State of the IVOA

Groningen, Netherlands
11 October 2019

Mark Allen

Centre de Données astronomiques de Strasbourg
Chair of the IVOA Executive Committee

IVOA Interoperability Meeting
Opening Session

Credit: X-ray: NASA/CXC/CfA/R. Tullmann et al.; Optical: NASA/AURA/STScI

Hosted by

ASTRON

OmegaCEN

university of groningen

ADASS XXIX Organising Institutions

ADASS XXIX

DOTLivePlanetarium Theatre

Sponsored by

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SRON
Netherlands Institute for Space Research

DSSC
Data Science & Systems Complexity

CHANDRA
X-RAY OBSERVATORY

CADC/CCDA
NRC·CNRC Canada

esa

VOBs.it

CDS
Centre de Données
astronomiques de Strasbourg

IVOA in 2019

- **21** diverse member projects
- 2 well attended Interoperability meetings per year
  - May
  - Oct/Nov with ADASS

- 6 Working Groups, 7 Interest Groups
  - Completely open to participation
- Technical coordination Group (TCG)
- Committee for Science Priorities (CSP)
- Media Group
- Document Coordinator
- Executive committee

Credit: X-ray: NASA/CXC/CfA/R. Tullmann et al.; Optical: NASA/AURA/STScI

Astro Grid
ArVO
Armenian Virtual Observatory
ASVO
ALL SKY VIRTUAL OBSERVATORY
BRAVO
China-VO
ChiVO
CHILEAN VIRTUAL OBSERVATORY
CVO
esa
European Space Agency
France
IVOA
EURO VO
GERMAN ASTROPHYSICAL
GAVO
VIRTUAL OBSERVATORY
HVO
Hungarian Virtual Observatory
Japanese Virtual Observatory
JVO
NOVA
RVO
NRF
National Research Foundation
SA3
South African Astroinformatics Alliance
SVO
UKR VO
USVOA
VObs.it
vo-i

VO and IVOA

Vision of the VO:

- Astronomical datasets, tools, services should work seamlessly together

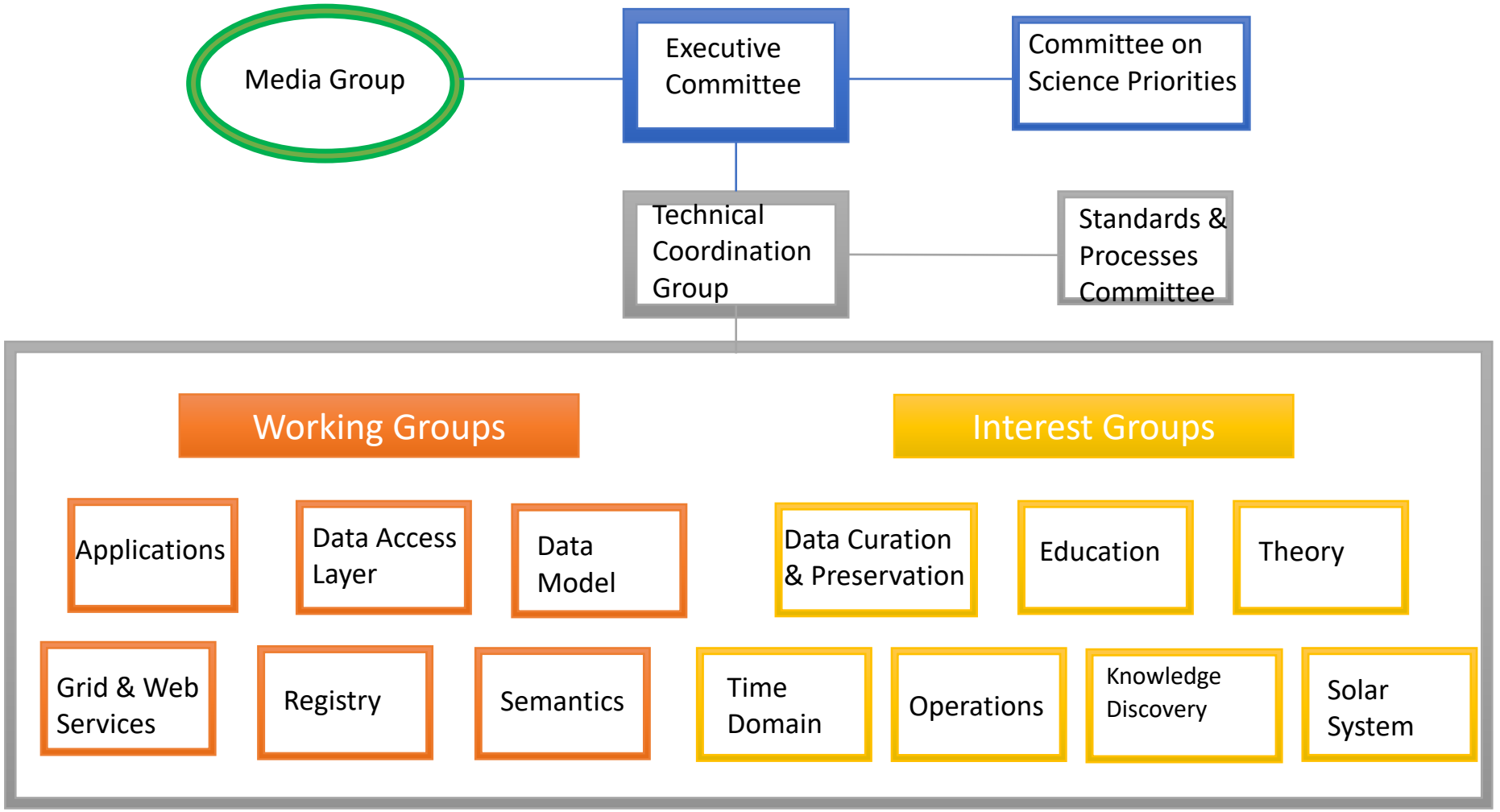
IVOA:

- An organisation that debates and agrees the technical standards that are needed to make the VO possible
- A focal point for VO aspirations, a framework for discussing and sharing VO ideas and technology
- Promoting and publicising the VO

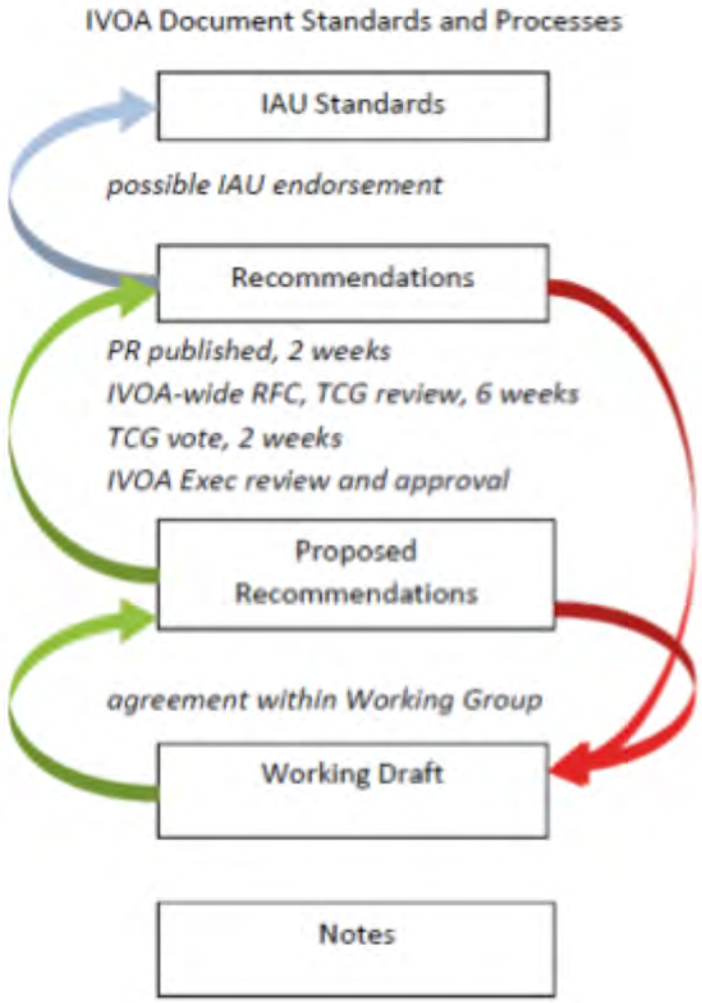
Changing Scientific landscape

- Multi-messenger astrophysics
- Time Domain Astronomy – movie of the sky surveys/projects
- Rise of python – users and data centres
- Science analysis platforms: how will users access and analyse data?
- Prominence of machine learning
- Big Data
  - Scalability of data access mechanisms
  - Code to the data
- **See the CSP presentation!**

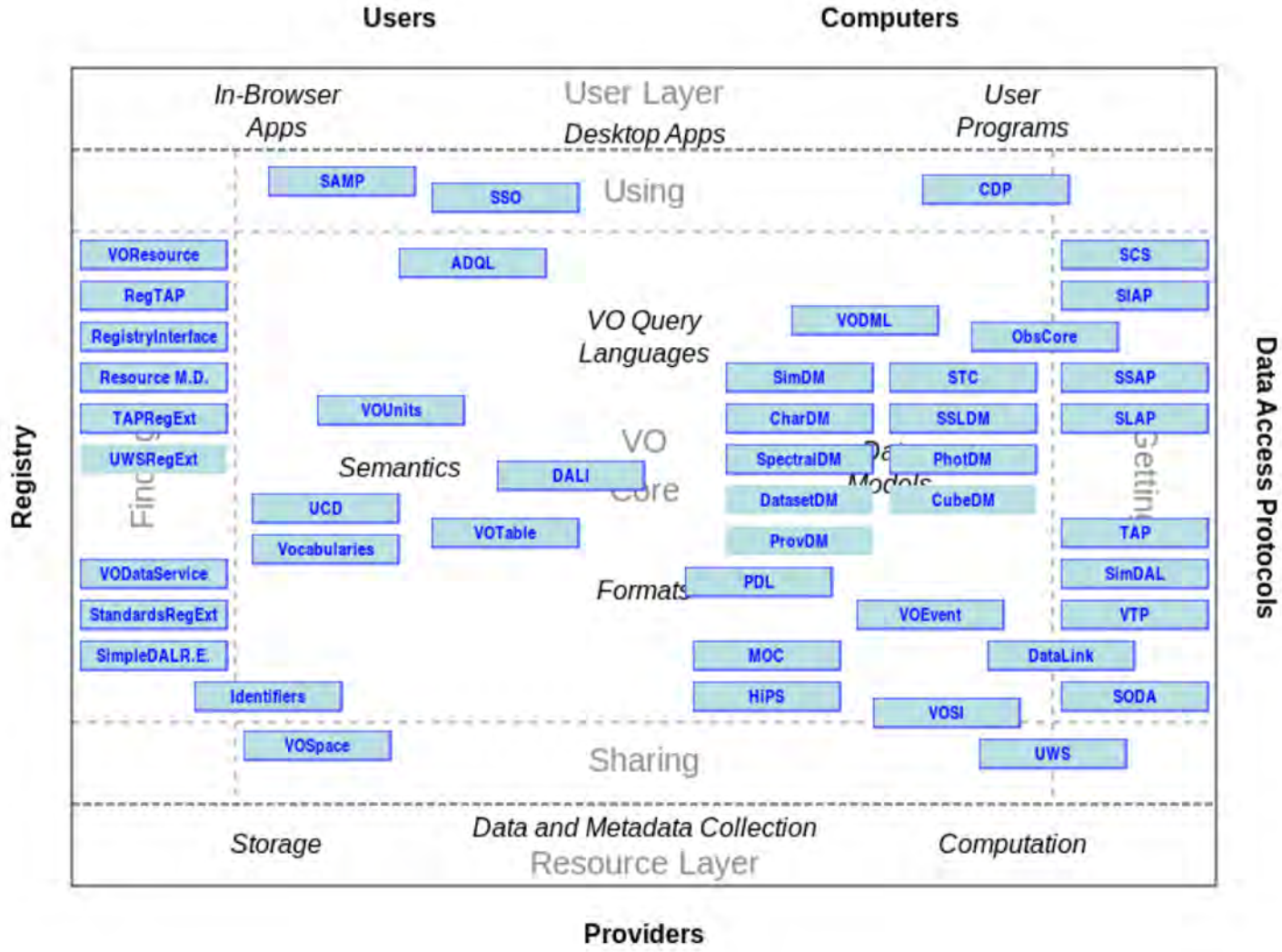
IVOA Organization Chart



Process



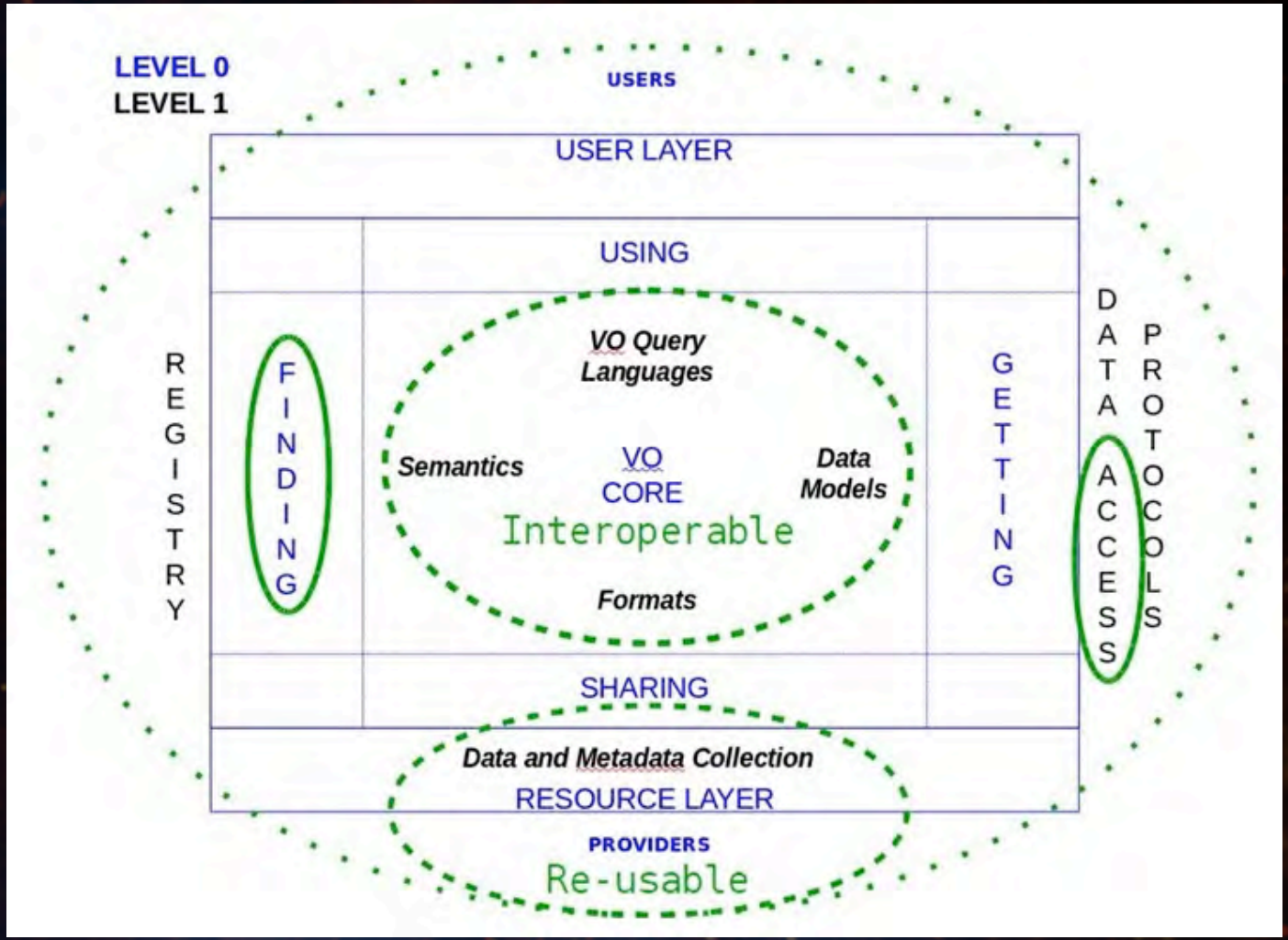
IVOA Standards



VO is FAIR

Making data:

***F**indable*
***A**ccessible*
***I**nteroperable*
***R**eusable*



Credit: X-ray: NASA/CXC/CfA/R. Tullmann et al.; Optical: NASA/AURA/STScI

Recent standards approved as IVOA Recommendations

- Table Access Protocol Version 1.1 (TAP-1.1) : *Approved September 27, 2019*
- Maintenance of the list of UCD words Version 2.0 : *Approved September 27, 2019*
- IVOA Registry Relational Schema Version 1.1 (RegTAP-1.1) : *Approved October 07, 2019*
- MOC - HEALPix Multi-Order Coverage map Version 1.1 (MOC-1.1) : *Approved October 07, 2019*
- VOTable Format Definition Version 1.4 (VOTable-1.4) : *Approved October 07, 2019*

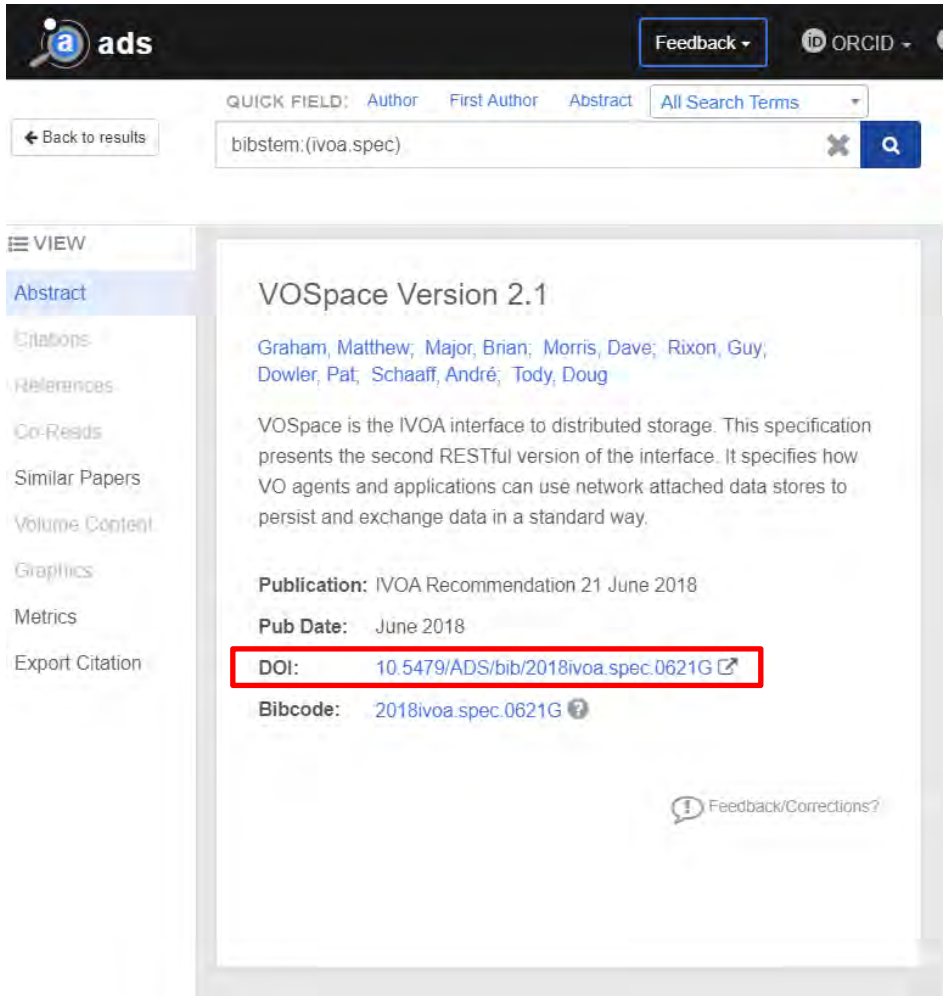
DOIs for IVOA Standards and Endorsed Notes

ADS is now providing DOIs for all IVOA Standards and Endorsed Notes

- See them all at http://tinyurl.com/y5vyavg7

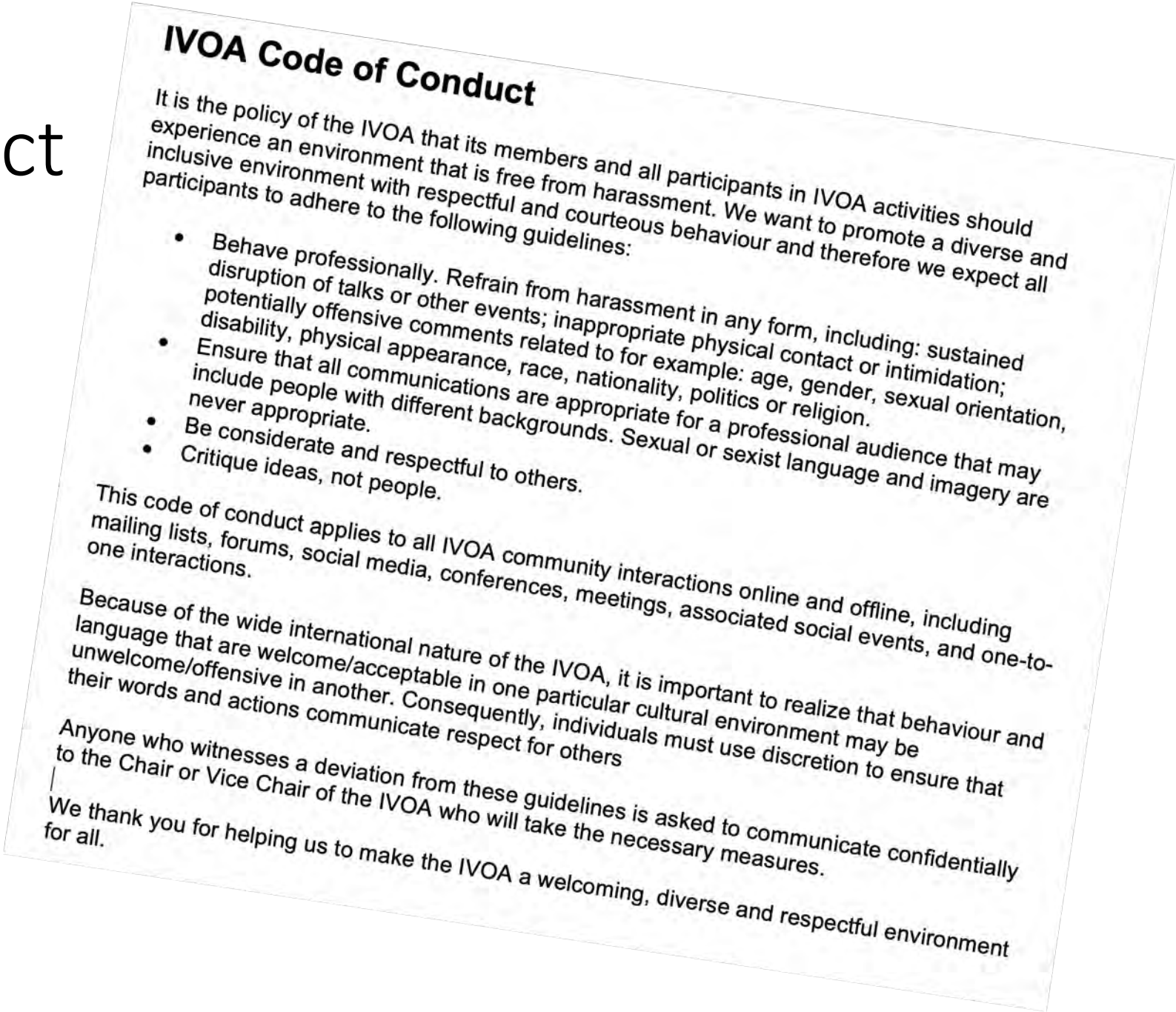
Still to be done

- Update all existing IVOA standards / EN landing pages to include their DOI
- Update procedure when a new REC / EN so it includes the ADS registration and its DOI
- Make reference to the ADS DOIs in other systems when IVOA standards/EN are registered (eg FAIRSharing)



Draft
Code of Conduct

- Seeking feedback



IVOA Code of Conduct

It is the policy of the IVOA that its members and all participants in IVOA activities should experience an environment that is free from harassment. We want to promote a diverse and inclusive environment with respectful and courteous behaviour and therefore we expect all participants to adhere to the following guidelines:

- Behave professionally. Refrain from harassment in any form, including: sustained disruption of talks or other events; inappropriate physical contact or intimidation; potentially offensive comments related to for example: age, gender, sexual orientation, disability, physical appearance, race, nationality, politics or religion.
- Ensure that all communications are appropriate for a professional audience that may include people with different backgrounds. Sexual or sexist language and imagery are never appropriate.
- Be considerate and respectful to others.
- Critique ideas, not people.

This code of conduct applies to all IVOA community interactions online and offline, including mailing lists, forums, social media, conferences, meetings, associated social events, and one-to-one interactions.

Because of the wide international nature of the IVOA, it is important to realize that behaviour and language that are welcome/acceptable in one particular cultural environment may be unwelcome/offensive in another. Consequently, individuals must use discretion to ensure that their words and actions communicate respect for others

Anyone who witnesses a deviation from these guidelines is asked to communicate confidentially to the Chair or Vice Chair of the IVOA who will take the necessary measures.

We thank you for helping us to make the IVOA a welcoming, diverse and respectful environment for all.

IVOA Media Group

Social media: Follow us and help spread the IVOA word! Interop: #ivoa19nl

Twitter: https://twitter.com/IVOAastro

Facebook: https://www.facebook.com/IVOAastro

Weibo (in chinese): https://m.weibo.cn/p/1005056397469427

Outreach: Handout material, templates, slides, stickers, examples, and the Corporate Design Document available at:

https://wiki.ivoa.net/twiki/bin/view/IVOA/MediaGroup

Newsletter: Send articles for the next IVOA newsletter, deadline: ???

Send to: ivoa-news-editors@ivoa.net

Contact us media@ivoa.net ***+ New members welcome!!***

Newsletter – latest issue: September 2019

IVOA Newsletter - September 2019

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IVOA Newsletter Editors: Deborah Baines, Bruce Berriman, Jamie Anne Budynkiewicz, Theresa Dower, Giulia Iafrate, Shanshan Li, Simon O'Toole, Yihan Tao.

The International Virtual Observatory Alliance (IVOA) was formed in June 2002 with a mission to facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating virtual observatory. The IVOA now comprises 20 VO programs from Argentina, Armenia, Australia, Brazil, Canada, Chile, China, Europe, France, Germany, Hungary, India, Italy, Japan, Russia, South Africa, Spain, Ukraine, the United Kingdom, and the United States and an inter-governmental organization (ESA). Membership is open to other national and international programs according to the IVOA Guidelines for Participation. You can read more about the IVOA and what we do at http://ivoa.net/about/.

What is the VO?

The Virtual Observatory (VO) aims to provide a research environment that will open up new possibilities for scientific research based on data discovery, efficient data access, and interoperability. The vision is of global astronomy archives connected via the VO to form a multiwavelength digital sky that can be searched, visualized, and analyzed in new and innovative ways. VO projects worldwide working toward this vision are already providing science capabilities with new tools and services. This newsletter, aimed at astronomers, highlights VO tools and technologies for doing astronomy research, recent papers, and upcoming events.

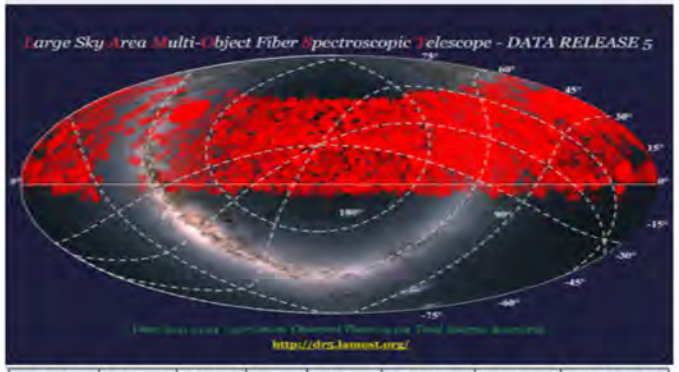
IVOA NEWS

VO APPLICATIONS A

A search engine for the IVOA documentatio
We provide a web application for textual se
IVOA recommendations and notes. The obje
users toward the documents answering
Documents are all downloaded from the I
page. They are then split into small parts tha
Elastic Search. Users can then retrieve th
matching the searched words.

More information:http://saada.unistra.fr/esdoc/i

A 3-color map of a 6° region of ρ Ophiuchus in
WISE bands W1, W3 and W4 (3.4, 12 and 22



Total Spectra	Star	Galaxy	Quasars	Unknown	AFGK Star Catalog	A Star Catalog	M Dwarf Catalog
9,026,365	8,183,160	152,863	52,453	637,889	5,348,712	439,920	534,393

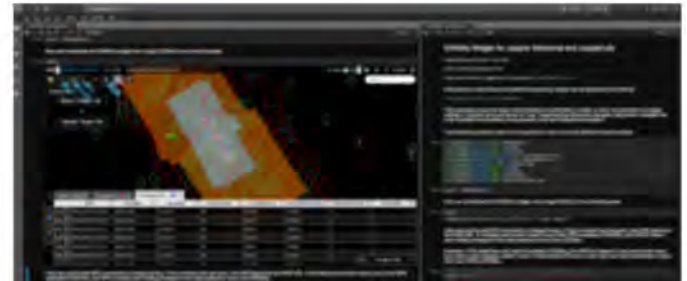
The website of LAMOST DR5 (top); footprints of the LAMOST pilot survey and the first five years' regular survey (middle); statistics of LAMOST DR5 (bottom).

LAMOST Releases the Fifth Data Release (DR5) Internationally
LAMOST published its fifth Data Release (DR5) to astronomers worldwide on June 26, 2019, according to the international astronomical practice and "the LAMOST Spectral Survey Data Policy". It includes all spectra obtained during the pilot survey and the first five years' regular survey. Scientific users can log on to the website powered by the China-VO at http://dr5.lamost.org for data query and download. The data release complies with multiple IVOA standards and protocols, including Simple Cone Search, Simple Spectral Access (SSA), Simple Application Messaging Protocol (SAMP), etc.

Through LAMOST DR5, a total number of 9.02 million spectra were released to the international community. Additionally, a catalog which provides stellar parameters of 5.34 million stars was also released internationally in this data set. The catalog will also be included in CDS VizieR. LAMOST DR5 has thus resulted in the largest public spectral data set and stellar parameter catalog in the world at present!

More information: http://dr5.lamost.org

pyESASky: An ESASky widget for Jupyter
ESASky allows scientists to explore large collections of astronomical data with the click of a button. At the same time, Jupyter Notebook and, more recently, JupyterLab provide the framework for quick and effective manipulation, visualisation and analysis of datasets. To take advantage of both tools, at the ESAC Science Data Centre (ESDC) we have developed



IVOA Web and Wiki pages - update

- Web and wiki to be hosted in Trieste, Italy (Vobs.it)
  - Transfer in the hands of Trieste & IUCAA
  - **News: Planned for the end of 2019**
- Developer resources being arranged in Italy
  - **Person in place since March 2019**

- Plans for new web site design have been made by the IVOA Media Group
  - Progress now dependent on resources

VO apects shown at ADASS

Selected topics *(in no way complete)* :

- Chandra Source catalog Focus Demo
- TAP and other VO protocols at NED
- VO compliant APIs for Euclid archive system
- Cut-out service for all HiPS data sets – hips2fits
- Efforts for access to VO resources via emerging Science Platforms
- Widespread use of VO: standards/tools/services/data
- Proof of concept – Space & time indexing of data

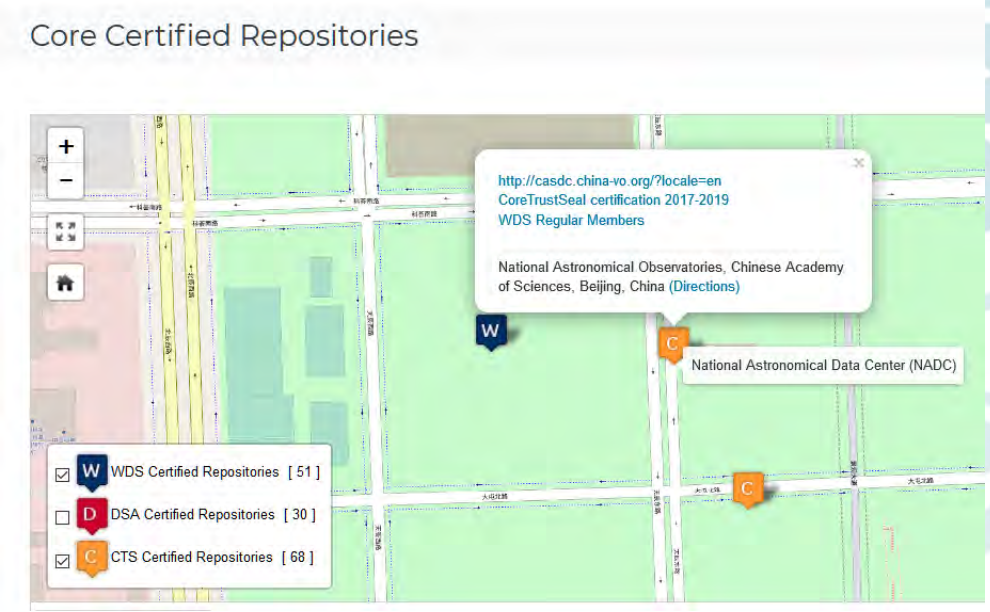
News from IVOA members

For the set of reports from IVOA members

– see the Exec meeting page: Aiming to be complete!

China-VO: NADC Announced in June

- National Astronomical Data Center (NADC) was announced by Chinese government in June as one of the first 20 national scientific data centers.
- Its information at CoreTrustSeal system is updated.
- NADC will become the official backend platform for the China-VO
- Many Data-driven Education & Outreach events

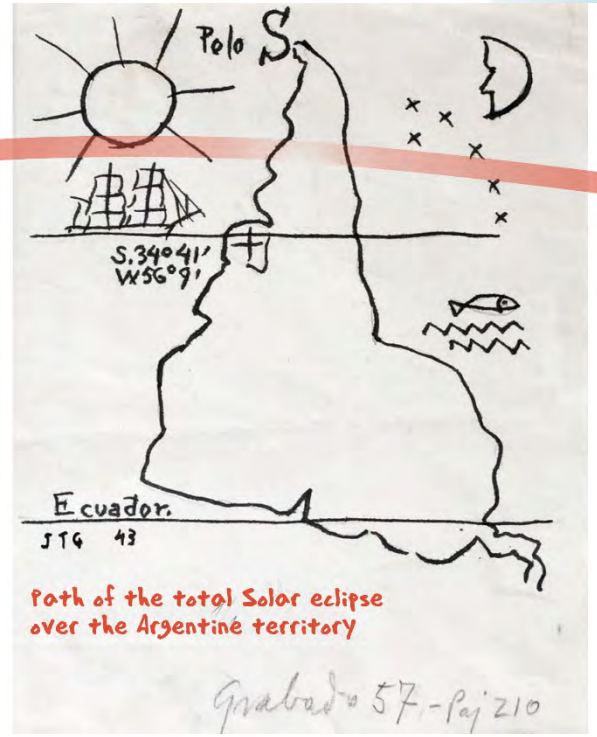


IWCC is unveiled in June

- Informatization Working Committee, Chinese Astronomical Society, was unveiled on June 13, 2019.
- 4 working groups established:
  - Research Informatization WG
  - Management Informatization WG
  - Cyber-infrastructure WG
  - Education and Outreach Informatization WG
- IWCC is the China-VO's position at Chinese Astronomical Society.

Topics:

- State-of-the-art of astronomy education in countries/continents in the framework of the 2020-2030 IAU plan.
- Meta-analysis of astronomy education research on contents/school grade levels/focus on education cross studies.
- Literacy in Astronomy.
- Innovations in education methodologies and instrumentation.
- Research into the value and influence of astronomy education in other disciplines.
- Big Data in education and Open Astronomy.
- Astronomy as an interdisciplinary approach to science education in all levels.
- Inclusive education in Astronomy.
- Use of Astronomy Education Research experiments and results by teachers and in informal education activities (museum, planetarium, etc).
- Cultural Astronomy and heritage and education: from Stonehenge to the Space telescopes.



IAUS 367: 9 – 14, Dec. 2020 – San Carlos de Bariloche, Argentina
http://sion.frm.utn.edu.ar/iaus367/

The first IAU symposium on education?

SVO – Spanish Virtual Observatory

- SVO Data Centre
  - Development of pipelines to ingest science-ready data into the Calar Alto and GTC VO-compliant archives
- VO-science: 4 refereed papers including SVO staff.
  - E.g.
    - The CARMENES search for exoplanets around M dwarfs. Different roads to radii and masses of the target stars (2019A&A...625A..68S) → **Featured Science Publication in IVOA Newsletters**
- Tools: VOSA
  - Ten new refereed papers using VOSA (since May 2019)
  - More than 500 new users have analysed ~ 1 000 000 objects in 2019.
- E&O
  - Development and maintenance of VO-compliant archives for the amateur community (e.g. https://sdc.cab.inta-csic.es/ObCP)

US VOA

- Chandra Source Catalog production - CSC2.0 is planned for an October release.
  - VO services including Simple cone search (Csc2scs),
  - Simple image access protocol (Csc2siap)
  - Table access protocol (Csc2tap) will also be released.
  - WWT is also planned for released and is being demoed along with all of the interfaces to CSC2 at the Chandra Booth at ADASS.
- A Focus demo at ADASS
- Continued support for the IVOA RofR operations and validation

NAVO

- The renewal proposal for NAVO (and all the NASA archives) will be due at NASA HQ on Feb 20 2020.

LSST

- Took a lead in reinvigorating the development of pyvo within the Astropy community.
- Added auth support to pyvo suitable for LSST, CADC, and ESAC.
- Prototyped a SODA server written in Python.
- Worked with the new STC2 standards to investigate serialization forms. This has led to discovery of some issues with the proposed standards.

All-Sky Virtual Observatory News

Overall: All nodes bar MWA now have Single-Sign On (using Data Central), MWA coming

Data Central and SkyMapper

- Moving towards a single access portal, known as the Optical Data Centre
- Data Central now offers ASVO-wide cone search using pyVO
- SkyMapper preparing for next survey Data Release

Theoretical Astrophysical Observatory

- Deploying latest version (TAO5) on NCI supercomputer (already on OzStar) to allow use of Genesis simulations

MWA

- Moving non-data services (e.g. web portals) to AWS.

CASDA

- Developed astroquery module
- ASKAP data now coming in for different surveys (EMU, WALLABY)

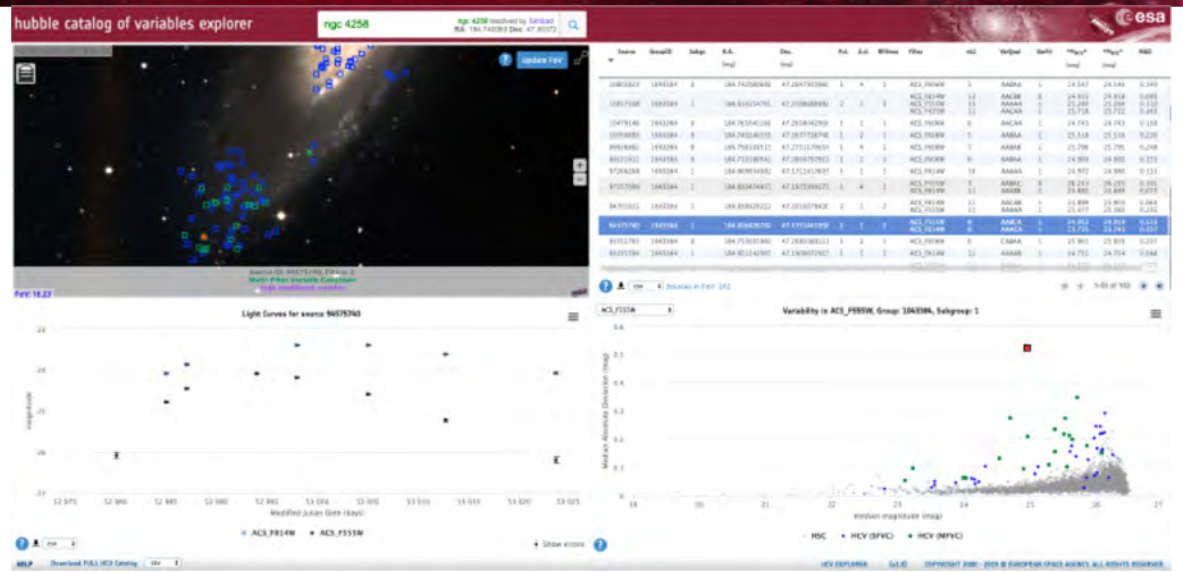
RVO

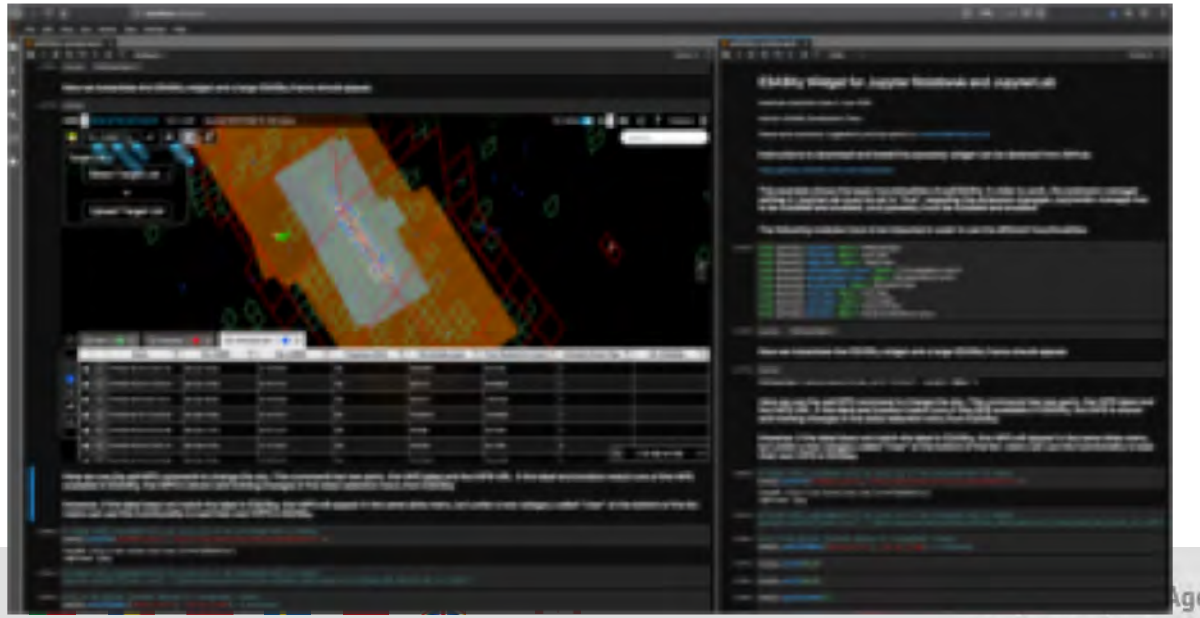
News about:

- General Catalogue of Variable Stars (GCVS) GCVS Version 5.1
- Working group "Astronomical data" (INASAN, led by Dana Kovaleva)
  - Binary Star Database (BDB)
- Observation Archive of the Zvenigorod Observatory
- Technologies of RVO information structures
  - Data Interoperability and Reuse
  - Developing formal conceptual specifications of research domains for research data infrastructures and particularly for virtual observatories.
  - Semantic approaches to problem solving in astronomy and astrophysics

ESA VO activities since May 2019

- First ESDC variability portal for HCV (Hubble Catalogue of Variables) http://hst.esac.esa.int/hcv-explorer/ (video: https://youtu.be/22SGQlEGjIE)
- ESASky: controlling with an iframe & release of pyESASky Jupyter widget
- Access to external TAPs: Gaia archive and prototype in ESASky (video tutorial: https://youtu.be/ysycmR3C8uk)
- New HST module published in astroquery and XMM-Newton module ongoing
- New versions of ObsLocTAP and first complete prototype server implementation for INTEGRAL archive





Euro-VO

- Euro-VO partners active in their national and European communities
- ESCAPE project is operational
  - https://projectescape.eu
  - Gathering requirements from ESFRI for their use of VO
  - E.g. Radio/mm astronomy partners (SKA, LOFAR, ALMA, JIVE)
    - focus session at this Interop meeting
  - Interaction with European Open Science Cloud
    - E.g. IVOA registry in EOSC framework
    - E.g. participation in EOSC Hub Week, EOSC symposium, RDA-EOSC activities
- ESCAPE events coming: School (2020), Data Provider event (2021)

This Meeting
IVOA

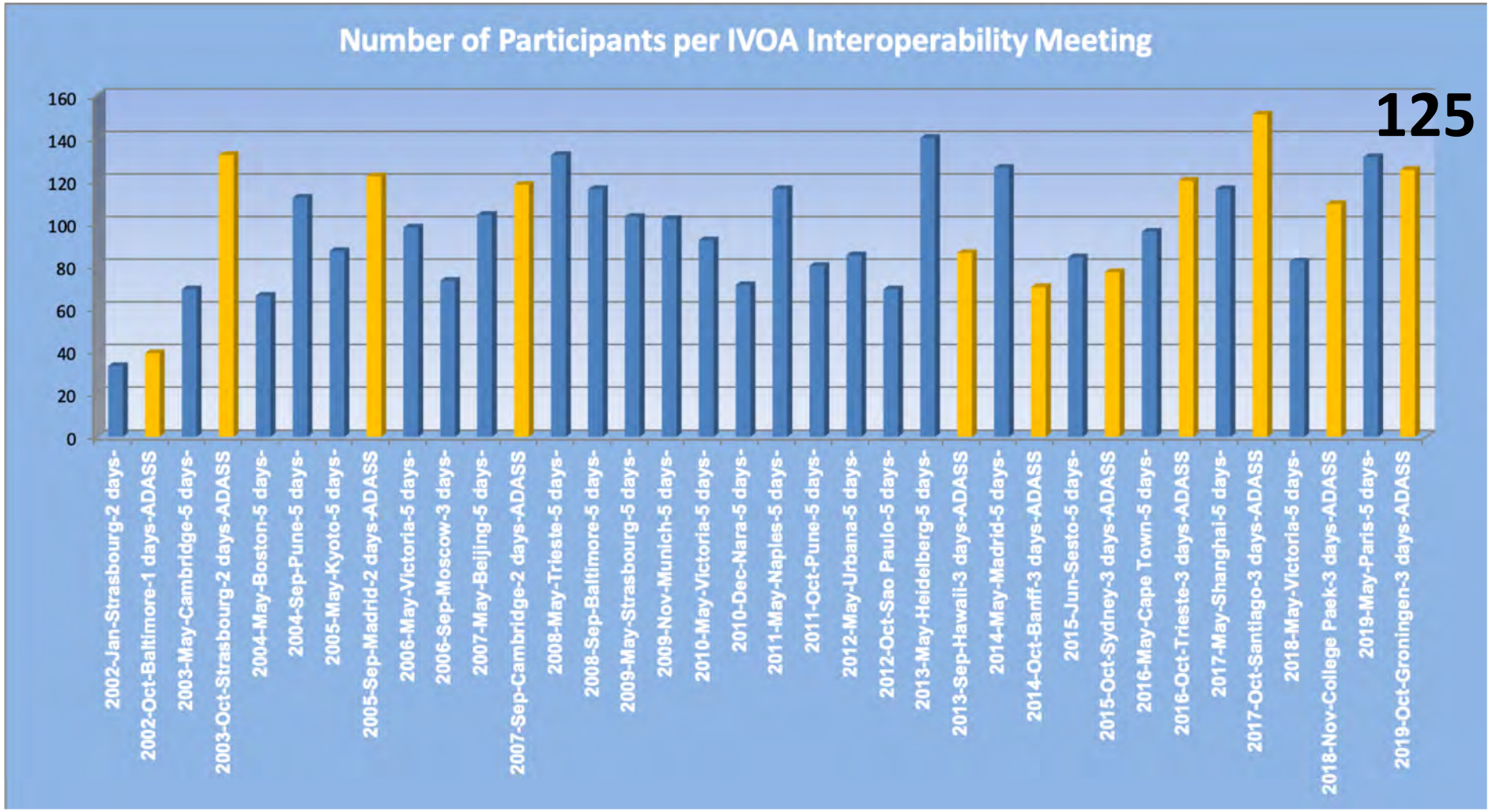
Schedule

A short 2.5 day Interop

- **Plenary Sessions**
- **WG and IG sessions**
  - A working meeting
  - Open discussions
- **Focus Session**
  - **Radio Astronomy and VO**
  - See CSP presentation
- **Some special dome projections**

Thanks to the Program Organising Committee!

Participation



Exec Chair and Vice Chair roles

- 18 month terms
- Positions renewed at Exec meeting yesterday
  - Effective Sunday afternoon

- Exec Chair – Chenzhou Cui

Exec Vice Chair – Bruce Berriman

And now – to work!!