Challenges of coordination and possible solutions

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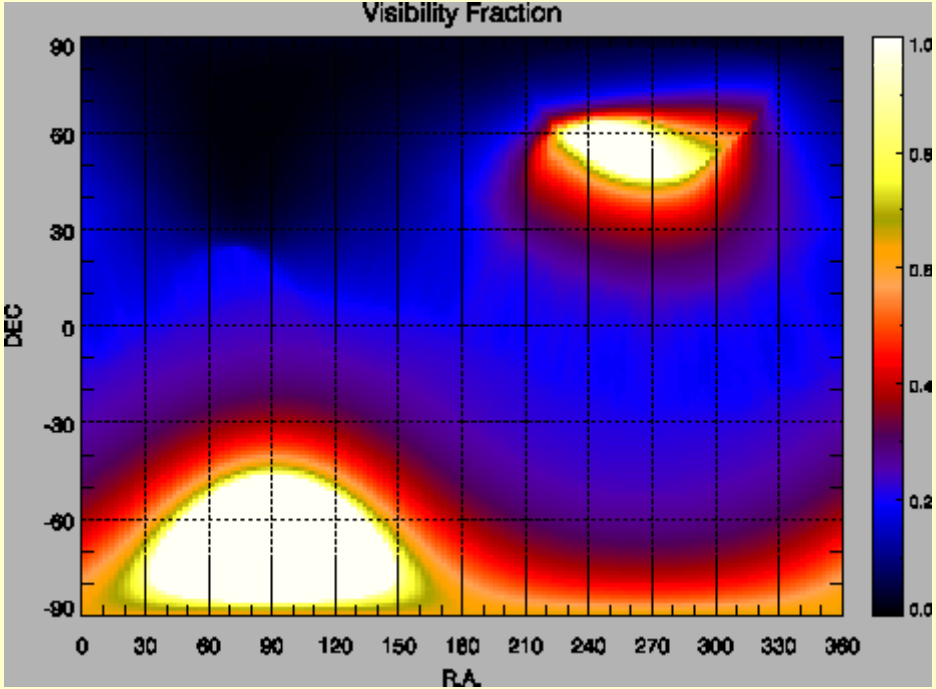
Constraints (examples)

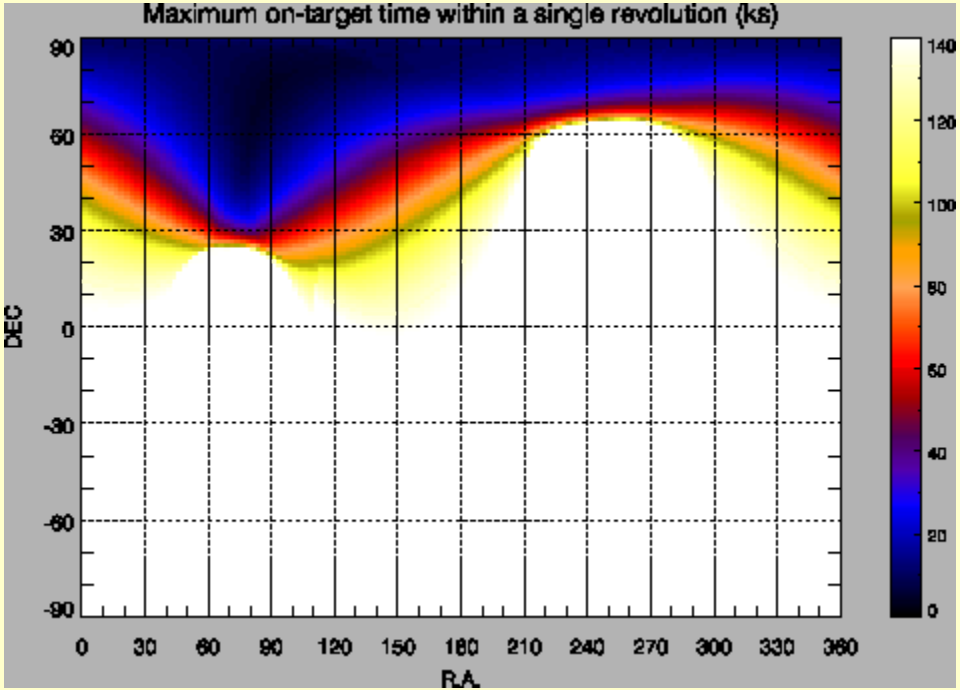
- No observations while passing through **radiation belts**
- **Orientation** of space craft to sun
- **Large avoidance** angles around Sun and **anti-Sun**, Moon, Earth, Bright planets
- **No slewing over Moon and Earth** (planets ok)
- **Availability of ground stations**
- **No commanding during ground-station handovers**
- Down times during maintenance

Some constraints only known a short time in advance
=> Flexibility with long-term planning

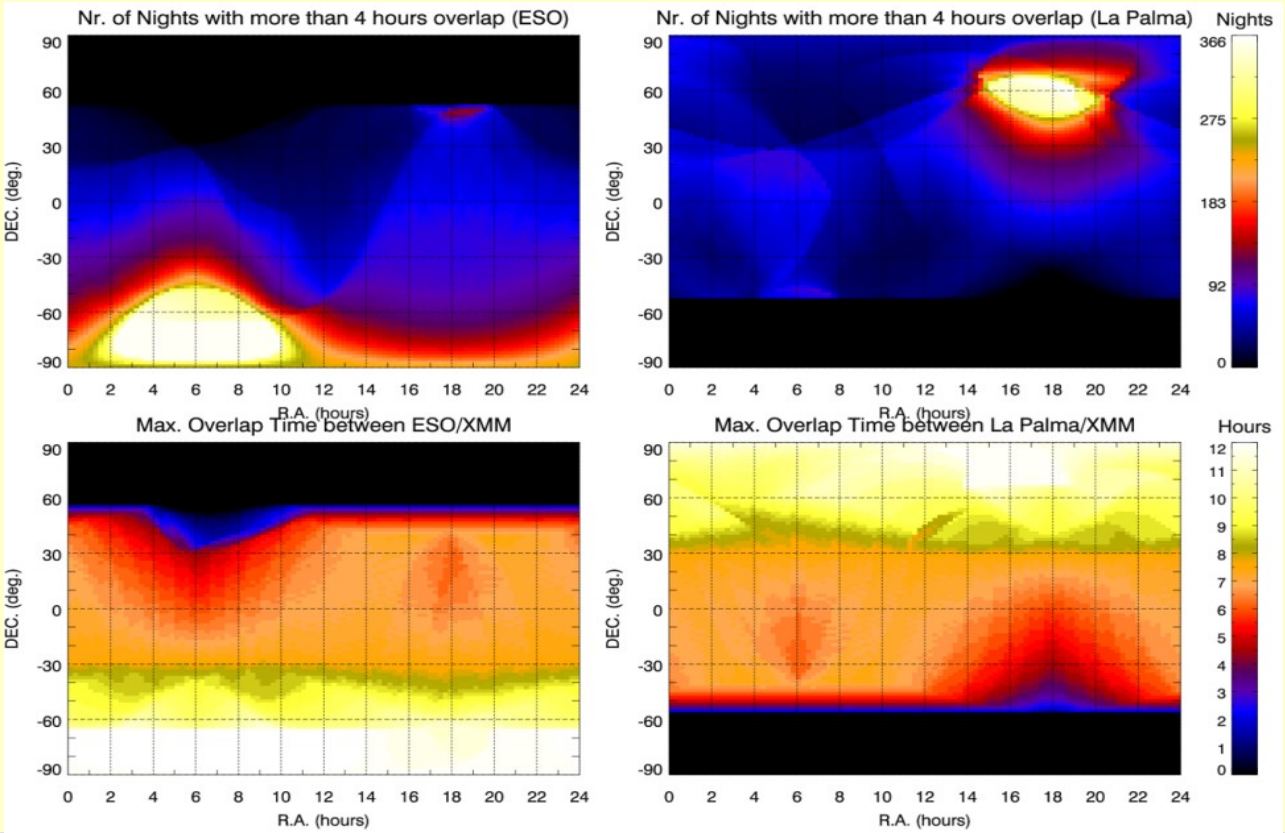
Space-specific constraints in bold red

Observing Constraints
XMM-Newton



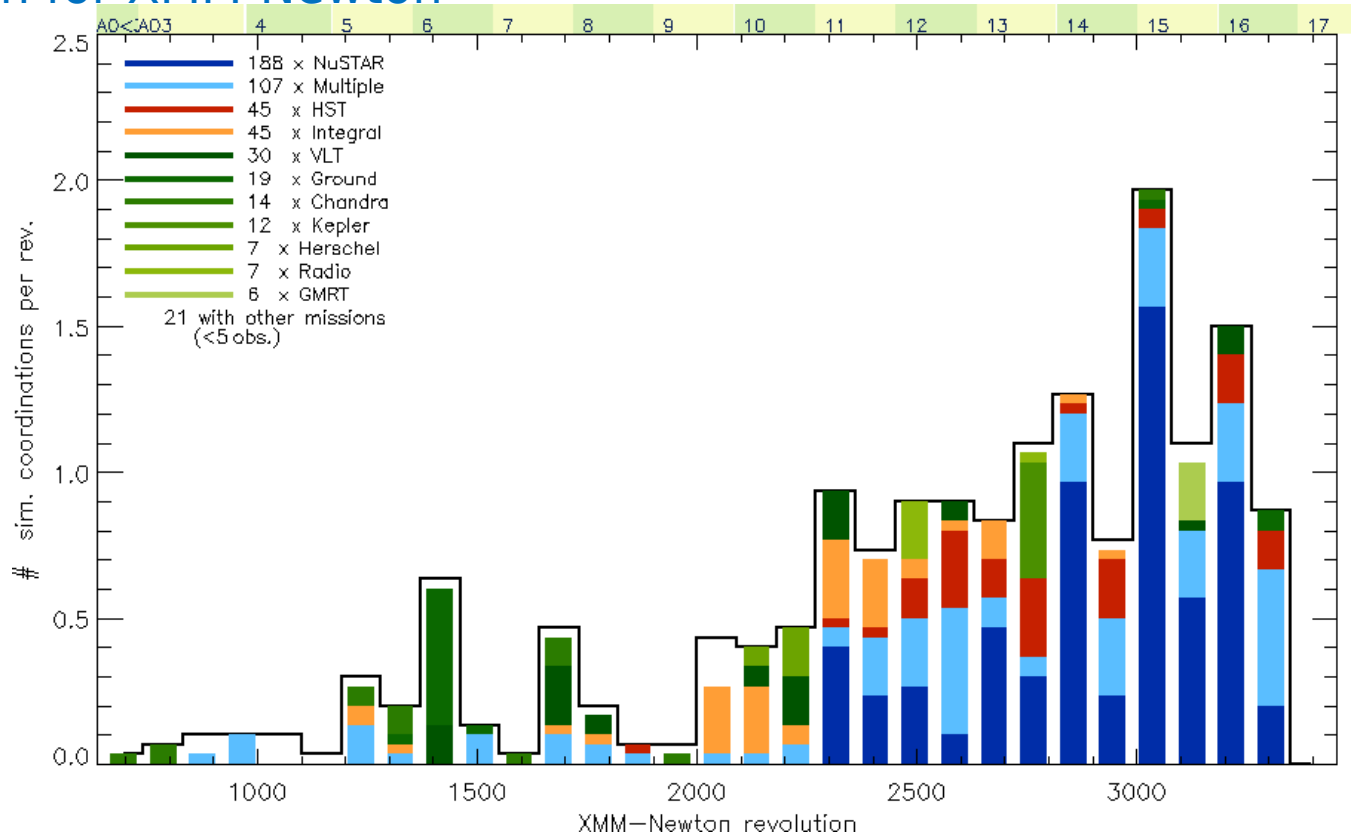


Observing Constraints
XMM-Newton plus others



Increasing Demand for Coordinated observations

Evolution for XMM-Newton



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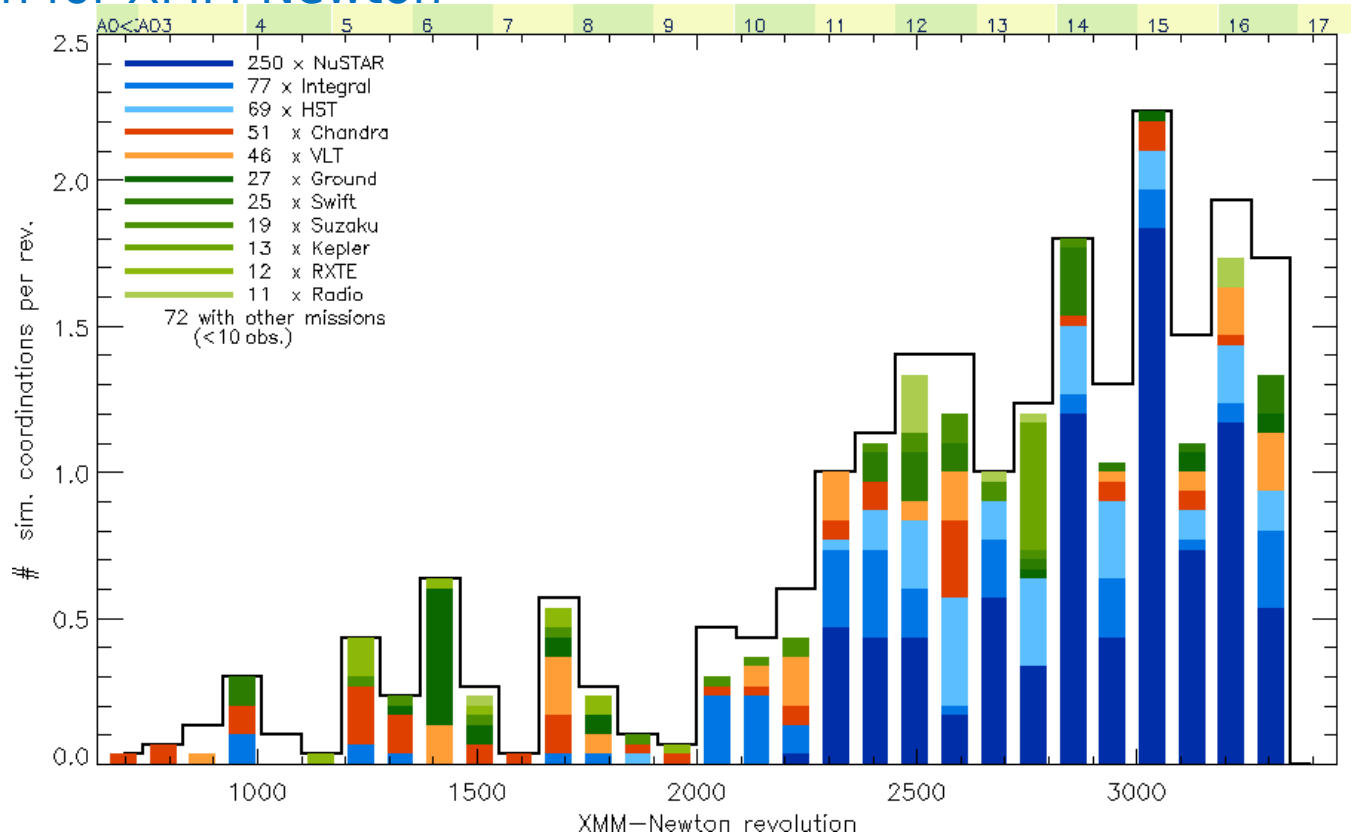
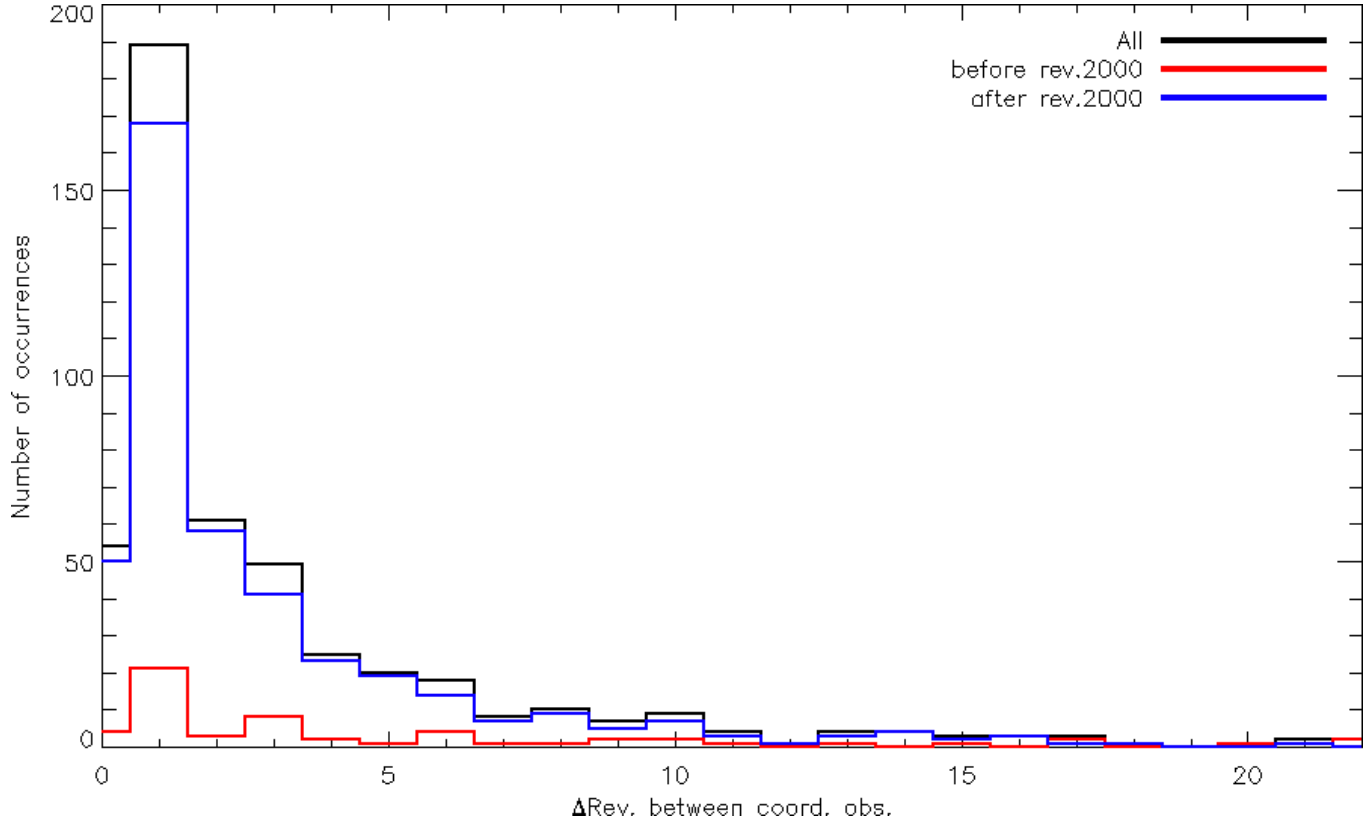
Evolution for XMM-Newton



Increasing Demand for Coordinated observations

Evolution for XMM-Newton



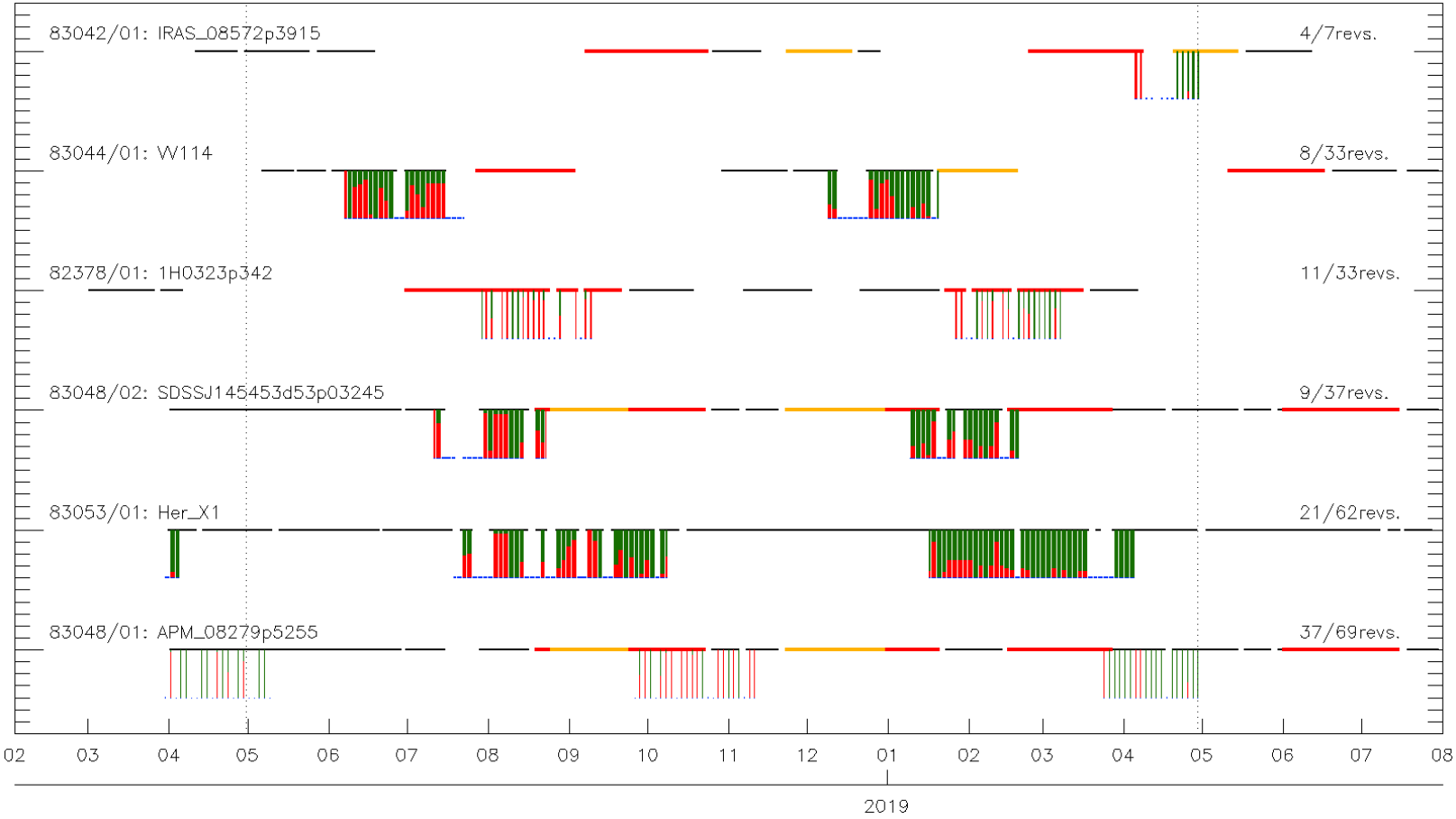
Coordination with other observatories

Strategies:

- Before planning coordinated observations, need to have all “own” time-critical observations planned
- Important to keep record of margins for later steps
- Determine constraint-free observing slots of own facility
- Present available slots to other facilities and determine overlap
- Some agreements may contain the more flexible observatories to follow the scheduling of the less flexible ones

Thus, manoeuvre around own constraints and other constraints:

- Visibility hard constraints
- Observing Plan soft constraints depending on priorities


83042/01: IRAS_08572p3915
4/7revs.
83044/01: W114
8/33revs.
82378/01: 1H0323p342
11/33revs.
83048/02: SDSSJ145453d53p03245
9/37revs.
83053/01: Her_X1
21/62revs.
83048/01: APM_08279p5255
37/69revs.
02
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2019

All information needed to plan an observation (via AO or ToO) is currently in facilities own web pages.

Target Visibility Constraints

Instrument characteristics

BUT

Short-term schedule

Observations info

Long-term schedule

This information is usually shown in a web page statically and is only accessible trough forms that have to be manually filled in.

All information about Target Visibility Checks is there...

ISAAC NEWTON GROUP OF TELESCOPES

About ING ▾ Astronomy ▾ Developments ▾ Public Information ▾ Search:

Home > Astronomy > *Object Visibility*

Object Visibility – STARALT

Staralt is a program that shows the observability of objects in various ways: either you can plot altitude against time for a particular night (**Staralt**), or plot the path of your objects across the sky for a particular night (**Startrack**), or plot how altitude changes over a year (**Starobs**), or get a table with the best observing date for each object (**Starmult**). For further information, click on the "help" button at the bottom of the page.

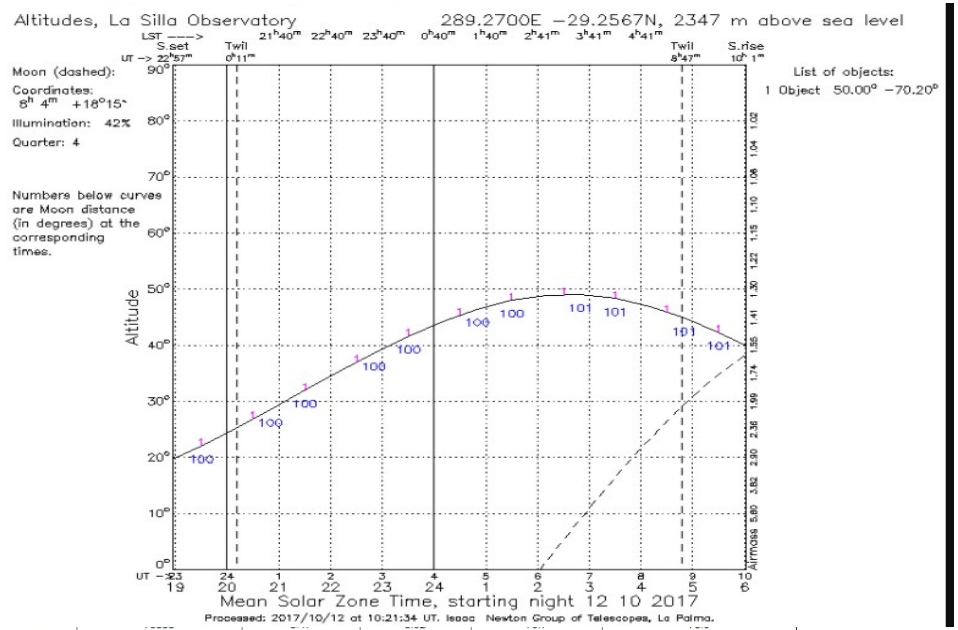
Mode	Staralt ▾
Night	12 ▾ October ▾ 2017 ▾ or date when the local night starts. *Staralt, Startrack only.*
Observatory	La Silla Observatory (Chile) ▾ Select one above or specify your own site with this format: `Longitude(°East) Latitude(°) Altitude(metres) UTC offset(hours)` Ex.: `289.2767 -30.2283 2725 -4`

Coordinates	Formats can be any of these:
	`name hh mm ss ±dd mm ss`
	`name hh:mm:ss ±dd:mm:ss`
	`name ddd.ddd dd.ddd`
	name must be a single word with no dots, avoid using single numbers. Every entry must be in the same format, do not use different formats with different entries. We recommmend a maximum of 100 targets per submission.
	50.0 -70.2

TY CHECKER

TS RETURNED BELOW.

Go!




```
RA & dec:   5 23 34.5, -69 45 22, epoch 2000.0
Site long&lat:  +4 41 36.8 (h.m.s) West, -24 37 30 North

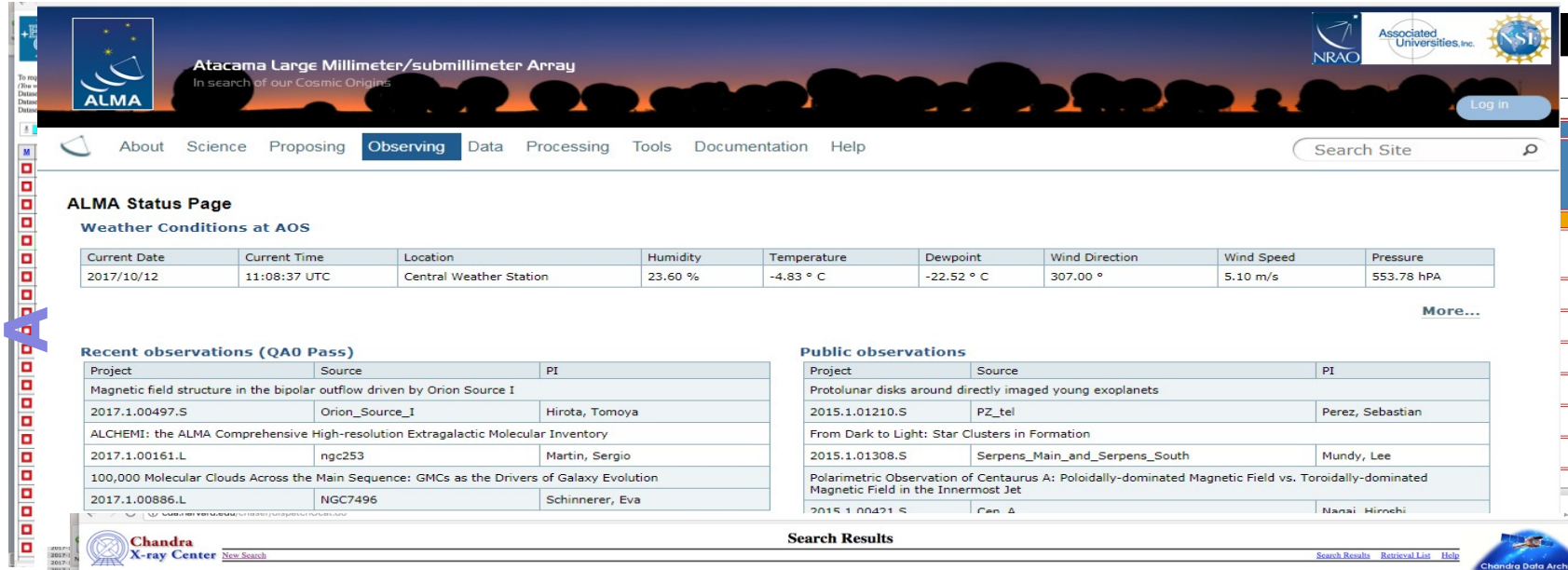
Shown: local eve. date, moon phase, hr ang and sec.z at
(2) natural center of night, and (3) morning twilight; t
nighttime hours during which object is at sec.z less tha
Night (and twilight) is defined by sun altitude < -18.0

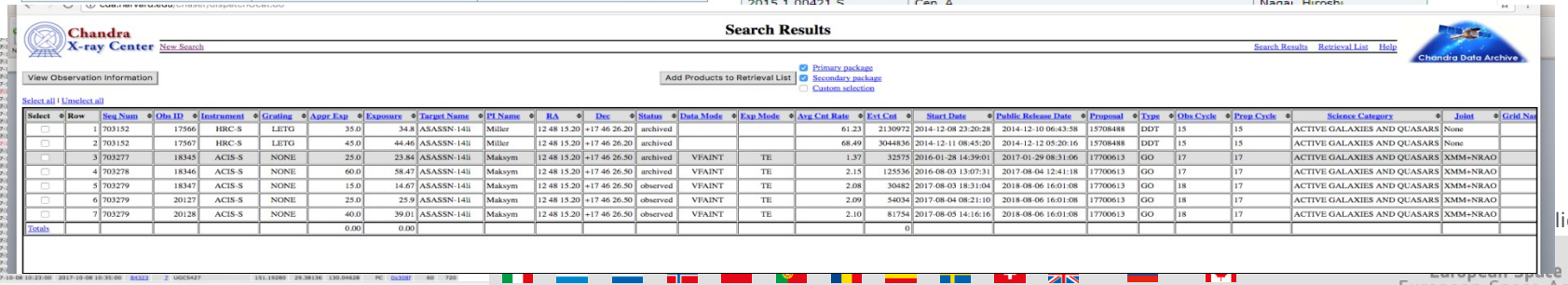
 Date (eve) moon      eve            cent           morn
                    HA  sec.z      HA  sec.z      HA  se
2017 Nov 3    F   -6 52   3.1    -2 45   1.6    +1 21
2017 Nov 17   N   -5 44   2.4    -1 49   1.5    +2 07
```

Rev.	(yyyy-mm-dd hh:mm)	Duration (s)	(yyyy-mm-				
3397	2018-06-28 02:58	27036	2018-06-28 10:29				
3398	2018-06-29 12:49	78126	2018-06-30 10:31				
3399	2018-07-01 12:42	78063	2018-07-02 10:23				
3400	2018-07-03 12:35	77939	2018-07-04 10:14				
3401	2018-07-05 12:29	77804	2018-07-06 10:06	75000	0.47	0.92	77.3	69.5
3402	2018-07-07 12:22	77715	2018-07-08 09:58	75000	0.47	0.92	78.8	68.5
3403	2018-07-09 12:15	78302	2018-07-10 10:00	75000	0.47	0.93	80.4	67.4
3404	2018-07-11 12:07	78348	2018-07-12 09:53	75000	0.47	0.93	82.0	66.3

SkyCalc provided by courtesy of John Thorstensen, Dartmouth College. *John.Thorstensen@dartmouth.edu*

And information about scheduled observation...





ObsTap as existing standard

… Core components of the Observation data model that are necessary to perform data discovery when querying data centres for astronomical observations of interest …

Extend this standard to be used for visibility check and scheduled observation info

obs_id	unitless	String	Observation ID	OBS_ID
obs_publisher_did	unitless	String	Dataset identifier given by the publisher	?
access_url	unitless	String	URL used to access (download) dataset	TBD
access_format	unitless	String	File content format (see in App. **Error! Reference source not found.**)	NULL
access_estsize	kbyte	integer	Estimated size of dataset in kilo bytes	NULL
target_name	unitless	String	Astronomical object observed, if any	"Target" ?
s_ra	deg	double	Central right ascension, ICRS	RA
s_dec	deg	double	Central declination, ICRS	DEC
s_fov	deg	double	Diameter (bounds) of the covered region	Fixed value for each XMM-Newton Instrument
s_region	unitless	String	Sky region covered by the data product (expressed in ICRS frame)	TBD, not easy for RGS

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Observation Data Model Core Components and its Implementation in the Table Access Protocol

The XMM-Newton & Integral: Visibility

XMM-Newton

http://xmm.esac.esa.int/XMMVisCheck?
startDate=11-10-2017&
minduration=12.000&
coordinates=equatorial&
ra=192.063458&
dec=17.77394

INTEGRAL

http://integral.esac.esa.int//IntegralVisCheck?
startDate=11-10-2017&
minduration=12.000&
coordinates=equatorial&
ra=192.063458&
dec=17.77394

xmm.esac.esa.int/XMMVisCheck?ra=321&dec=34&minDuration=5000&startdate=20-Dec-2017&enddate=20-Dec-2018&coordinates=equatorial


```
[{"SolarA":"89.3","Rev":"3293","VisStar":"2017-12-01 10:19","AstroA":"241.2","VisEnd":"2017-12-03 01:12","StarPh":"0.12","Round":"130000","VisDur":"139962","EndPh":"0.93"},
{"SolarA":"87.9","Rev":"3294","VisStar":"2017-12-03 10:11","AstroA":"239.7","VisEnd":"2017-12-05 00:54","StarPh":"0.12","Round":"130000","VisDur":"139376","EndPh":"0.93"},
{"SolarA":"86.5","Rev":"3295","VisStar":"2017-12-05 10:05","AstroA":"238.2","VisEnd":"2017-12-07 00:47","StarPh":"0.12","Round":"130000","VisDur":"139318","EndPh":"0.93"},
{"SolarA":"85.1","Rev":"3296","VisStar":"2017-12-07 09:59","AstroA":"236.8","VisEnd":"2017-12-09 00:39","StarPh":"0.12","Round":"130000","VisDur":"139189","EndPh":"0.93"},
{"SolarA":"83.7","Rev":"3297","VisStar":"2017-12-09 09:53","AstroA":"235.3","VisEnd":"2017-12-11 00:31","StarPh":"0.12","Round":"130000","VisDur":"139045","EndPh":"0.93"},
{"SolarA":"82.3","Rev":"3298","VisStar":"2017-12-11 09:46","AstroA":"233.8","VisEnd":"2017-12-13 00:12","StarPh":"0.12","Round":"130000","VisDur":"138334","EndPh":"0.92"},
{"SolarA":"80.9","Rev":"3299","VisStar":"2017-12-13 09:39","AstroA":"232.3","VisEnd":"2017-12-15 00:03","StarPh":"0.12","Round":"130000","VisDur":"138278","EndPh":"0.92"},
{"SolarA":"79.5","Rev":"3300","VisStar":"2017-12-15 09:31","AstroA":"230.7","VisEnd":"2017-12-16 23:55","StarPh":"0.12","Round":"130000","VisDur":"138259","EndPh":"0.92"},
{"SolarA":"78.1","Rev":"3301","VisStar":"2017-12-17 09:23","AstroA":"229.2","VisEnd":"2017-12-18 23:47","StarPh":"0.12","Round":"130000","VisDur":"138228","EndPh":"0.92"},
{"SolarA":"76.7","Rev":"3302","VisStar":"2017-12-19 09:17","AstroA":"227.7","VisEnd":"2017-12-20 23:29","StarPh":"0.12","Round":"130000","VisDur":"137542","EndPh":"0.92"},
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{"SolarA":"71.6","Rev":"3306","VisStar":"2017-12-27 08:52","AstroA":"222.3","VisEnd":"2017-12-28 01:42","StarPh":"0.12","Round":"60000","VisDur":"60634","EndPh":"0.48"}]
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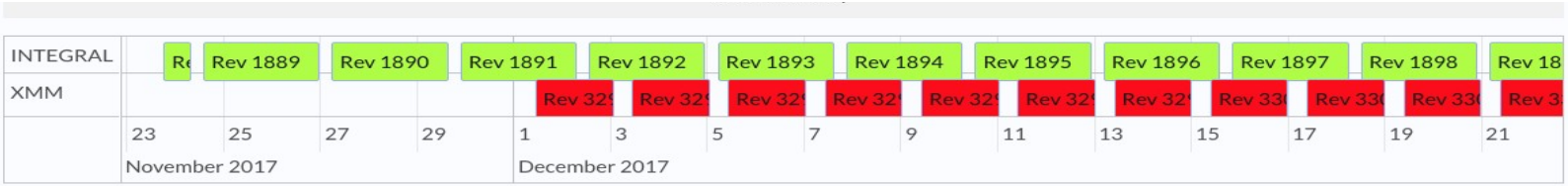

The XMM-Newton & Integral: Observation Info

XMM-Newton

http://xmm.esac.esa.int/XMMVisCheck?
coordinates=equatorial&
ra=192.063458&
dec=17.77394

INTEGRAL

http://integral.esac.esa.int//IntegralVisCheck?
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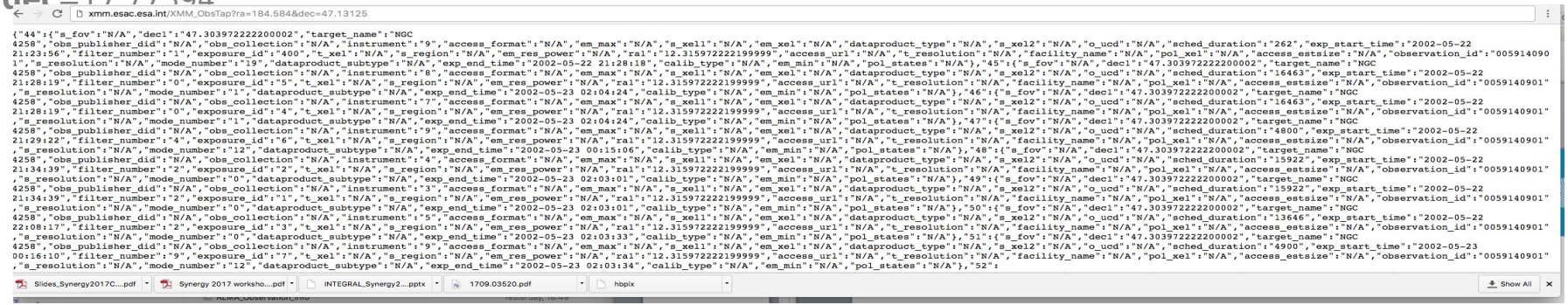
ra=192.063458&
dec=17.77394



Summary

- Increasing demand for multi-mission coordinations
- Challenges:
  - Diverse formats of hard constraints (visibility)

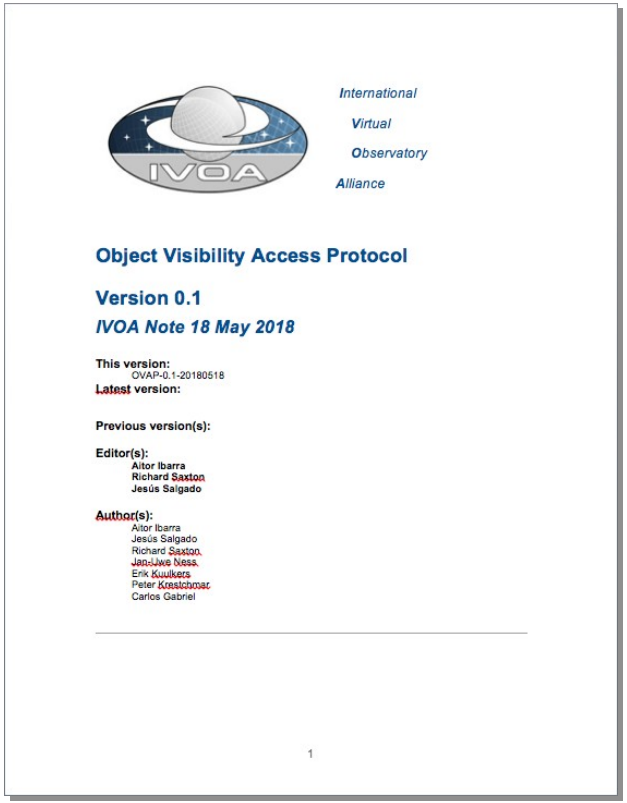
  => Needed to find common slots (Can observe?)

  Diverse formats of observing plans (Will observe?)

  => Needed to find common slots with lowest scientific impact
- Solutions:

Standard of visibility and observing information

=> machine readable, interface with optimization routines (clients)



International Virtual Observatory Alliance

Object Visibility Access Protocol

Version 0.1

IVOA Note 18 May 2018

This version:
OVAP-0.1-20180518
Latest version:

Previous version(s):

Editor(s):
Aitor Ibarra
Richard Saxton
Jesús Salgado

Author(s):
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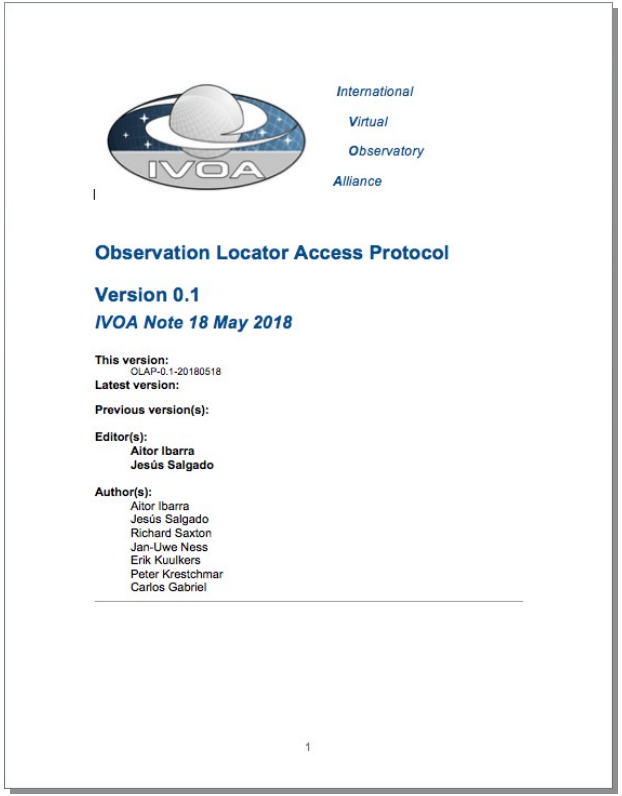
OVAP IVOA Note



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Observation Locator Access Protocol

Version 0.1

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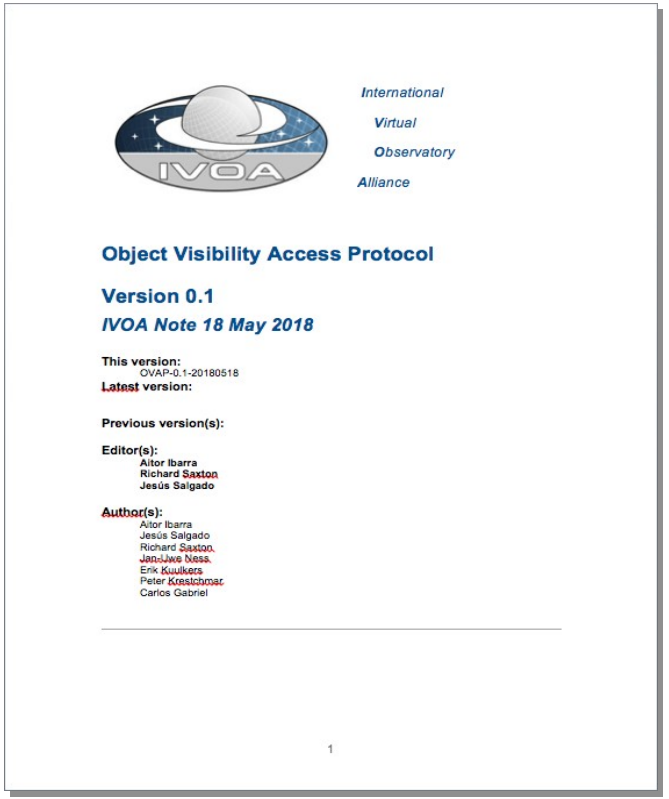
OLAP IVOA Note

1. Simple Access Protocol
2. Easy to implement for the different observatories
3. Already available in a non-standard way in many cases
4. Based on “parameter=value” approach
5. VOTable response

6. Analyzed to be done as a TAP protocol but it was not so easy to implement



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If interested to collaborate, contact any of us!

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