IAC, Spain



The EST is promoted by the

EAST

European Association for Solar Telescopes

EST: Strategic European Infrastructure since 03/2016

Eu-funded projects

2008-2011 Conceptual Design -- 3.2 M€

2013-2017 SOLARNET

For a better and wider usage of present EU facilities to get prepared for EST -- 6 M€

2015-2018 GREST

Continue with the technical development of EST instrumentation -- 3 M€

2017-2021 PRE-EST

To provide the EST international consortium and the national agencies with a detailed plan for the implantation of EST -- 9 M€

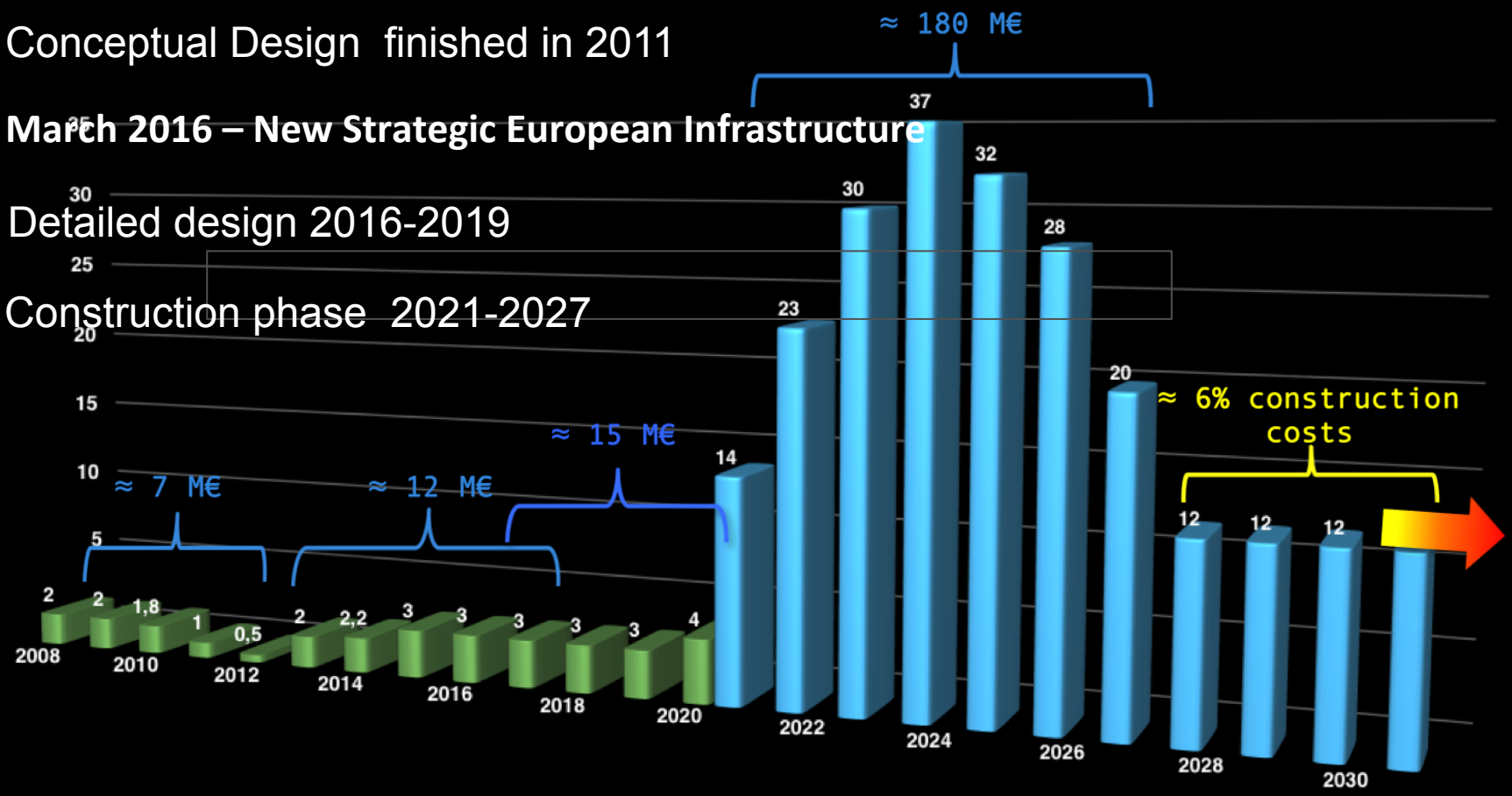
Timeline

Conceptual Design finished in 2011

March 2016 – New Strategic European Infrastructure

Detailed design 2016-2019

Construction phase 2021-2027

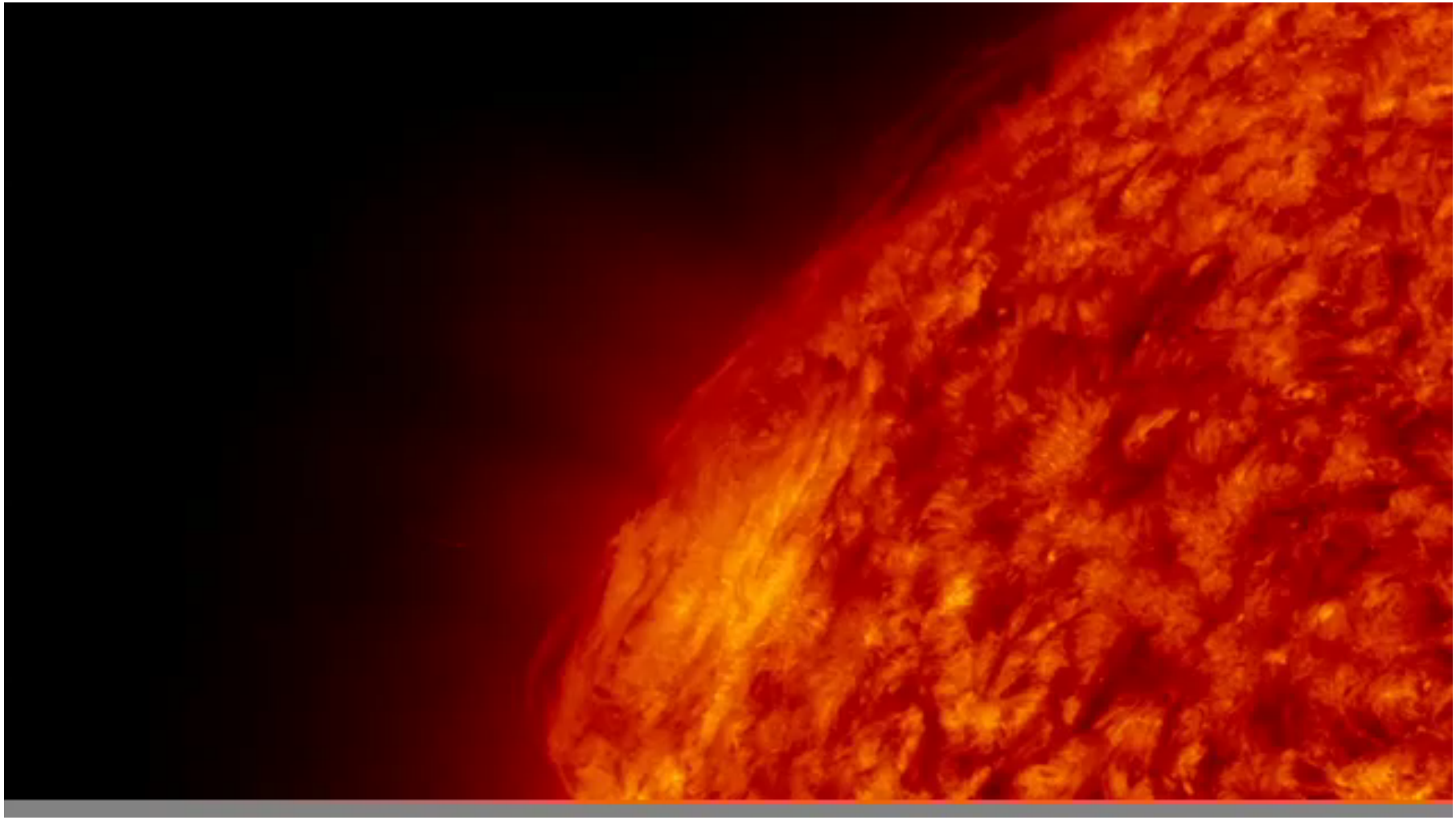


Main science goals

Increasing the capabilities of ground-based solar telescopes will allow us to provide an answer to the following questions:

- How does the **magnetic field evolve** and emerge to the solar surface?
- How is the **energy transported** from the photosphere to the chromosphere?
- How is the **energy released** and deposited in the upper atmosphere?
- Why does the Sun have a **hot chromosphere** and a hot **corona**?
- What causes the **explosive events**, flares, filament eruptions, CMEs?

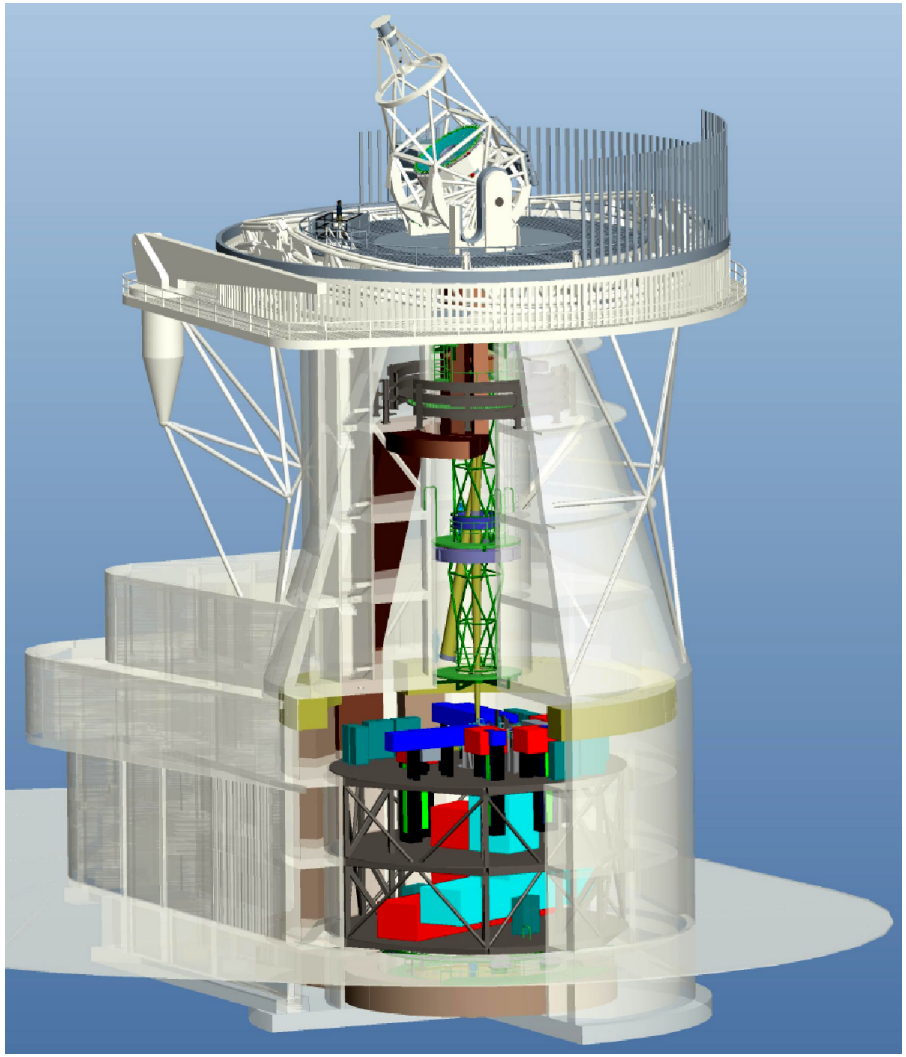
Key questions



Telescope and instrumentation key requirements

- **High precision polarimetric capabilities** for accurate magnetic field determination
- **Multiwavelength capabilities** for simultaneous observation of different heights in the solar atmosphere
- **Large** photon **collector**
- **High** angular **resolution**

Conceptual design



4-m telescope to collect photons

On axis Gregory

Mirrors polarimetrically compensated for high accuracy spectropolarimetry

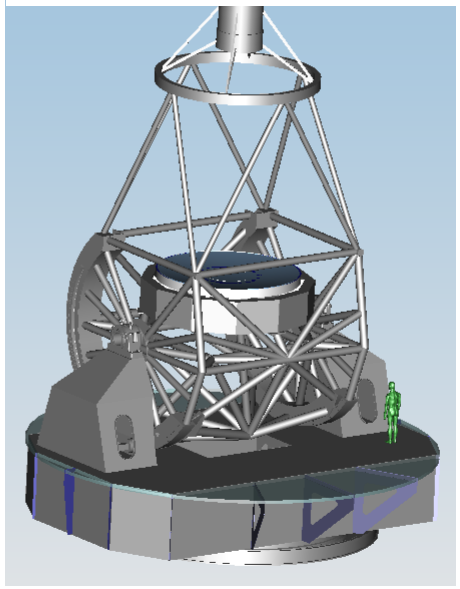
Adaptive Optics and Multi Conjugate Adaptive Optics system for the highest spatial resolution

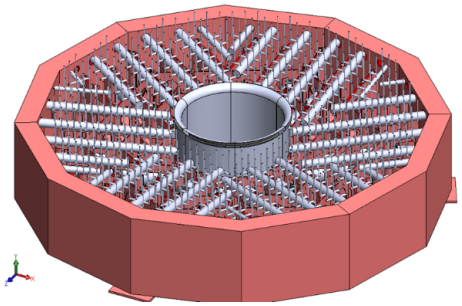
MCAO integrated in the optical path

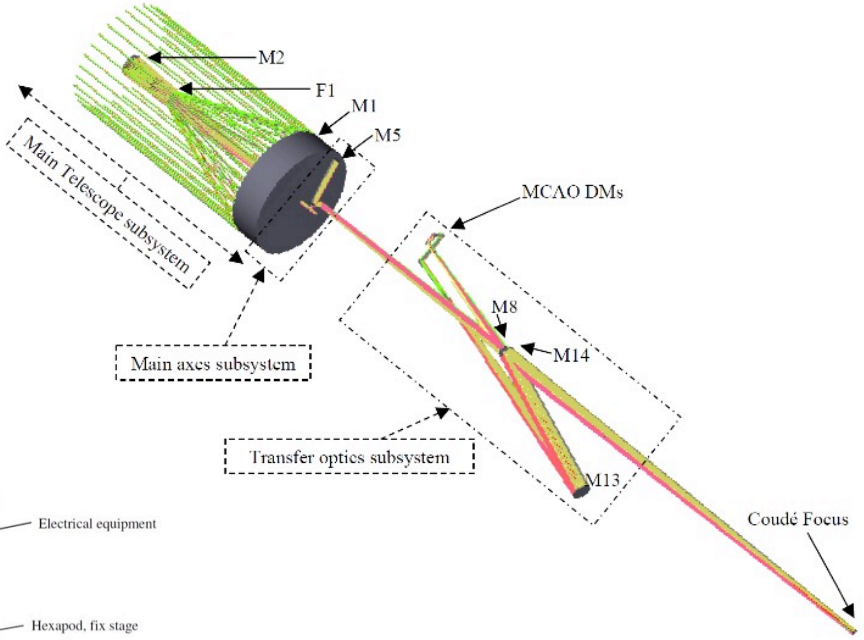
Simultaneous instrument stations (each with several wavelength channels)

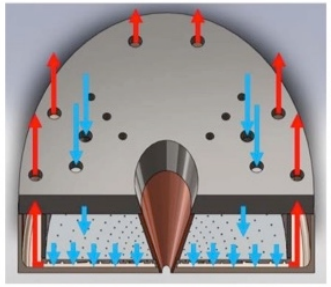
Coudé instruments for larger stability

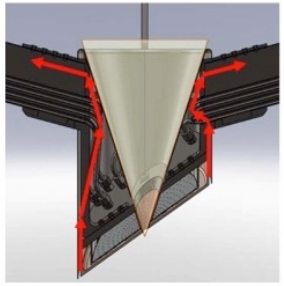
Telescope conceptual design

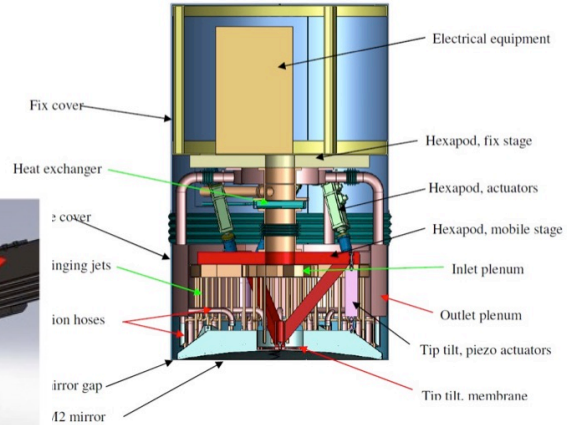


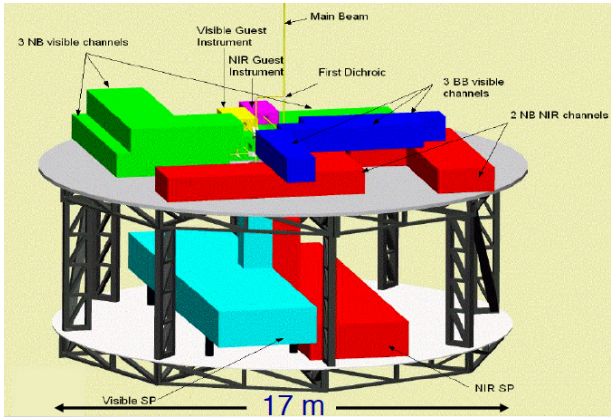






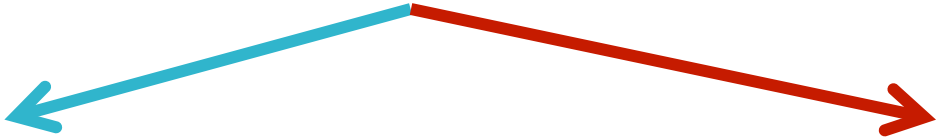






Instruments conceptual design

The light beam is **divided** into **infrared** and **visible** light



broad band imager

380-500 nm | 380-500 nm | 600-900 nm

narrow band imager

390-500 nm | 500-620 nm | 620-860 nm

grating spectrographs

390-560 nm | 560-1100 nm

narrow band imager

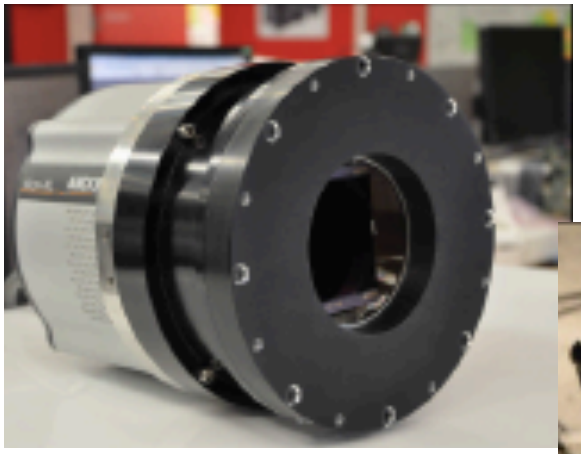
800-1100 nm | 500-1800 nm

grating spectrographs

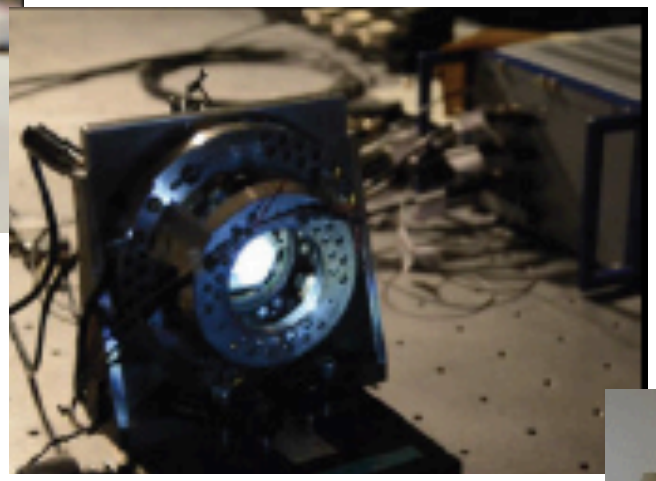
700-1600 nm | 1000-2300 nm

guest instrument

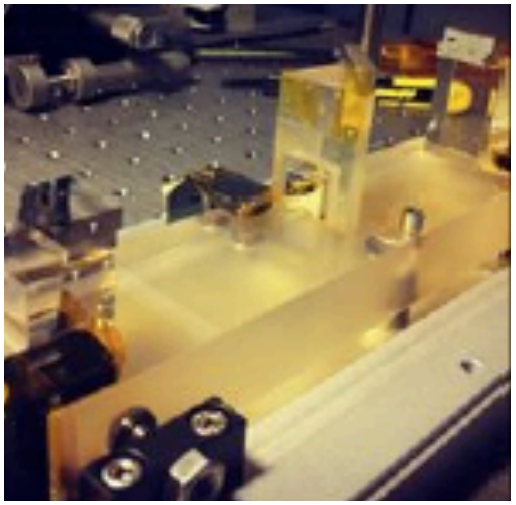
Instrumental developments



Boosting the new generation of detectors
Large format, high precision, low noise



Development of a large Fabry-Pérot prototype for high mechanical stability and high parallelism of the etalons



New techniques for 2-D spectropo-larimetry Multi-slit Integral field unit

Development of large format liquid crystal modulators

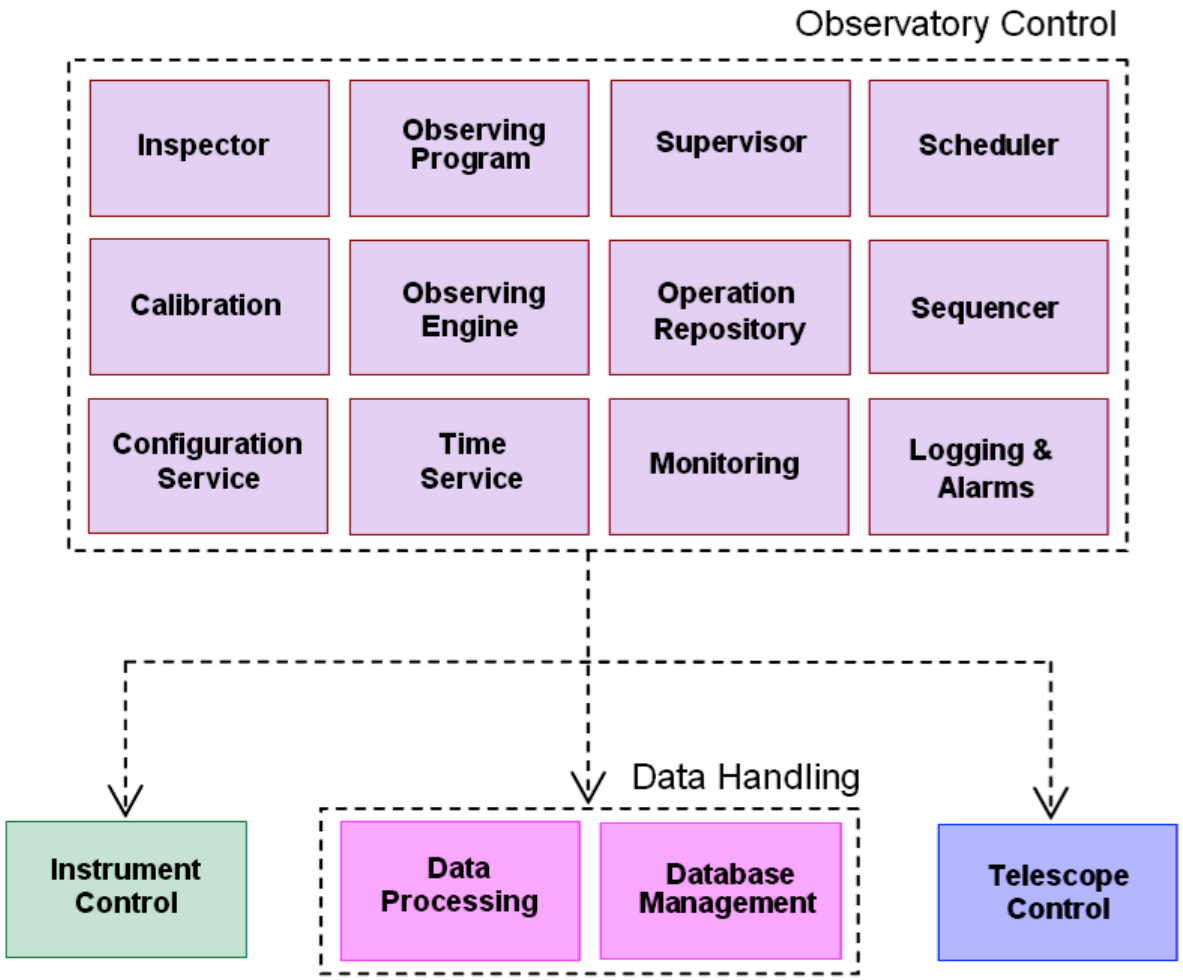
Control conceptual design

- **Control system:**

Integrated control system for the entire observatory

  - Common software
  - Distributed, object-oriented architecture

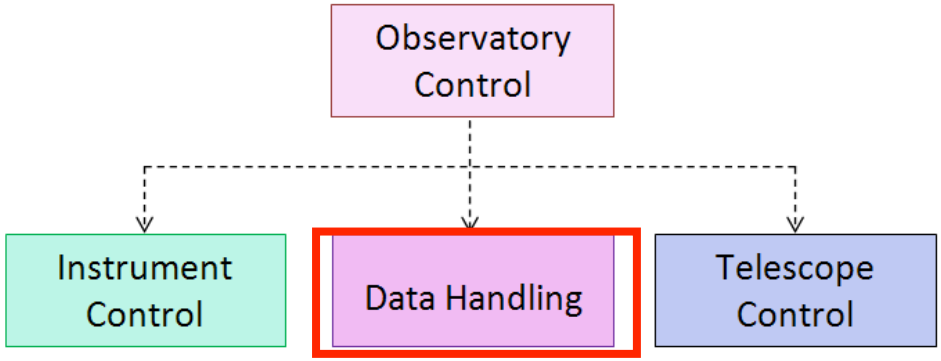
- **Data handling**



DH conceptual design

Maximum Detector Flux:

4096 x 4096 pixels ; 100 frames /sec
-> **3 GB /sec (visible)**
2048 x 2048 pixels ; 100 frames /sec
-> **0.8 GB /sec (infrared)**



Instrument	# of Detectors	Data Rate
Broadband Filters	9 visible	28 GB / sec
Narrowband Filters	9 visible 6 infrared	28 GB / sec 5 GB / sec
Spectrographs	5 visible 3 infrared	16 GB / sec 3 GB / sec
	32 detectors	**80 GB / sec**

On-site

A lot & urgent

Lossless compression
Image reconstruction

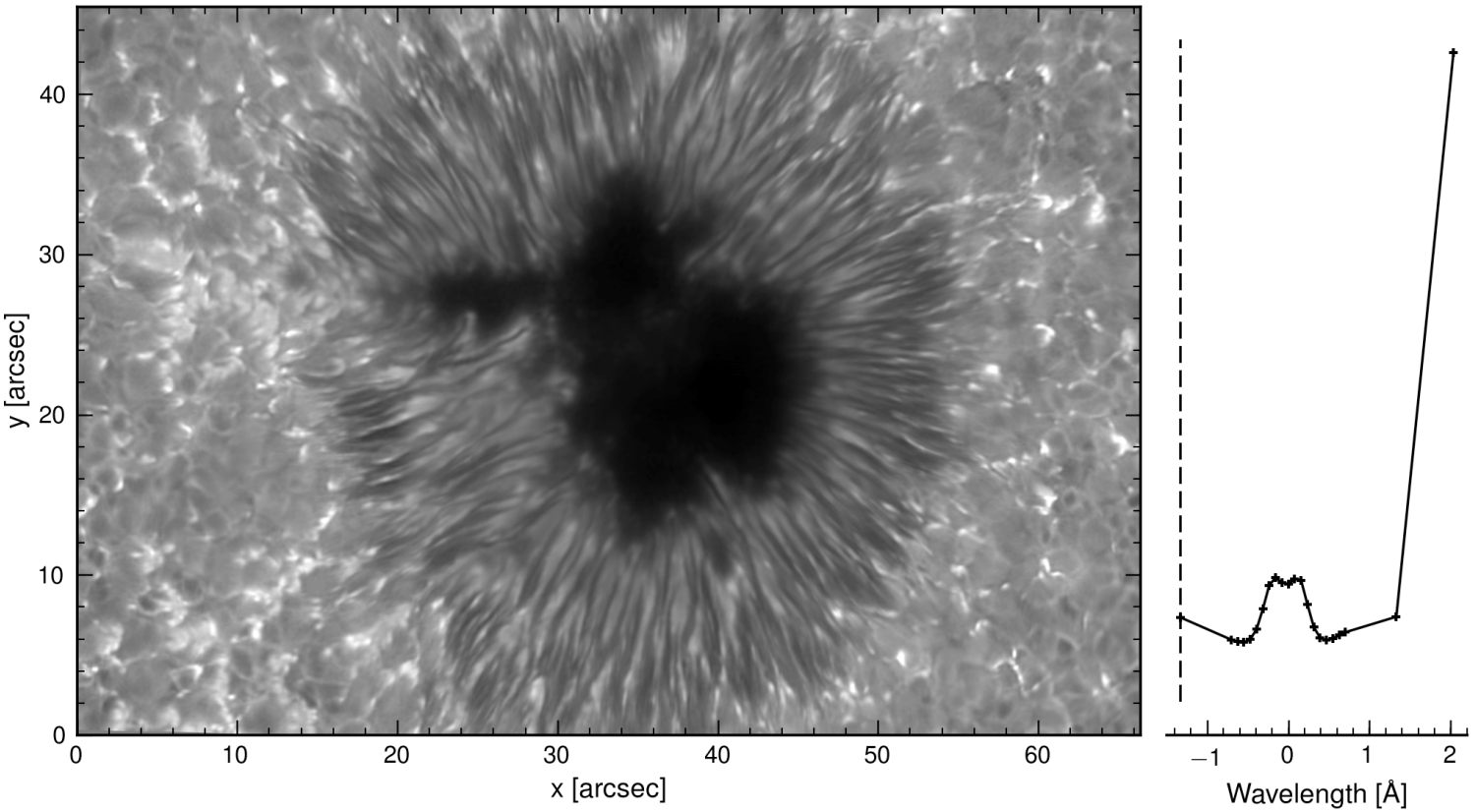
Off-site

Science-ready
VO-compliant

Definition of standards
Pipelines
Analysis Tools

EST data

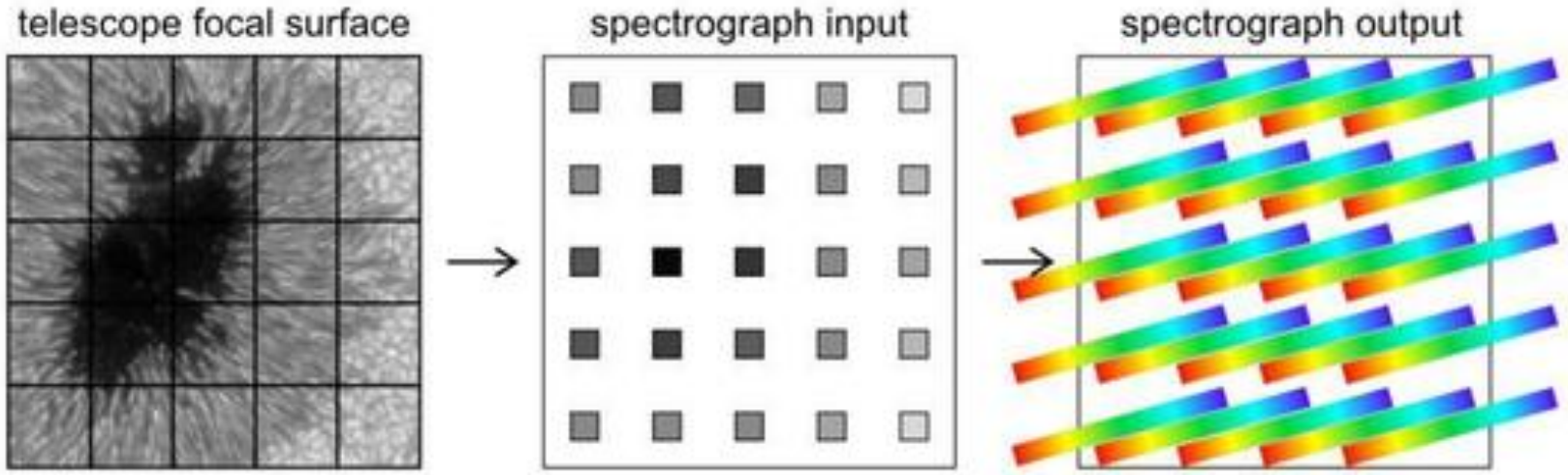
Narrow band spectropolarimetric imager

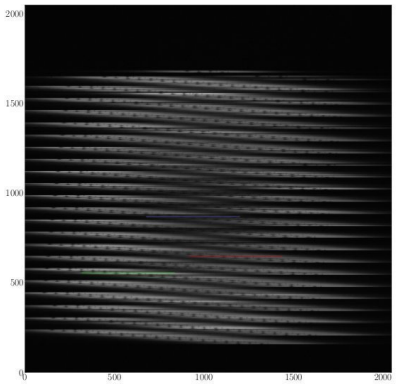


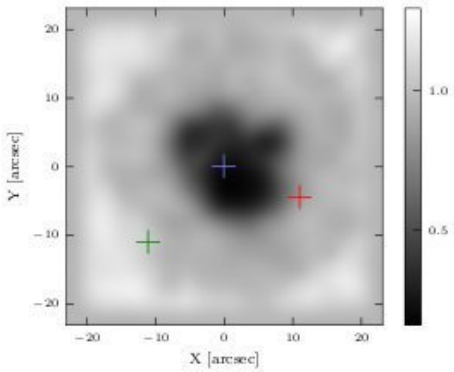
SST/CHROMIS observations: courtesy G. Scharmer

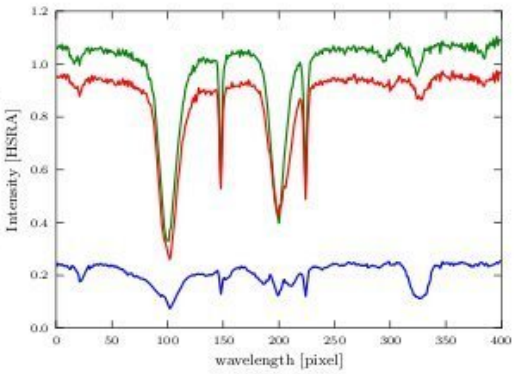
EST data

Microlens-fed spectrograph



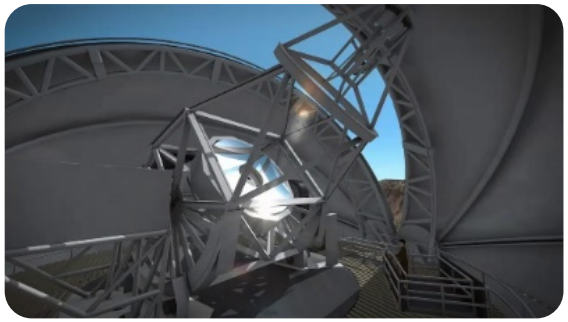


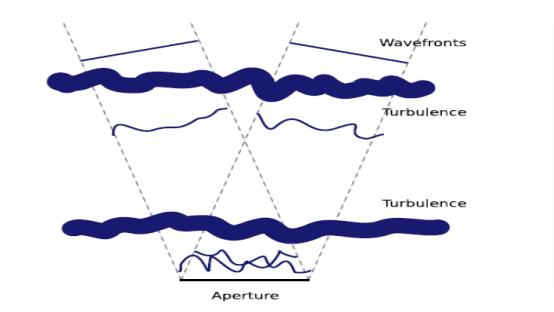


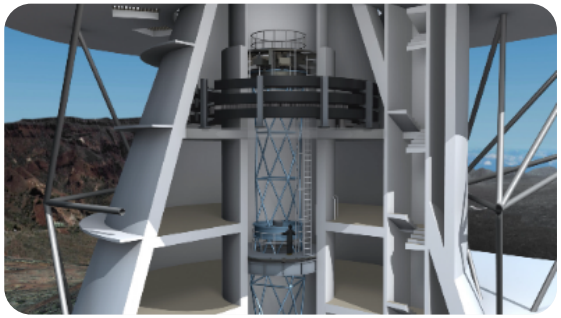


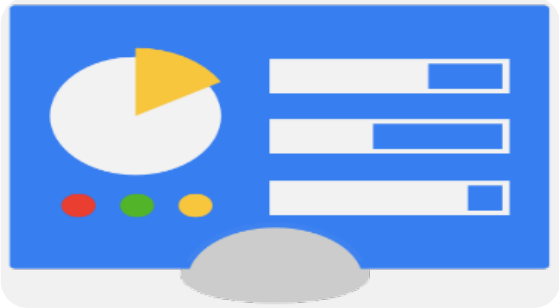
SST/MIHi observations: courtesy M. Van Noort

Preparatory phase
Technical works









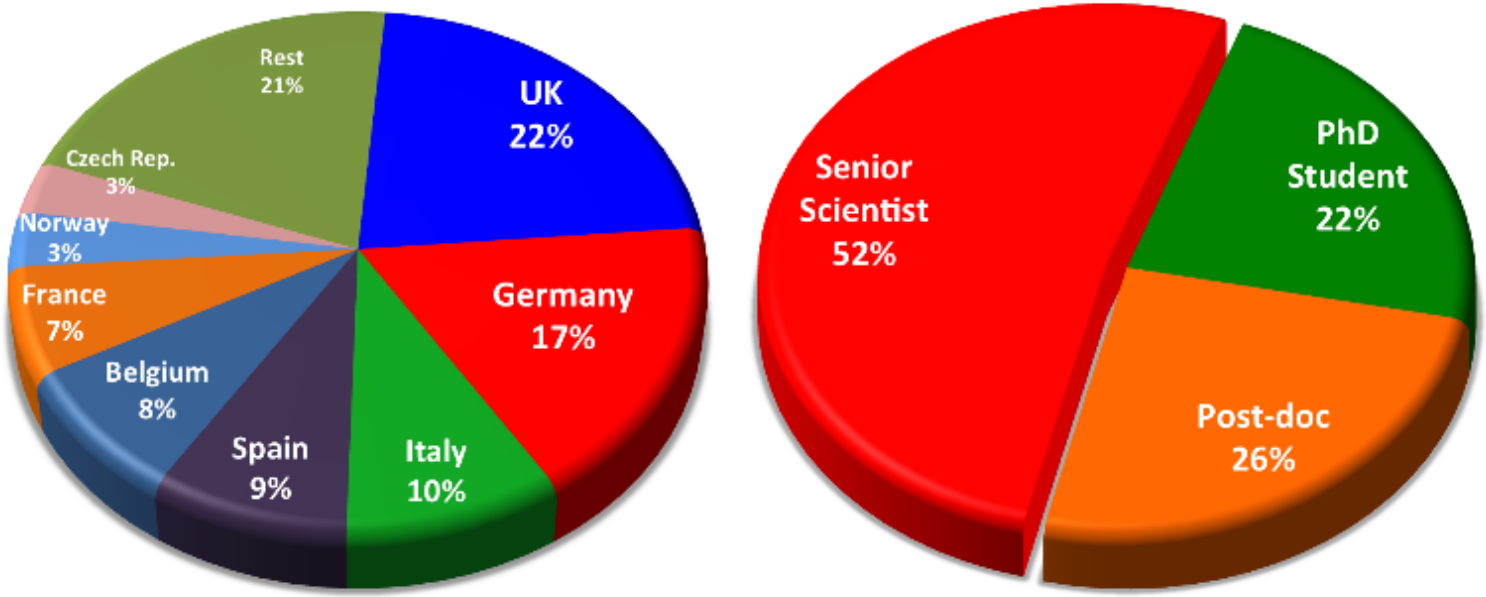
2017-2021

PRE-EST

Governance, Legal Entity, Financial plan, Site.

EST Community

1. A total of **615 researchers** have been identified in **22 European countries**.
2. **UK, Germany and Italy** represent **close to 50%** of the total solar community.
3. The first **9 countries** concentrate **more than 80%** of the community.



Thanks!