

Limits and possibilities from 25  
years of EC-funded access to  
astronomy infrastructures and  
support of scientists

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# context

- OPTICON and ORP have been providing EC-funded community support for Access and JRA-development for 20+ years [My focus is optical and ORP strategy]
- ORP overview in previous talk – how we deliver access now
- ORP is developing a single-point single-proposal multi-wavelength proposal, review and delivery system
- Optical time domain talk on Monday (Lukasz)
- **This talk**
- Some more context
- Some constraints
- A model for successful development and implementation of a virtual European coordination network

# context

- Transnational access means funding the RI cost to provide resources to a peer reviewed PI-led project, or to support archive access – open or registered-user
- RadioNet, OPTICON, ORP have decades of experience in delivering astronomy TA/VA
- Some constraints:
  - There are stable communities which depend on EC-funded access
  - Must develop the new without damaging the present
- Total RI TA/VA funding from EC 1-3% of an RIs budget
- This is not dominant so community must work with RIs, not impose on them.
- The RI's retain access control, may agree to implement a TOM system
- Typical with EC access is that RIs are full partners – new models possible
- **The EC SERV Calls do not fund science subjects. They fund users of RIs.**
- **The substantial majority of funds in current EC SERV projects goes to support user access to participating RIs**
- **ACME needs to identify its user community and its RI community**

# context

- Many complex constraints on what facilities can do – some rapid response at any time (TOM-like, or override), most are not and require intervention
- The multi-messenger, the multi wavelength, the high-energy transient, the more general time domain communities all exist. They are active. They are productive.
- Do they need or want a new “command and control” centre?
- build on experience from what has worked previously to support progress
- BIGGEST CHALLENGE HERE FOR A MULTI-MESSENGER PROJECT
- Are there enough user-led projects in purely multi-messenger on facilities which accept EC TA/VA funding to justify a TA/VA project on this scale?
- If not mission creep into multi-wavelength & time-domain. Demands careful communications

# Points to note

- Need a clear definition of time domain, multi wavelength, multi-messenger, transient
- Challenge for MMA:
- Consortia are in place and approved large facility followup override projects are in place.
- There are many PI-led dedicated localization facilities which the PI controls
  
- What is the opportunity space for a new TA/VA project?
  
- There are communities already active doing these types of science
- Multi-wavelength: this is routine, eg follow-up of GRBs
- Improved process for simplified single-point single-authorization access to MWA is the prime goal of ORP
- TOM/AEON developments have similar ambition and very substantial progress
- These are being developed specifically to optimize multi-facility follow-up of MM alerts with a wide range of facilities. Need 4m-10m optical telescopes for spectroscopy

# We are not starting from nothing

- Two basic types of time domain events – use these to define the role for ACME
- ONE: events which allow for PI selection to trigger action [eg frequent but “slow” – hour-daytimescales]
- override normal operations on a trigger
- default process is proposal review-allocation-supported data taking – data reduction (+ help?)- [science ready data] to consortium.
- Data processing can be a major cost , as can science verification of automated processing systems
- PI/consortia are in place, waiting for science-relevant discoveries
- Consortia have required technical expertise (this is a factor in TAC approval)
- Review process manages priority between competing groups
- BHTOM an example
- FEATURES:
- Number of alerts is large – PI science prioritization required
- Possibility of competing teams on key facilities exists
- What value can ACME add?
- Are the currently approved PIs interested?
- What budget could be spent on what?

# We are not starting from nothing

- Two basic types of time domain events – use these to define the role for ACME
- TWO: very short timescale events
- Automated alerts – no intervention. GW/nu/GRB/... alert – trigger to community, typically through broker-filters, immediate trigger of localization specialist systems. After localization trigger detailed study/spectra on (typically) 8-m class optical facilities.
- Only a few of these optical systems charge TNA access. Most are private or provided by TAC review
- What value can ACME add?

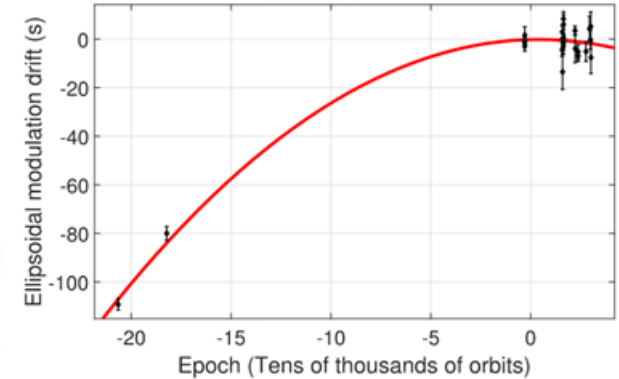
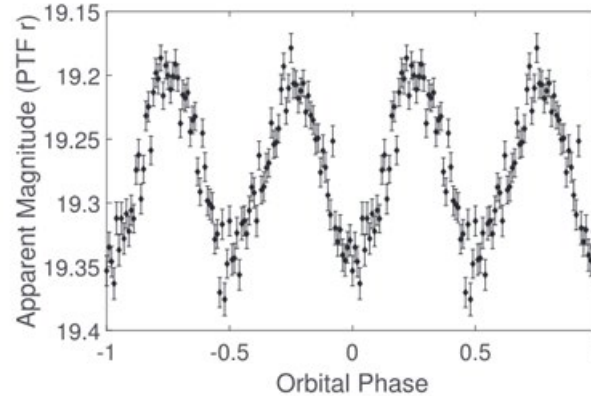
# We are not starting from nothing

- Major developments since GW17 – many localization facilities now in routine operation
- several powerful brokers
- There is always a long list of desirable technical enhancements – many have been developed through Las Cumbres TOM, will be on-line ready for O4.
- always more to do, but that is JRA. This is TA/VA
- Current system (AEON/TOM) provides – or will for O4 - substantial capability.

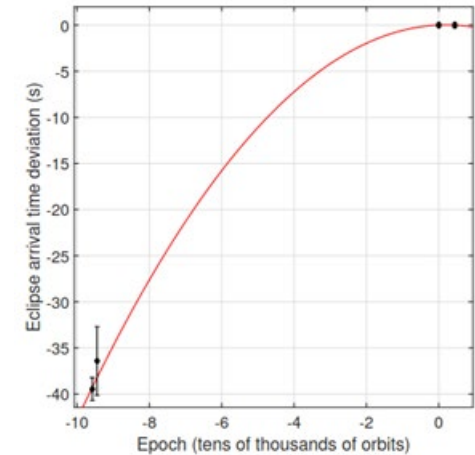
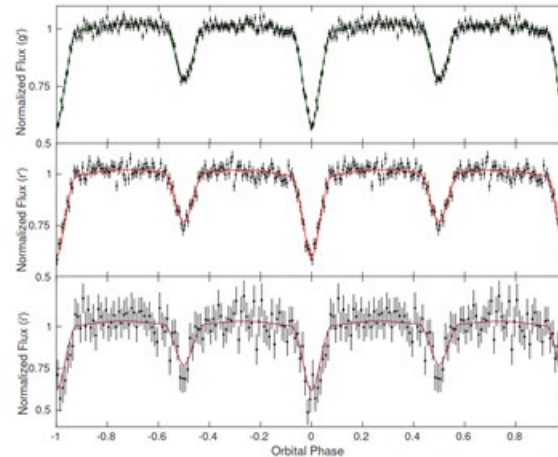


# Time domain – MMA example. Strong LISA sources

- **20.6 min** WD + WD binary
- Orbital decay of 100s in a decade



- ❖ **8.8 min** eclipsing WD + WD binary
- ❖ Orbital decay of 40 s in less than 2 years due to **gravitational wave emission**



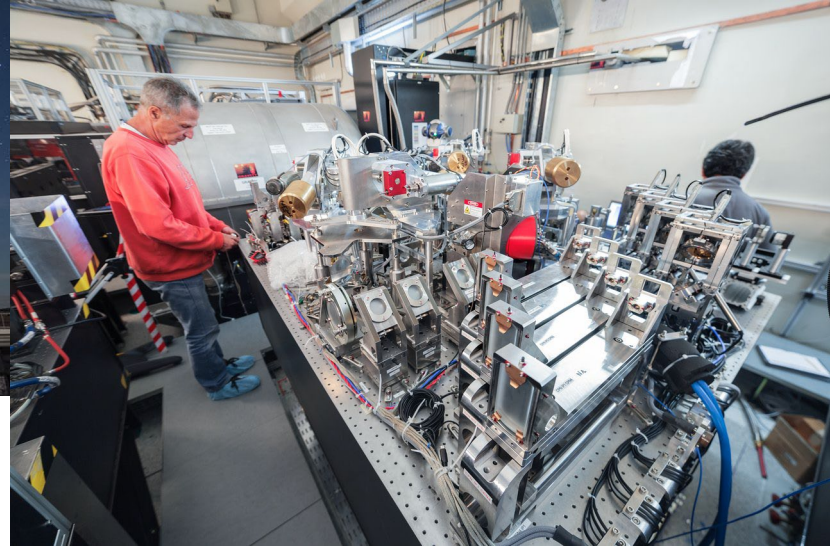
Burdge et al 2019 ApJ 886L 12  
Burdge et al 2020 ApJ 905L 7

# Very Large Telescope Interferometer [VLTI] distributed support centres

A real example of how ACME might  
Operate a virtual European centre

But:

This activity costs ~5% of ORP



# VLTI distributed support centres creating a distributed virtual centre

- The motivation for this WP is to provide user-support to make optical/infrared interferometry an accessible, valuable and complementary tool for researchers (from PhDs to experienced astronomers), with a potential for significant scientific impact.
- In addition, the aim is to reinforce the participation of current VLTI stakeholders and provide improved opportunities for new stakeholders.

# VLT distributed support centres creating a distributed virtual centre

- The network (<http://www.european-interferometry.eu/vlti-expertise-centres-network>) supports VLT users in infrastructure time applications and data reduction. Interested users can obtain either remote support or travel to the nodes. Support scientists are identified and made available at each node, as well as workstations and office space for data reduction and collaboration.
- Structured development of optical interferometry requires a European network of VLT Expertise Centres.
- These centres are the backbone of dissemination activities to new VLT users, by organising observing preparation and [data reduction schools](#), by co-organising with ESO VLT open days, and being the end-points of the [Fizeau staff exchange programme](#). They operate a Citizen Science programme.

# VLTI distributed support centres creating a distributed virtual centre

- Modality of access under this proposal: ESO directly manages infrastructure access. Users apply for facility time or use archival data. Applicants must be registered in the ESO Users Portal to apply for time or use archival data.
- Two main calls for telescope time take place per year. Applications for facility time are peer-reviewed. A public archive stores the collected data. The applicant team has privileged access for one year to the data. After one year the data are freely available in the ESO archive.
- In this work-package no access costs to the ESO archive are claimed.

# VLTl distributed support centres creating a distributed virtual centre

- The present network of VLTl Expertise Centres includes three partners from the OPTICON Horizon 2020 networking activity:
- [Jean-Marie Mariotti Centre \(JMMC\) - Service aux Utilisateurs du VLTl](#), (SUV) France - a structure that aggregates manpower from different observatories:
  - [Observatoire des Sciences de l'Univers de Grenoble](#) (OSUG)
  - [Observatoire des Sciences de l'Univers de Lyon](#) (OSUL)
  - [Observatoire de Paris-Meudon](#) (OPM)
  - [Observatoire de la Côte d'Azur](#) (OCA)
- [Portuguese VLTl Expertise Centre](#), Portugal
- [University of Exeter](#), United Kingdom
- two interferometry JRA (Joint Research Activities; WP8) lead partners:
- [Lagrange Laboratory/OCA](#), France
- [KU Leuven, Belgium](#)
- and two new nodes from the [OPTICON/RadioNet Pilot](#) (ORP) program:
- [Leiden Observatory, The Netherlands](#)
- [Konkoly Observatory, Hungary](#)
- An overview of the support provided by each VLTl Expertise Centre and the data protection policy can be found [here](#).
- Visitors wishing to travel to the above centres to reduce their VLTl data or prepare observations are encouraged to use the [Fizeau Programme](#).

# VLTI distributed support centres a model distributed virtual centre

- Structured development of multi-messenger astronomy in Europe could be supported by a virtual European centre structured on the model of the VLTI Expertise Centres.
- These centres are the backbone of dissemination activities to new users, building and strengthening consortia by organising observing preparation and [data reduction schools](#), by co-organising open days, and being the end-points of a [staff exchange programme](#).
- The model would have the set of local, mostly nationally-supported centres, all together providing the full expertise set, but with each specializing in a key wavelength range or technique.
- Call for proposal required, but this list is plausible
  - radio wavelengths (LOFAR+ JIVE?)
  - High-energy space (AHEAD-like)
  - High-energy ground
  - MMA trigger (GW, Neutrino, +)
  - Optical time domain (ORP-TDA like)
- This does not “manage” the alert/broker-data PI-led facilities & projects, or the RIs.
- Each manages its own proposal and allocation system, funded if wished through TA/VA
- It provides a communication and support system, and links to JRA and outreach activities



# ACME

- There is considerable experience in delivering EC-funded transnational access to the community
- There are boundary conditions from other communities, who risk the EC thinking ACME is their financial support
- There are examples of building a successful distributed virtual centre
- Together we can build on experience to develop a viable and innovative way forward within our constraints