Astrophysics Centre for Multimessenger studies in Europe ACME

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A. Kouchner & J. Epas

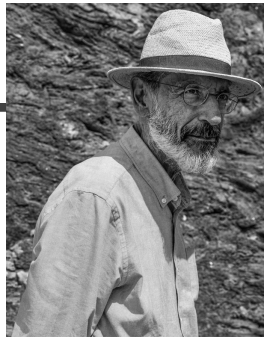
ACME
Preparatory Meeting

Multi-Messenger Astrophysics Workshop (MMAW)
October 10-12, 2022
EGO, Cascina, Italy

During the second day, working groups will be formed and these groups will convene in parallel in the morning of the third day for a common restitution in the afternoon, and a discussion for a common proposal for Multi-Messenger Astrophysics answering to the European Union call. **HORIZON-INFRA-2023-SERV-01-02**

09:00 → 09:10 **Welcome**

Orateurs: A. Kouchner, S. Katsanevas



Astrophysics Centre for Multimessenger studies in Europe ACME

Kick-Off meeting September 16-17, 2024

Cf. Press Release on October 1st

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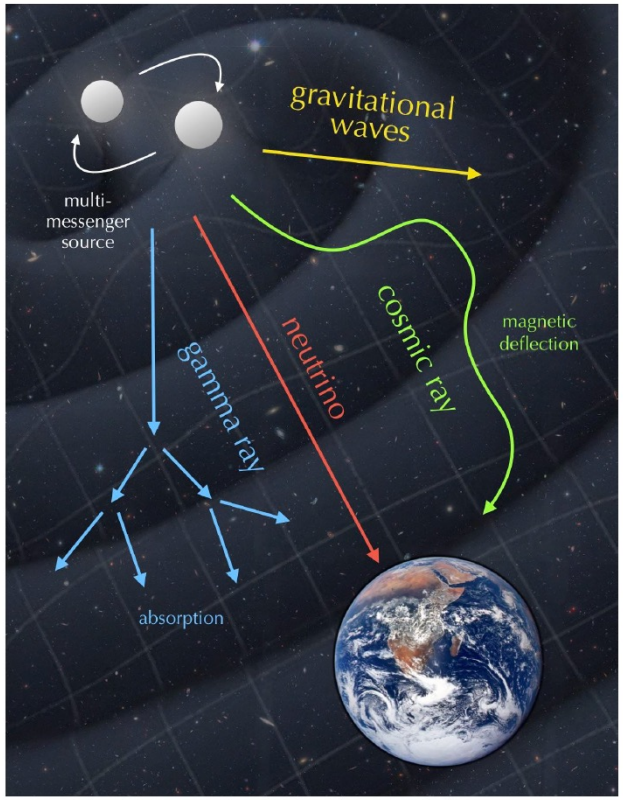

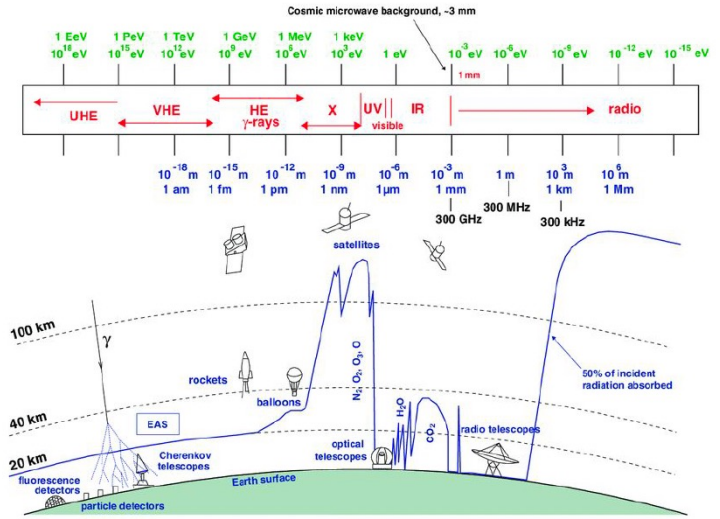

And MM is not any more the future but already the present.

Efforts on going all across astronomy, including gamma-ray astronomy

From O. Blanch ACME Kick-off

Establishing a lasting link between communities is the underlying objective

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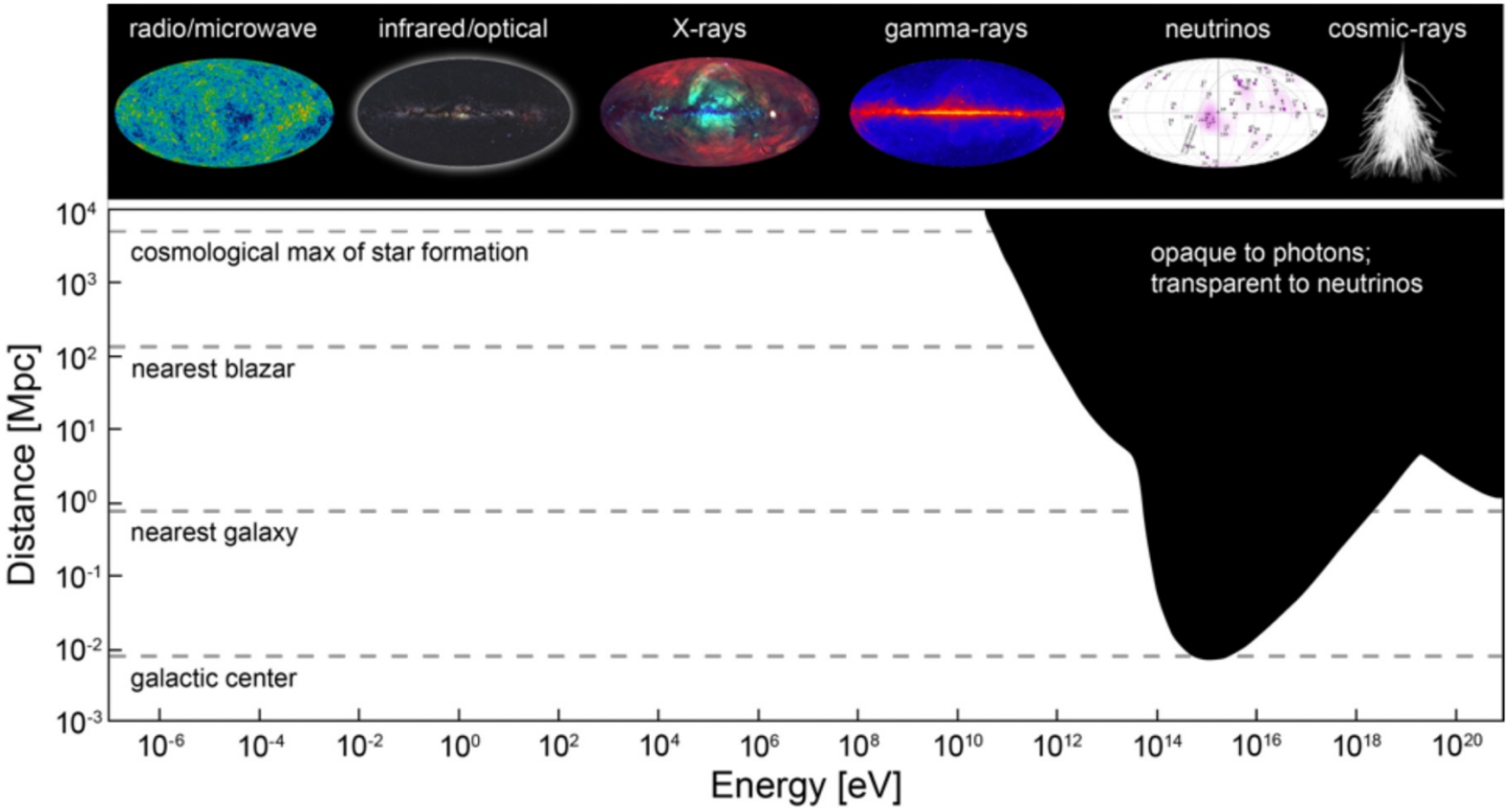

The Universe is opaque to EM radiation for ¼ of the spectrum, i.e. above 10-100 TeV where IceCube sees cosmic neutrinos.

Astrophysics Centre for Multimessenger studies in Europe ACME

Objective: ACME is set up to realize an ambitious coordinated European-wide optimization of the accessibility and cohesion between multiple leading RI, offering access to instruments, data and expertise, focused on the new science of multi-messenger astrophysics.

Funded under
Research infrastructures

Total cost
€ 14 499 999,34

EU contribution
€ 14 499 999,25

Coordinated by
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS
France

Funded by the European Union

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Astrophysics Centre for Multimessenger studies in Europe ACME

Consortium: 40 partners, 15 countries, over 30 research infrastructures (observatories and detectors, cyberinfrastructures and expertise centers) from Astronomy and Astroparticle domains, covering GW, Gamma & X-rays, neutrinos, CR, radio, optical.

Suppported by:

AstroParticle Physics European Consortium APPEC

A planning and advisory Network for European astronomy ASTRONET

The ACME project coordinator **Prof. Antoine Kouchner** (CNRS/Université Paris Cité), and co-coordinator **Paolo D'Avanzo** (INAF), represent each community to ensure balance and drive cross-domain collaboration.

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ACME


Google Earth
Suède
Norvège
Irlande
Roumanie
France
Portugal
Honolulu
Lahaina
Hilo
CFHT
AALTO
UU
VLBA
CUD
LNIMAN
UCAM
DESY
LOFAR ERIC
JIVE ERIC
UHER
UMK
NCDJ
TSNUK
CTAO
HAU
UP
CEA
CNRS
LMU
MPG
EPFL
IRAM
UGR
UTS
EGO
GSSI
INAF
IFAE
ENRI
ALTH
NOA
AHEAD2020 workshop 21-23 October 2024 EGO, Pisa

ACME

Objectives: The Astronomy and Astroparticle physics research infrastructures involved in this proposal will lay the foundations for building a new ecosystem for a deepened, stronger and long-term vision collaboration with the aim to:

1. implement the **European roadmaps'** recommendations and act as a pathfinder to broaden, improve and align the accesses to the respective RI services and data
2. provide a harmonized **transnational and virtual access** to world-class RIs
3. develop **centers of expertise**
4. improve the **science data products** management
5. develop and improve interoperable **cyberinfrastructures** for alert sending and better manage **coordinated observations**
6. provide **training** for a new generation of scientists and engineers
7. open the astrophysics data sets to other disciplines and increase **citizen engagement** in scientific research

7 Work Packages (WP) corresponding to the objectives above

ACME objectives are to implement the Astroparticle Physics European Consortium's (APPEC) and the Planning and Advisory Network for European Astronomy's (ASTRONET) roadmaps' recommendations

https://www.appec.org/roadmap/ https://www.astronet-eu.org/?page_id=521

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WP1 Coordination & Management

Antoine Kouchner (Coordinator), Paolo d'Avanzo (Co-coordinator), Julie Epas (PM)

- Coordination of the work across all WPs to ensure the achievement of the scientific and technical objectives
- Interface and communication with the European Commission
- Nominate expert panels for the selection procedure for TNA if needed, in collaboration with the Consortium and the respective WP leaders
- Prepare the Research Infrastructure strategic report on the Transnational Access landscape, with recommendations for the future
- Implementation of the Project Website, with an interface for management of the activities of the Centres of Excellence
- Data Management Plan

WP2 Transnational Access for Multi-messenger and time-domain Astrophysics

WP leaders: Rob Beswick, Damien Dornic, Izabela Rottmann

- Provide Transnational access (TNA) to world-class Research Infrastructures with complementary observational data: radio, high-energy gamma rays, neutrinos, cosmic rays

- Develop and implement the TNA procedures for new Infrastructures

- Facilitate new, innovative science via cross-disciplinary programmes and increase scientific impact

- By linking Astronomy & Astroparticle communities, extend the user communities and enable new science via access to multiple facilities

WP2 Telescopes and Detectors¶

DELIVERING TRANSNATIONAL ACCESS FOR MULTI-MESSENGER AND TIME-DOMAIN

Radio	EVN (JIVE, Tr, Ir, Mh, Yb), LOFAR, e-MERLIN, Eff
OPT	CFHT
GW	
GaVHE	CTA, MAGIC
Xray	
NeCR	Auger, KM3NeT

- ACME will enable open Transnational Access to 9 world-leading spanning radio, optical, and high-energy astrophysics, alongside astroparticle facilities.
- RI with existing open access processes will offer TA from year 1: EVN, LOFAR, e-MERLIN, Effelsberg, CFHT, MAGIC
- The remaining facilities will deliver TA after the development of TA process (year 2 onwards): KM3NeT, Pierre Auger Observatory, (CTAO)

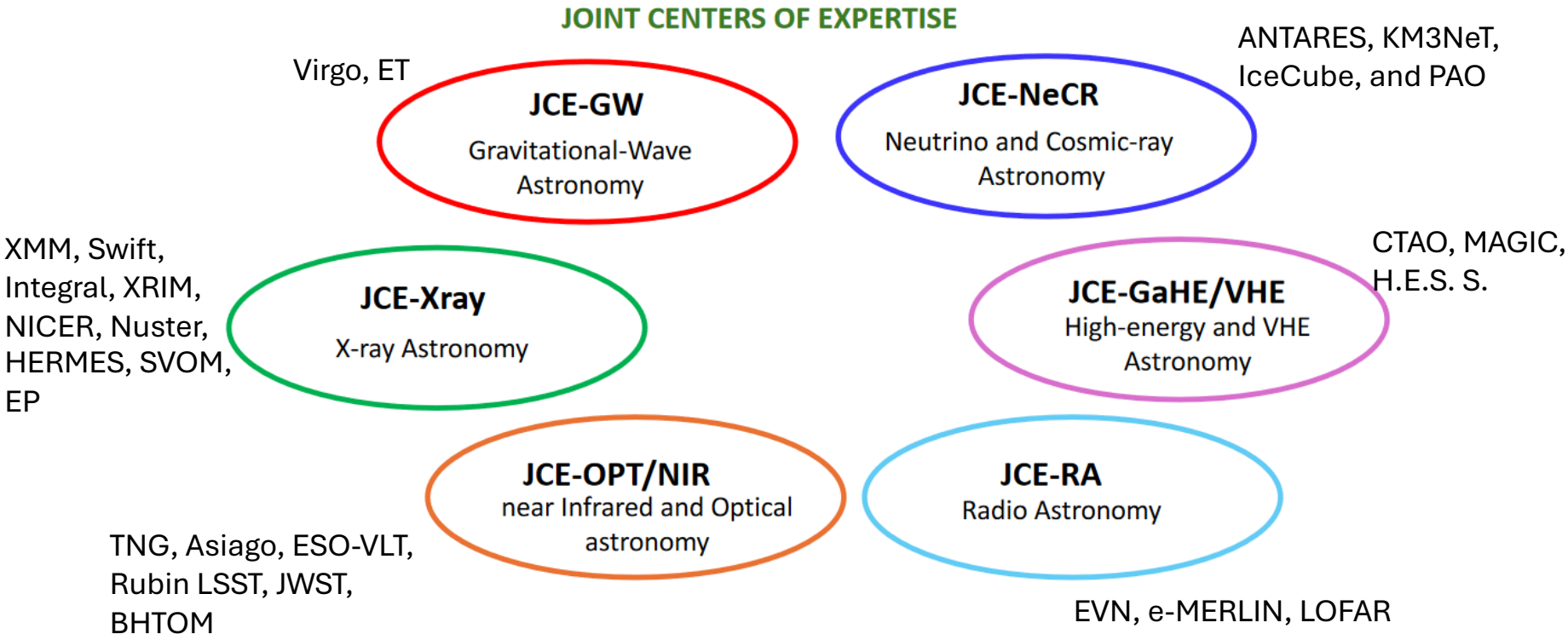
Author: Rob Beswick, ACME Kick-off

WP3 Provision of scientific expertise for multi-messenger observations

WP leaders: Marica Branchesi, Zsolt Paragi

- WP3 will provide access to expertise through the establishment of a virtual expertise network of key European players in multi-messenger astronomy.
- Each Centre consists of a network of distributed nodes
- Provision of expertise on the infrastructures, observations, data analysis and interpretation, joint MM analysis
- Implementation: hands-on sessions, help desk user support, visits to the Centres of Expertise.

WP3 Centres of Expertise



Author: Marica Branchesi, ACME Kick-off

WP4 Provision of improved access to near-real time and archival multi- messenger data

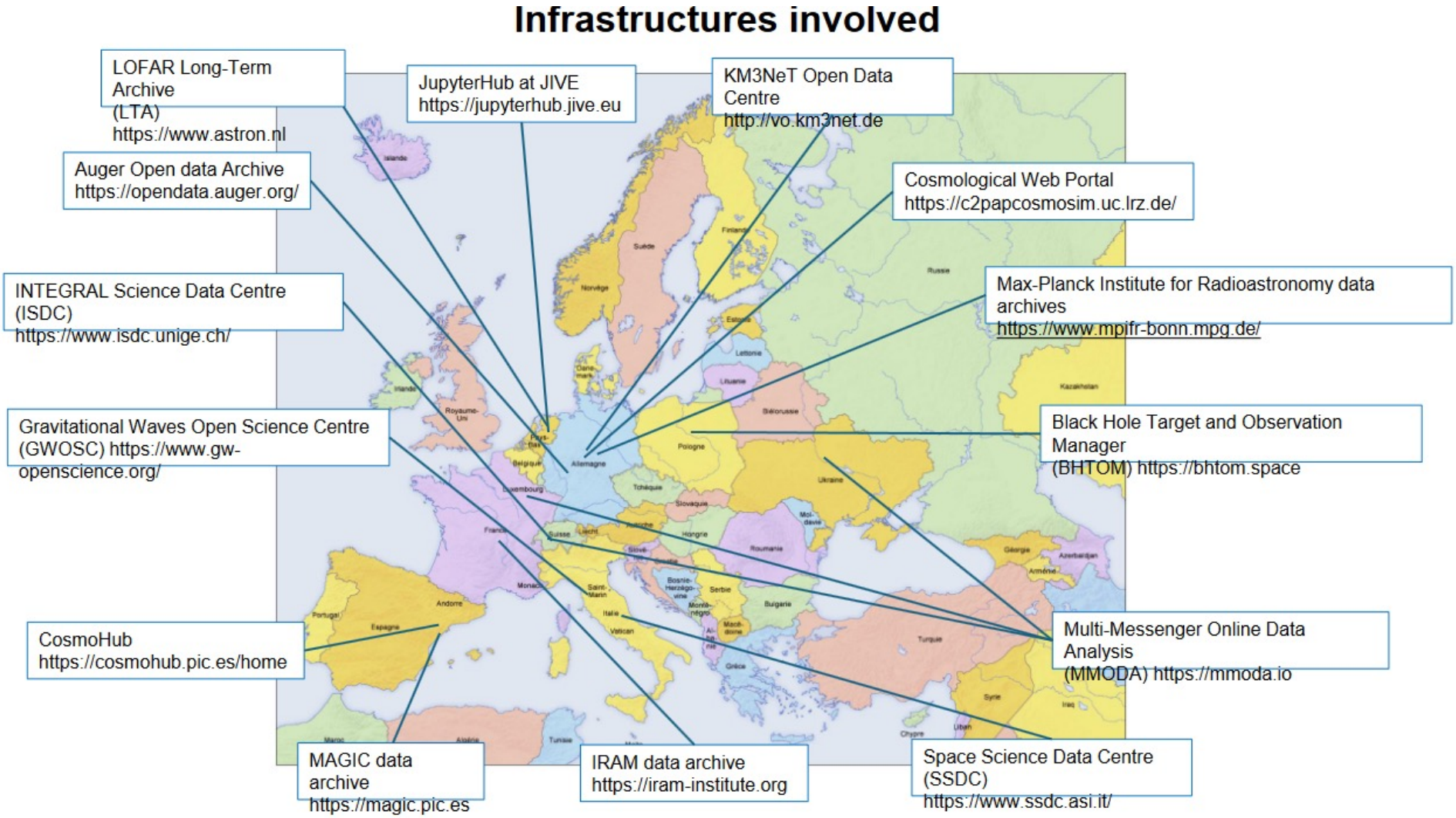
WP leaders: Andrii Neronov, Lukasz Wyrzykowski

- Main objective is to provide Virtual Access (VA) to online services enabling a combination of the data products of the various telescopes and detectors, together with the relevant modeling tools, within multi-messenger data analysis workflows.

- Second objective: lower the barrier of learning practices of the other communities via harmonization of standards for data access and analysis tools

- Third objective: facilitate decision taking for planning of the follow-up observations via provision of services for on-the-fly analysis of archival multi-messenger data.

WP4 Archives and Data Format



Author: Andrii Neronov, ACME Kick-off

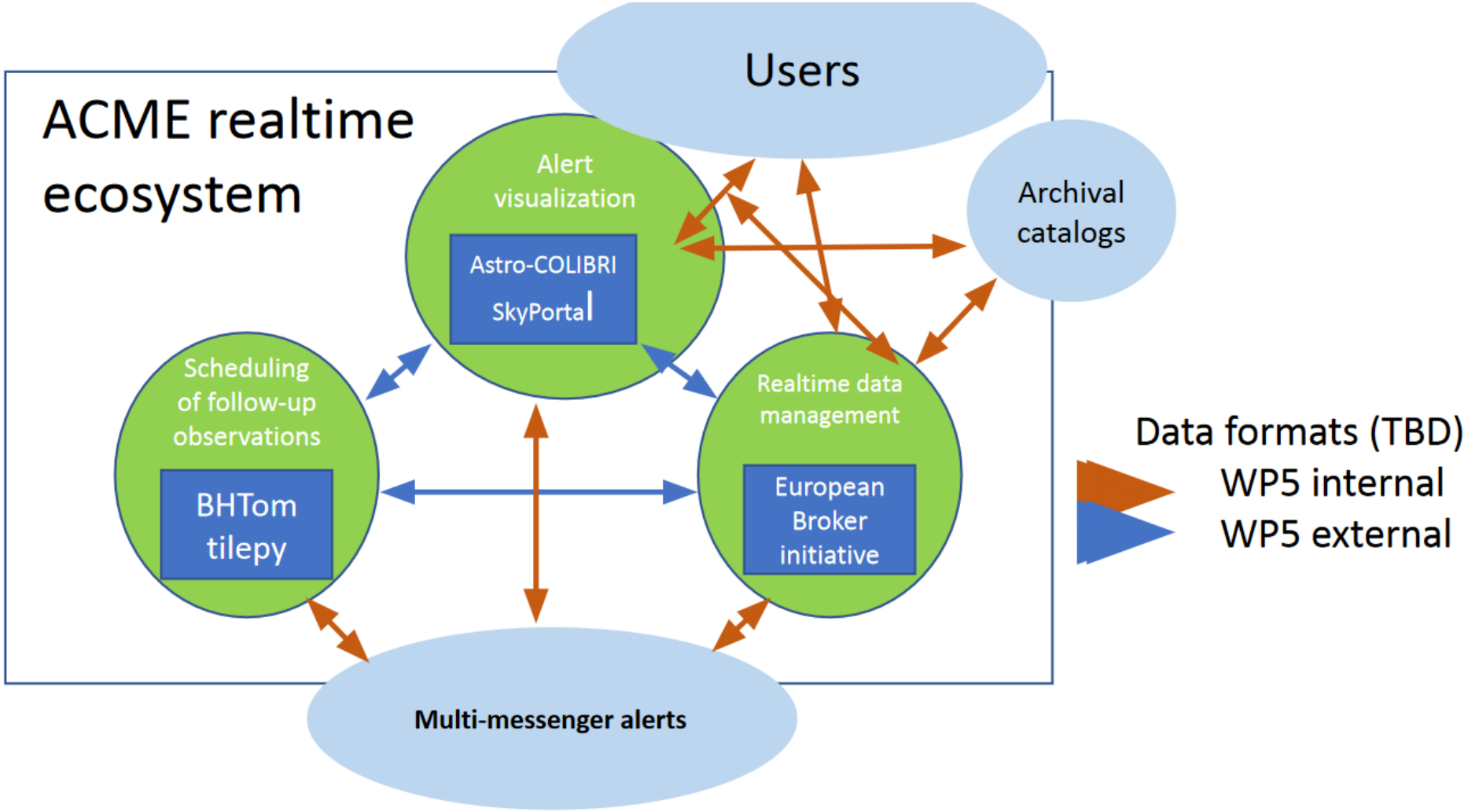
WP5 Improved coordination for real-time detection of transient events and low-latency alert management

WP leaders: Fabian Schüssler, Marek Kowalski

Goals:

- Create a real-time ecosystem, in which researchers obtain virtual access to different, essential and improved alerts streams
- Provide tools to manage and analyze the streams
- Visualise the data and organize follow-up observations based on detections made in near real time

WP5 Real-time alerts and follow-up observations



Author: Fabian Schüssler, ACME Kick-off

WP6 Training for scientists and engineers

WP leaders: Natalie Webb, Heidi Korhonen

- Assist the scientists in taking, analysing and interpreting multi-wavelength/messenger observations and coordinating efforts
- This will be achieved via conferences, workshops, schools and hackatons and through providing dedicated training material
- Strong synergy with the actions in the other work packages

Author: Heidi Korhonen, ACME Kick-off

WP6 Training for scientists and engineers

ACME training plan

1	**Multi-wavelength/messenger conference: The gravitational wave sky and complementary observations**	**hybrid**	**T0+6m**	**1st year**
2	Workshop / hackathon - Archives and real-time data access	in-person	T0+8m	
3	Workshop - MAGIC	virtual	T0+9m	
4	Workshop - Citizen science	virtual	T0+10m	
5	Workshop - Swift / XMM-Newton	in-person	T0+11m	
6	*Workshop - open call for topic*	*in-person*	*T0+12m*	
7	Workshop - SNEWS / outreach	virtual	T0+14m	**2nd year**
8	**Multi-wavelength/messenger conference: The transient Universe in the Rubin era**	**hybrid**	**T0+15m**	
9	School - MAGIC / CTAO	in-person	T0+17m	
10	Training - neutrinos - in person	in-person	T0+19m	
11	*Workshop - open call for topic*	*virtual*	*T0+21m*	
12	Training - LOFAR	in-person	T0+23m	
13	*Workshop - open call for topic*	*in-person*	*T0+24m*	
14	Small conference - LSBB/iDust	in-person	T0+26m	**3rd year**
15	Workshop - Swift / XMM-Newton	virtual	T0+27m	
16	**Multi-wavelength/messenger conference: The multi-wavelength/messenger sky in the SKA era**	**hybrid**	**T0+28m**	
17	School - optical instrumentation	in-person	T0+29m	
18	Workshop / hackathon - Rubin/Rubin brokers	in-person	T0+30m	
19	*Workshop - open call for topic*	*virtual*	*T0+32m*	
20	Workshop / hackathon - Archives and real-time data access	in-person	T0+33m	
21	*Workshop - open call for topic*	*in-person*	*T0+34m*	
22	Workshop - Well-being	virtual	T0+36m	
23	**Multi-wavelength/messenger conference: The high energy sky, archives and real-time data access**	**hybrid**	**T0+39m**	**4th year**
24	Training - LOFAR, Effelsberg, eMERLIN, EVN, IRAM (NOEM	in-person	T0+40m	
25	Workshop / hackathon - Archives and real-time data access	in-person	T0+41m	
26	*Workshop - open call for topic*	*virtual*	*T0+43m*	
27	Workshop - Swift	in-person	T0+44m	
28	*Workshop - open call for topic*	*in-person*	*T0+46m*	
29	Workshop - CTA/Pierre Auger	virtual	T0+48m	

Yearly larger conference in hybrid format

Several smaller pre-defined virtual and in-person events every year

Yearly open calls for virtual and in-person events

Large events ~100 people
Smaller events ~12-35 people

4/

Author: Heidi Korhonen, ACME Kick-off

WP7 ACME for environment and society

WP leaders: Gwenhaël De Wasseige, Stephen Serjeant

- The objective of this WP are to extend the ACME services for the users that do not belong to the two main communities targeted in this call (astronomers and astroparticle physicists)

- The telescopes and detectors participating in ACME monitor the environmental Parameters, store them as auxiliary data and consider these data in studies to correct for the variable environmental effects. These data will be made available through dedicated access services integrated into the EOSC ecosystem.

- The extraction of knowledge on variable and transient astronomical sources from vast amounts of diverse multi-messenger data can profit from the data mining that can be provided by crowd-sourcing and the involvement of a community of citizen scientists.

- Furthermore, WP7 will provide support to amateur astronomers to calibrate and submit their observations of transient phenomena that can then be merged with multi-wavelength/messenger data collected by ACME RI. WP7 will provide VA to projects hosted by well-known citizen science and crowd-sourcing

ACME Oulook

Ambition and Need → « better coordination among messengers and wavelength,common strategies among messengers and wavelength, increased exchange of information among messengers and wavelength, facilitate joint analysis among messengers and wavelength. » (O. Blanch)

« ACME offers the opportunity to maximize the science results from MM observations from the European Commmunity ».
« ACME can help evaluate the prospects of the innovative next generation facilities (ET, SKA, CTA, ELT, KM3NeT)». (M. Banchesi)

We have a lot to learn from AHEAD2020 !

In advance : thank you Lorenzo, Luigi et al.
for your guidance and advices