

Observing proposals

the scientific justification

Why do we propose for telescope time?

Long enough ago you built your own telescope when you wanted to observe something. This is not realistic today however - and you certainly could not send up a telescope in orbit!

Great Paris Exhibition Telescope
(lens at the same scale)
Paris, France (1900)

Yerkes Observatory
(40" refractor lens at the same scale)
Williams Bay, Wisconsin (1893)

Hooker (100")
Mt Wilson, California (1917)

Hale (200")
Mt Palomar, California (1948)

(1979-1998) (1999-)
Multi Mirror Telescope
Mount Hopkins, Arizona

BTA-6 (Large Altazimuth Telescope)
Zelenchuksky, Russia (1975)

Large Zenith Telescope
British Columbia, Canada (2003)

Gaia
Earth-Sun L2 point (2014)

Kepler
Earth-trailing solar orbit (2009)

James Webb Space Telescope
Earth-Sun L2 point (planned 2018)

Hubble Space Telescope
Low Earth Orbit (1990)



Tennis court at the same scale

Large Sky Area Multi-Object Fiber Spectroscopic Telescope
Hebei, China (2009)

Hobby-Eberly Telescope
Davis Mountains, Texas (1996)

Southern African Large Telescope
Sutherland, South Africa (2005)

Large Binocular Telescope
Mount Graham, Arizona (2005)

Very Large Telescope
Cerro Paranal, Chile (1998-2000)

Magellan Telescopes
Las Campanas, Chile (2000/2002)

Giant Magellan Telescope
Las Campanas Observatory, Chile (planned 2020)

Overwhelmingly Large Telescope
(cancelled)

Gran Telescopio Canarias
La Palma, Canary Islands, Spain (2007)

Keck Telescope
Mauna Kea, Hawaii (1993/1996)

Gemini North
Mauna Kea, Hawaii (1999)

Subaru Telescope
Mauna Kea, Hawaii (1999)

Gemini South
Cerro Pachón, Chile (2000)

Large Synoptic Survey Telescope
El Peñón, Chile (planned 2020)

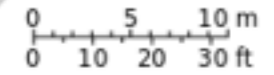
Arecibo radio telescope
at the same scale

Arecibo radio telescope at the same scale

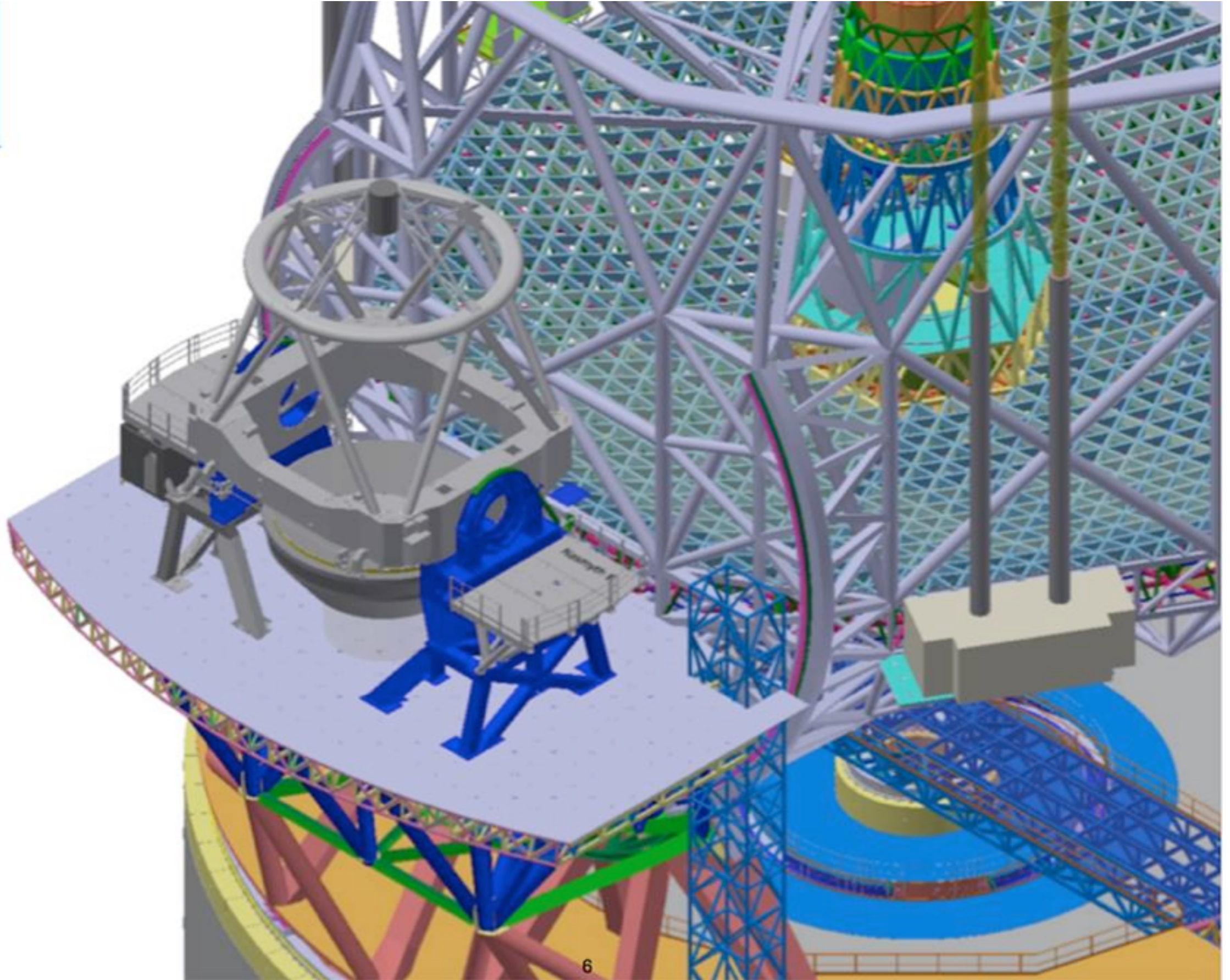
Thirty Meter Telescope
Mauna Kea, Hawaii (planned 2022)

European Extremely Large Telescope
Cerro Armazones, Chile (planned 2022)

Human at the same scale



Basketball court at the same scale



The VLT on the Nasmyth platform of the E-ELT...

From idea to data

1. What problem do you want to study?
2. What data do you need to tackle this problem?

Do you need spectra? Images? Radio-data? Do you need archival data?

3. Can you actually do it?

It is easy to imagine scientifically interesting data that are unrealistic, or even impossible, to get.

4. What telescope should you use?

Different telescopes have different instruments, are in different hemispheres, their access rights are different and the application pressure is different.

The cost of observing

The cost of one night on a big telescope (cost of telescope+maintenance+instruments):

ESO NTT (La Silla): 10000 €/night - 330 €/ksec

ESO VLT (Paranal): 59400 €/night - 2000 €/ksec

Keck: 53700 \$/night

HST: >11000 €/sec

XMM-Newton: 1800 €/ksec

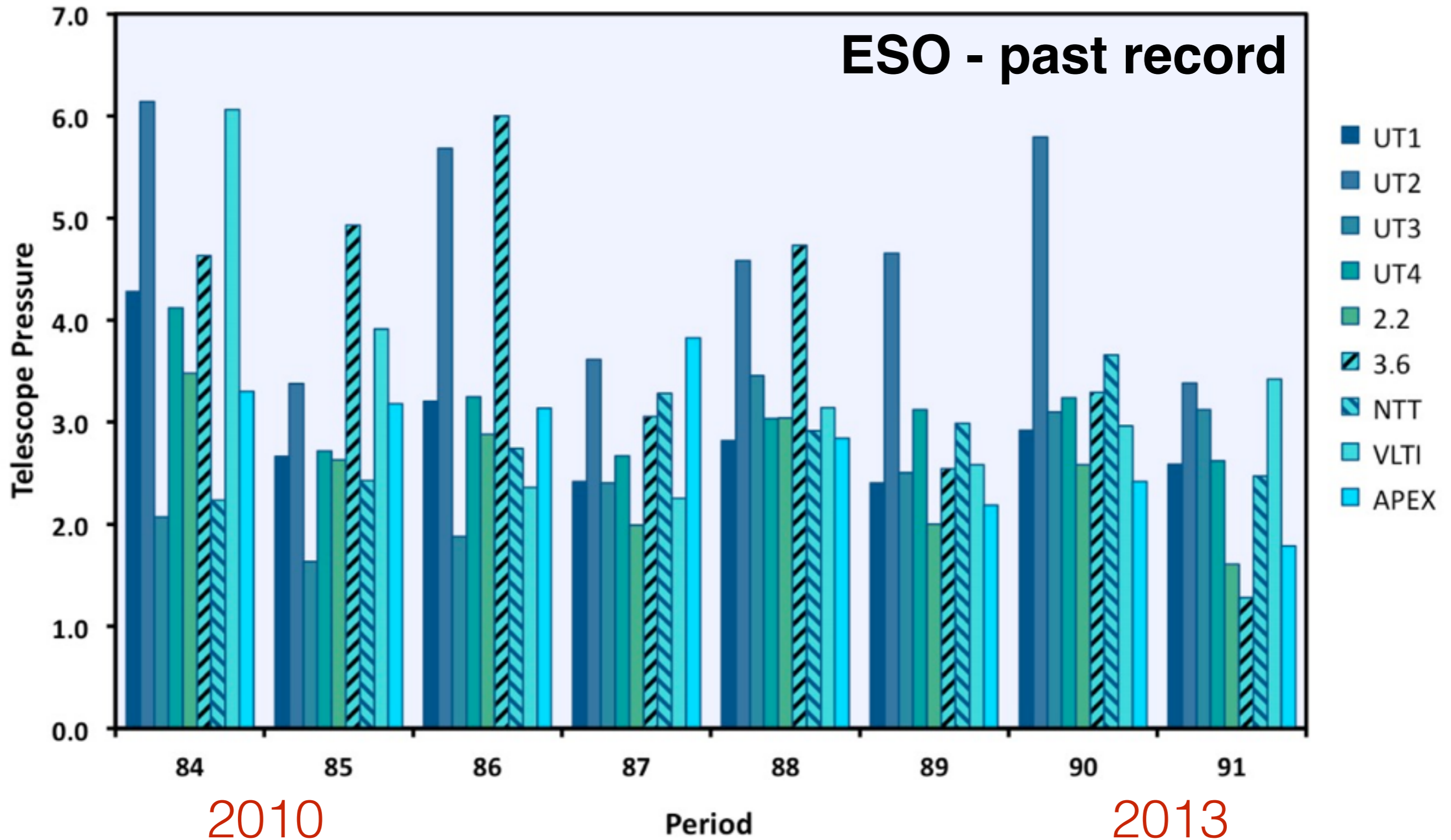
Chandra: 7700 €/ksec

With these costs it is important that we do as good science as possible with these facilities.

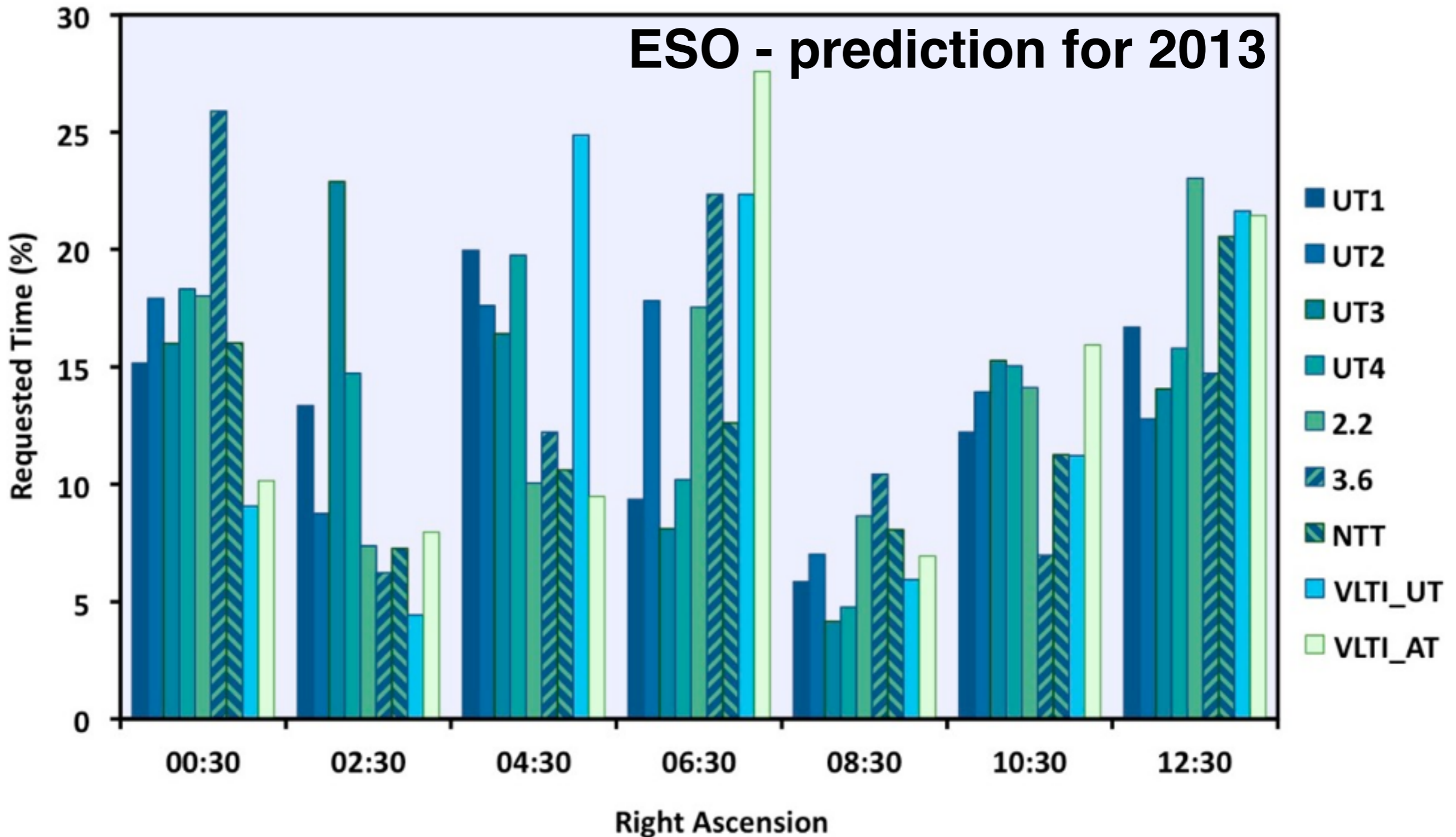
Competition - the proposal pressure

$$\text{Proposal pressure} = \frac{\text{Requested time}}{\text{Allocated time}}$$

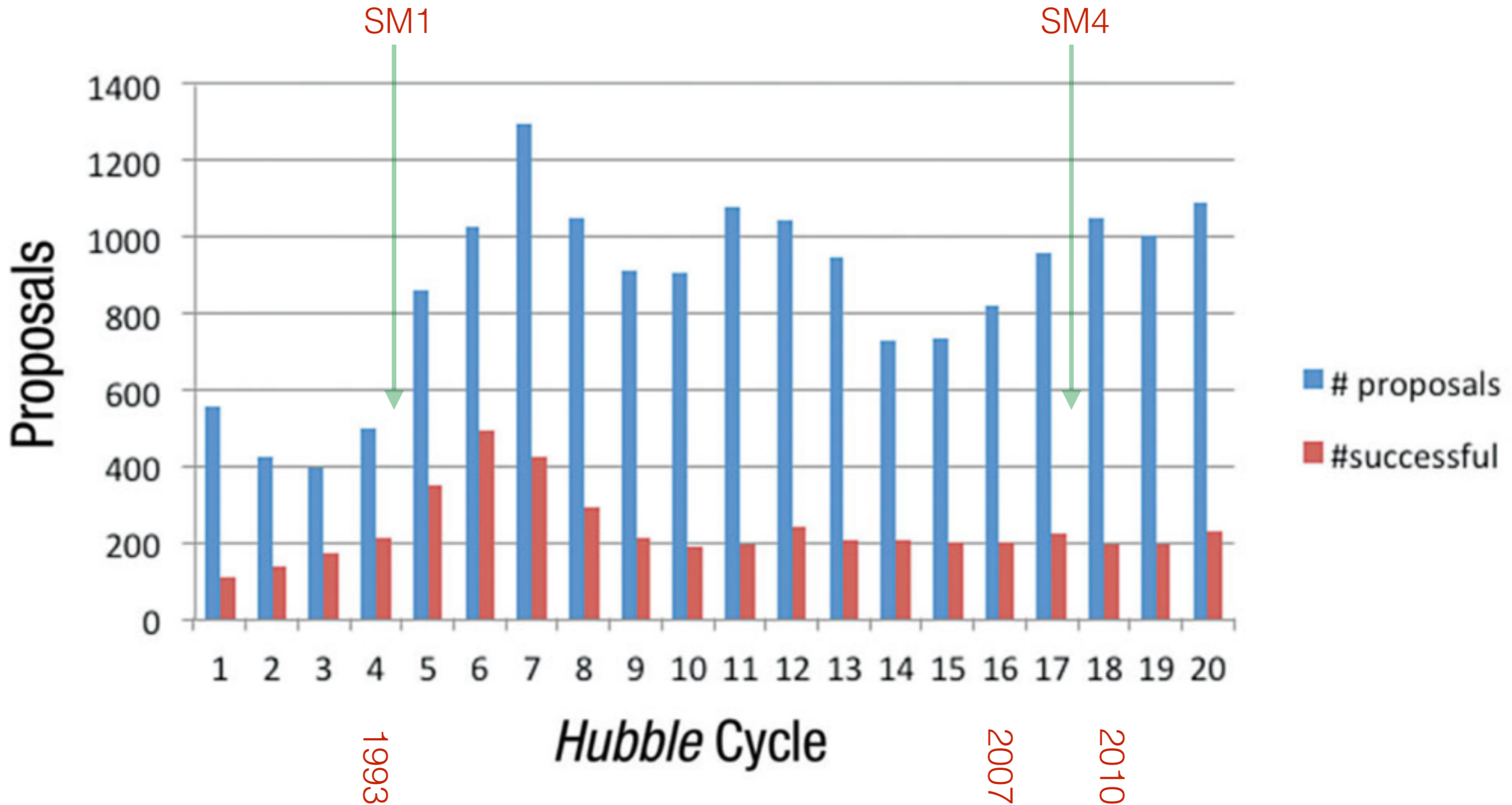
Competition - the proposal pressure



But not all the sky is equally desirable!

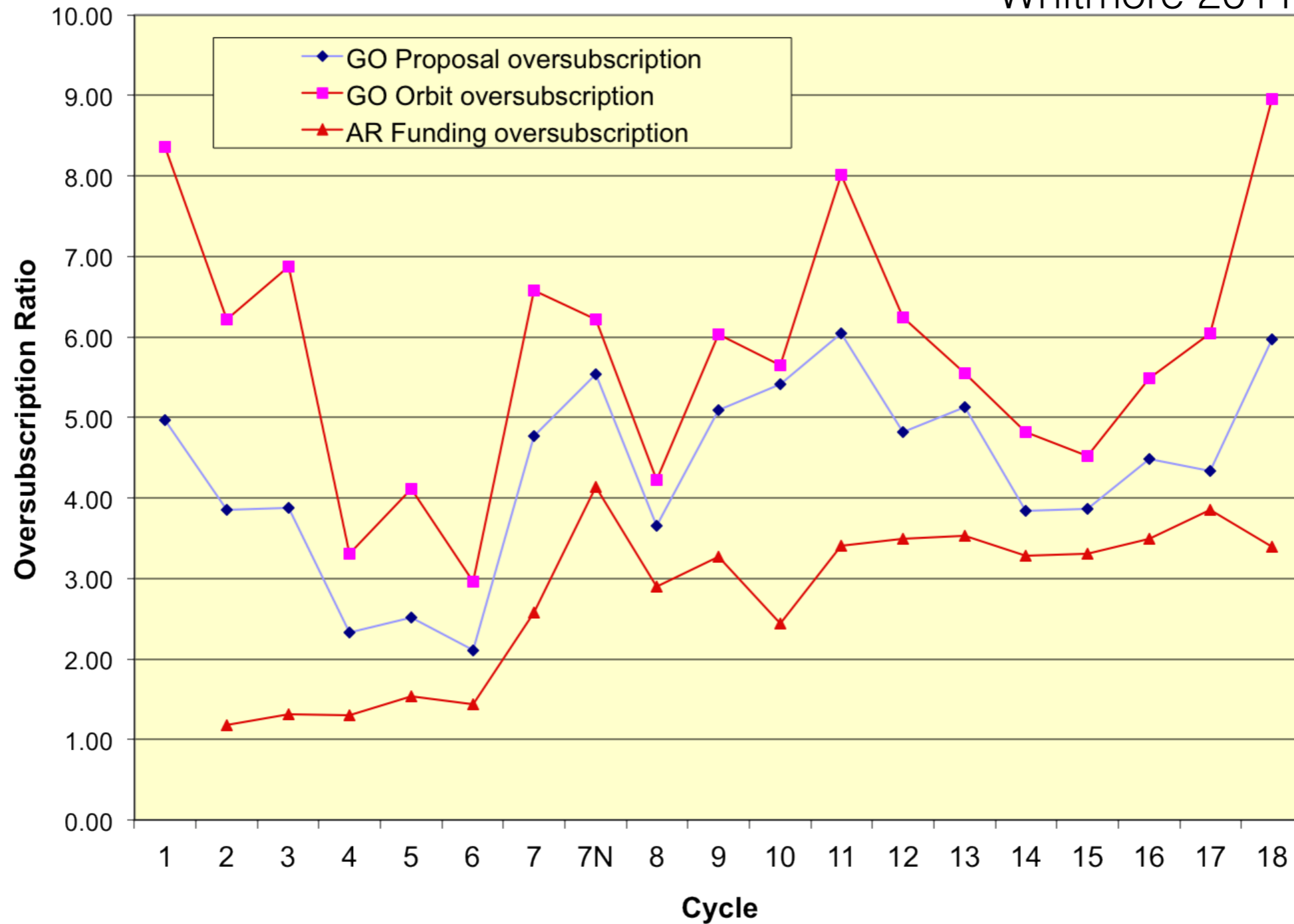


It is no better in space! HST

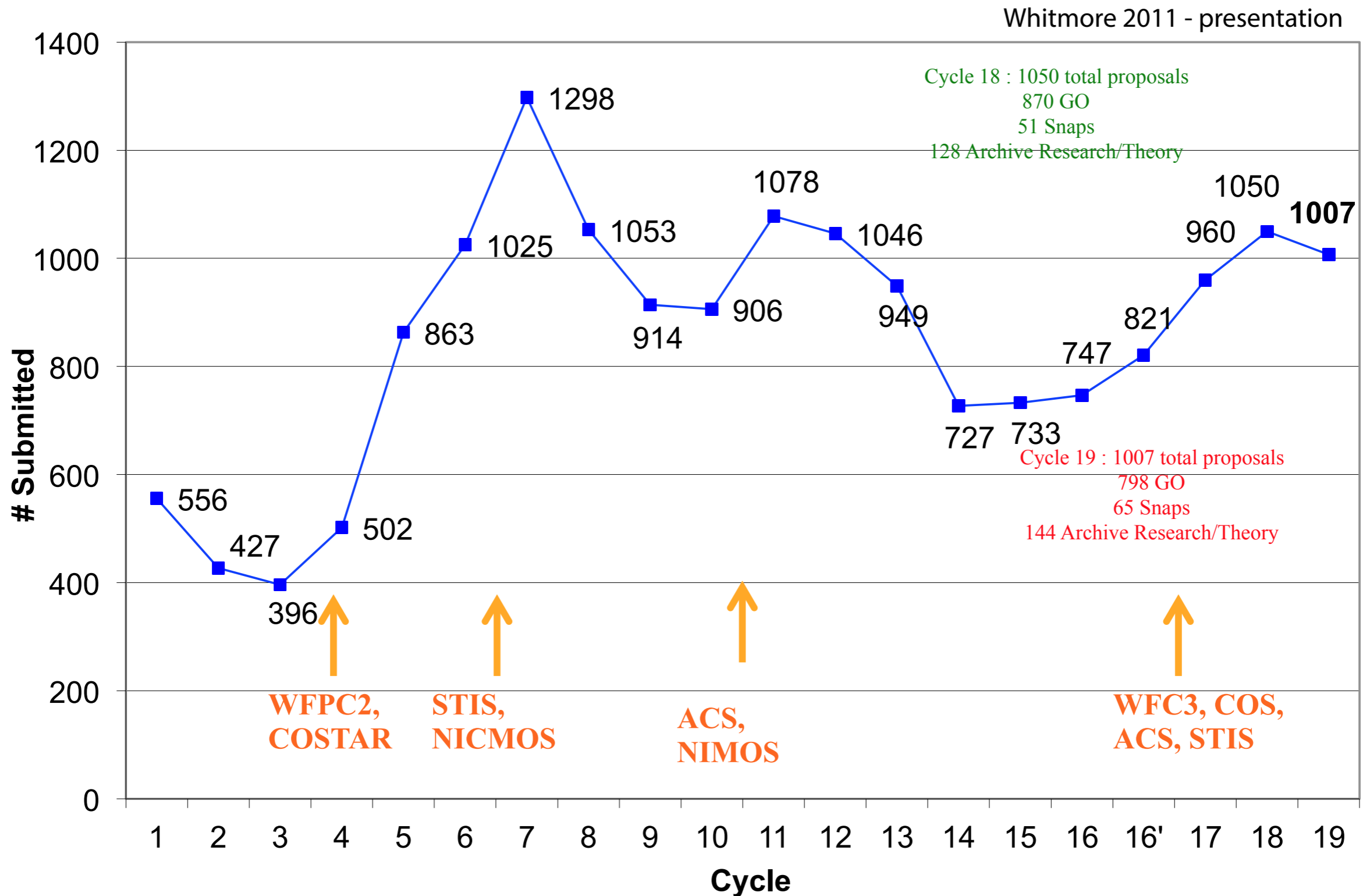


HST oversubscription

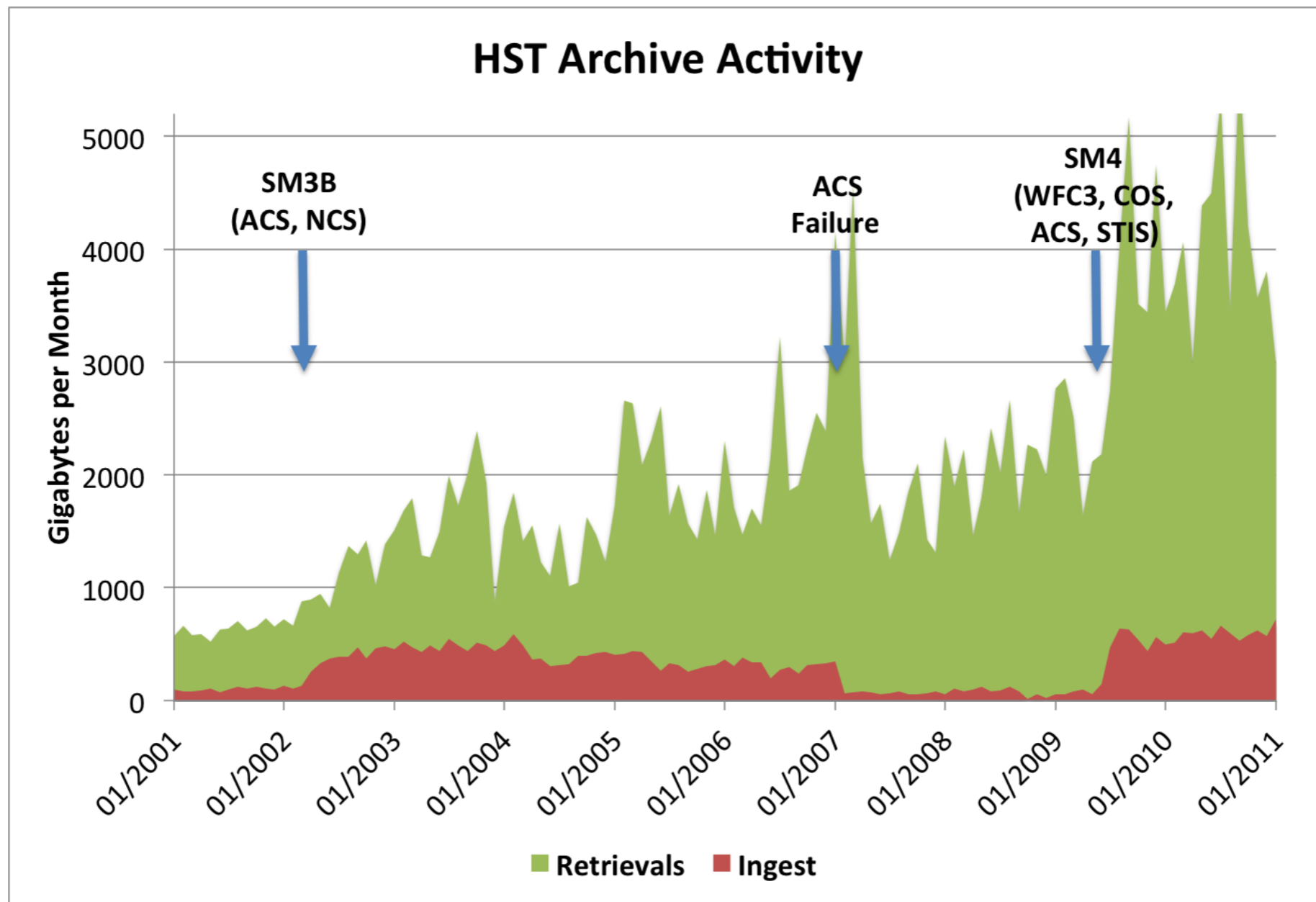
Whitmore 2011



New instruments, new opportunities



Archives - a transformation of science



Today archives are an essential ingredient in many research endeavours.

Types of observations

Targeted

Point your telescope on particular objects/areas of the sky and study these in detail.

Call for proposals at regular times

VLT, Keck, Gemini,
WHT, INT

Survey

Observe large parts of the sky in a systematic way.

*Long time plans or even
dedicated telescopes/satellites.*

2dFGRS, SDSS,
Euclid, KIDS

A given facility might do both!

Operation of telescope

Classical

Award of a given number of nights - observations done at a specific time, usually with the observer present at the telescope

Queue observing

Award of a specific amount of time to be executed when the conditions meet the observer's requirement.

Robotic surveys

No specific proposals - "continuous" collection of data

Competing for time

As the over-subscription plots show, there is fierce competition for telescope time!

Only **GOOD** proposals stand a chance - and in some cases only **outstanding** proposals make it!



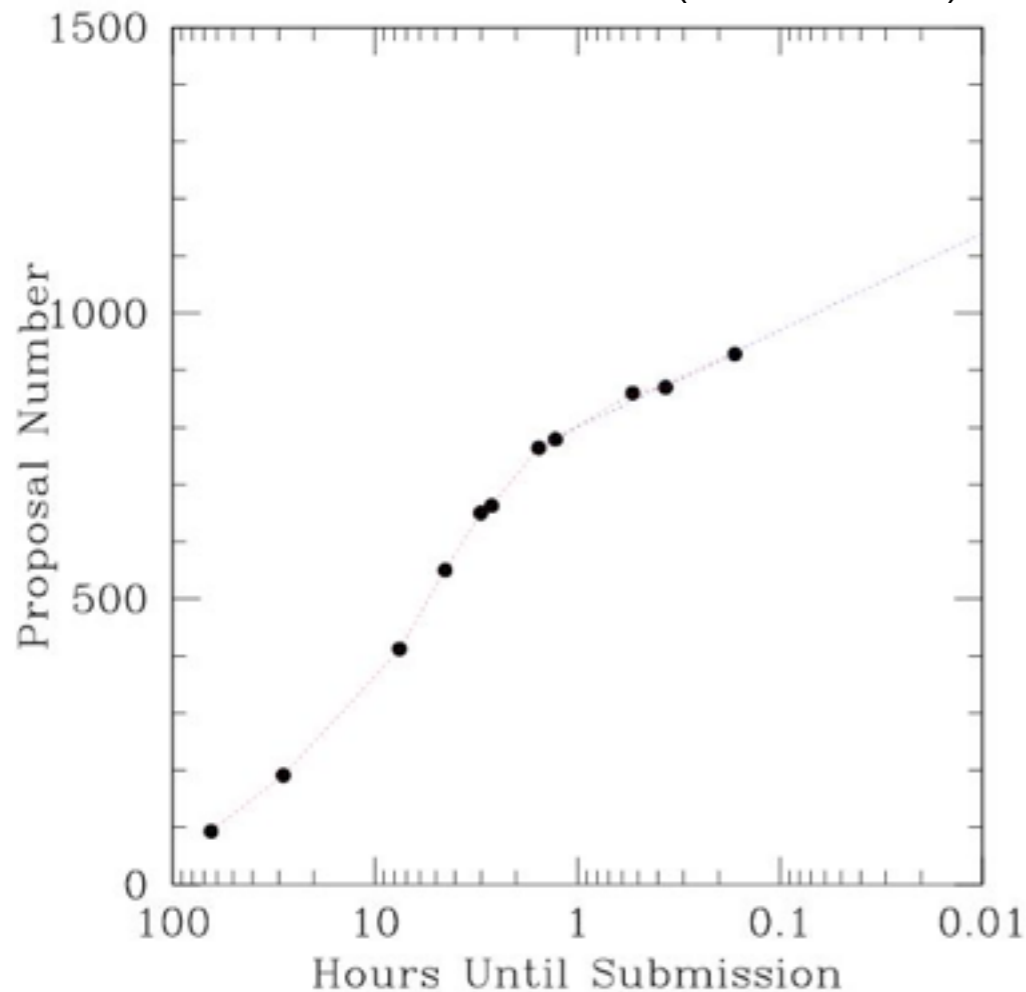
Writing good proposals is a crucial skill for an astronomer.

Also true for computing time, grants, etc - even outside astronomy/research

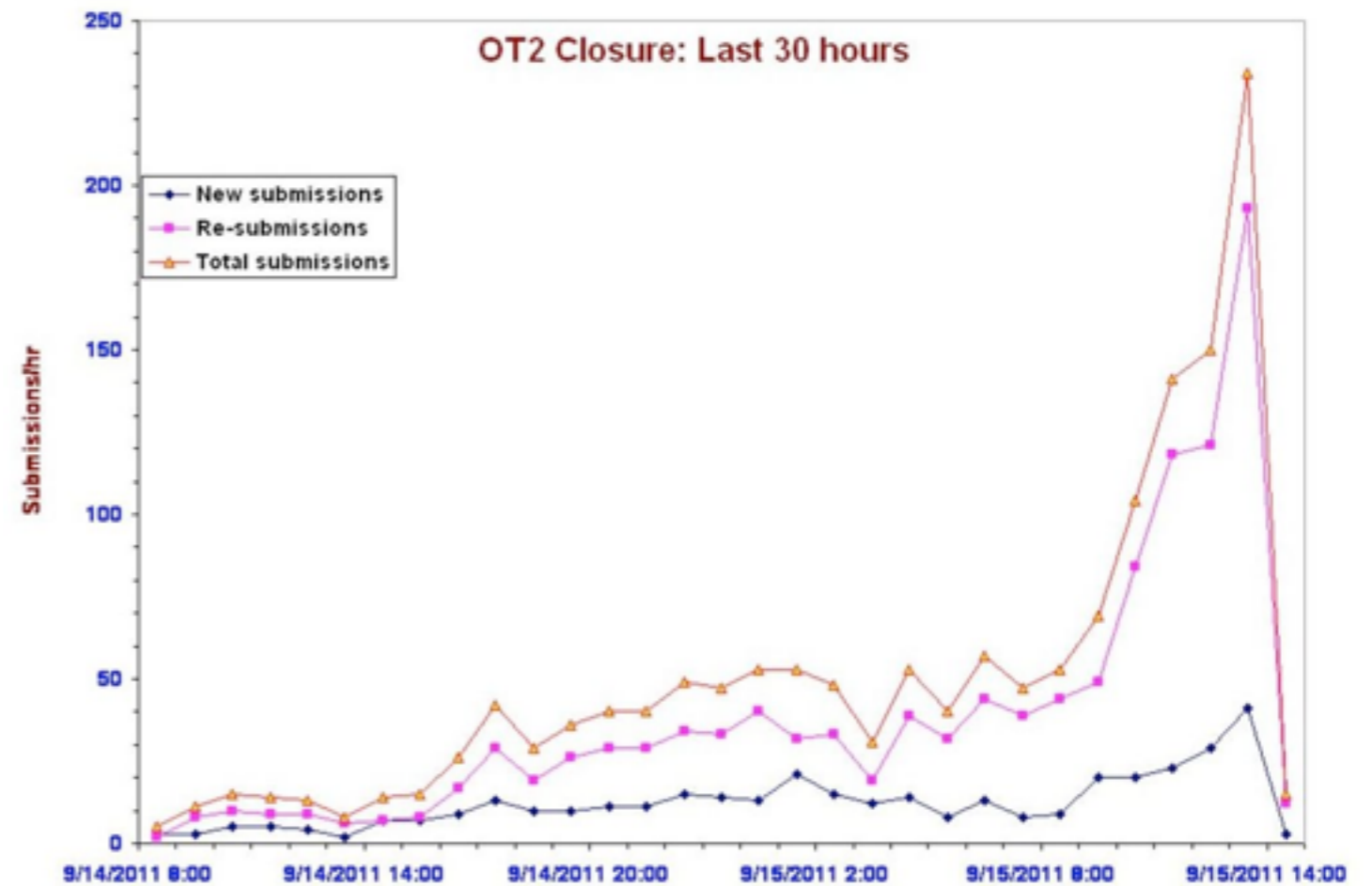
The call for proposals

1-2 months before the deadline a call for proposals is issued. This contains information on available instruments and other important news. You then have time to plan your observing proposal.

HST (Dalcanton)



Herschel



After the deadline

Formal check of the proposals - are the proposers eligible? can the object be observed? is the length/request acceptable?

Technical checks

Overlap checks

Time Allocation
Committee (TAC)

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graph TD; A[Formal check of the proposals - are the proposers eligible? can the object be observed? is the length/request acceptable?] --> B[Technical checks]; A --> C[Time Allocation Committee (TAC)]; A --> D[Overlap checks]; B --> C; D --> C;
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The TAC - be understandable!

This is composed of researchers that will evaluate the proposals. For big facilities like HST or the VLT there are many sub-committees that consist of experts in a broad area. But in national TACs there is usually only one group.

The reviewer is unlikely to be an expert on your topic!

A proposal must be understandable for a non-expert!

The TAC - be concise

A TAC member for a big facility might have 50-100 proposals to read. How long will they spend on each? Maybe 15 minutes?

A proposal must be concise and clear - get your point across quickly and efficiently!

The proposal

Introduction

Scientific justification

- ✓ Why is this topic important?
- ✓ What are the important questions?
- ✓ Why now?
- ✓ Links to other topics?
- ✓ Why are the proposed observations important?
- ✓ How will you do the analysis?

Technical justification

- ✓ Can you actually carry out your observations?

The proposal

Some hints on writing a good proposal:

- ✓ Clear and concise arguments
- ✓ Make it clear *what* you want to do
- ✓ Make it clear *how* you will do it
- ✓ Write clearly and in correct English - sloppy writing will not help you!
- ✓ Avoid jargon and explain acronyms the first time you use them
- ✓ Carefully follow instructions!

Deadlines

18/02 - Provide idea for observing proposal (by email!)

11/03 - Scientific justification for observing proposal
1 page

25/03 - Technical justification (1 page) & abstract (max 10 lines)

Maximum 2 pages with figures & references

Font: 11 pt Times Roman

Proposal ideas

Measure distances to globular clusters: e.g. RR Lyrae

Calculate the rotation period of asteroids

Determine the orbital elements of minor planets

Map star formation in nearby galaxies

Binary stars

Stellar streams

exo-planets