Laboratorio di Astrofisica multimessaggera

Workshop di orientamento alle tesi nelle attività di ricerca svolte presso INFN e Università Perugia

Giuseppe Greco
INFN-Perugia

Perugia INFN Istituto Nazionale di Fisica Nucleare

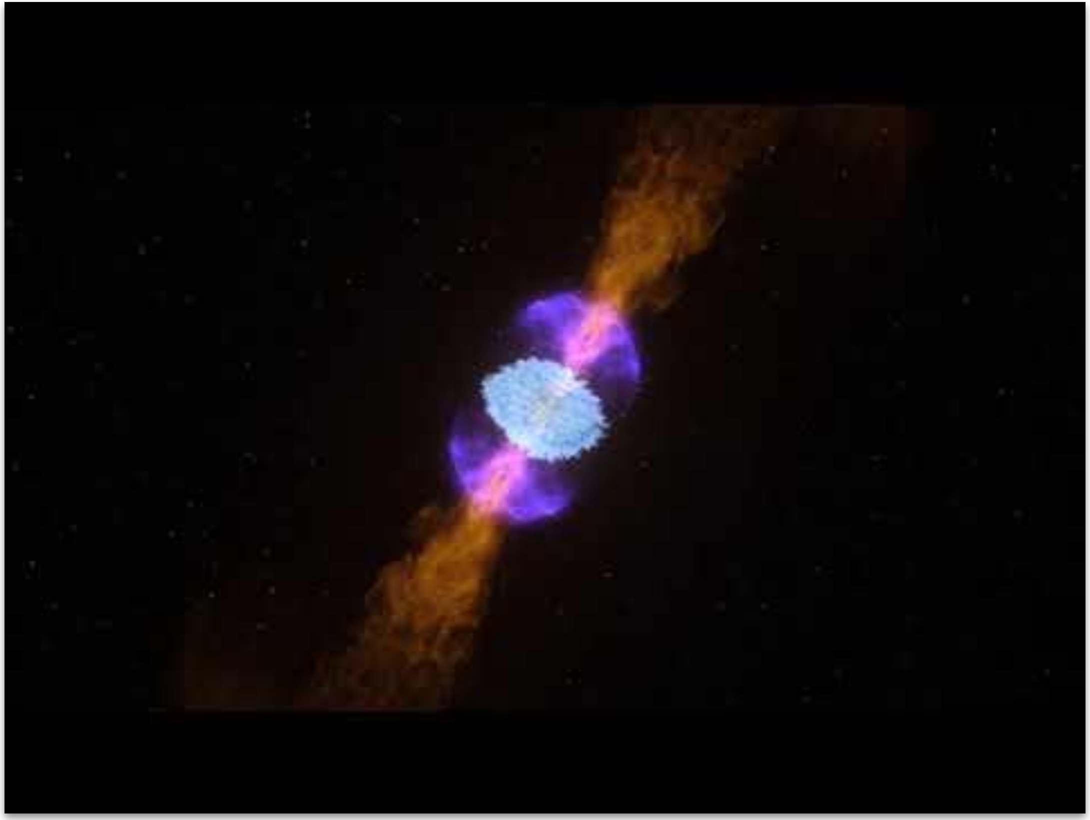
UNIVERSITÀ DEGLI STUDI DI PERUGIA

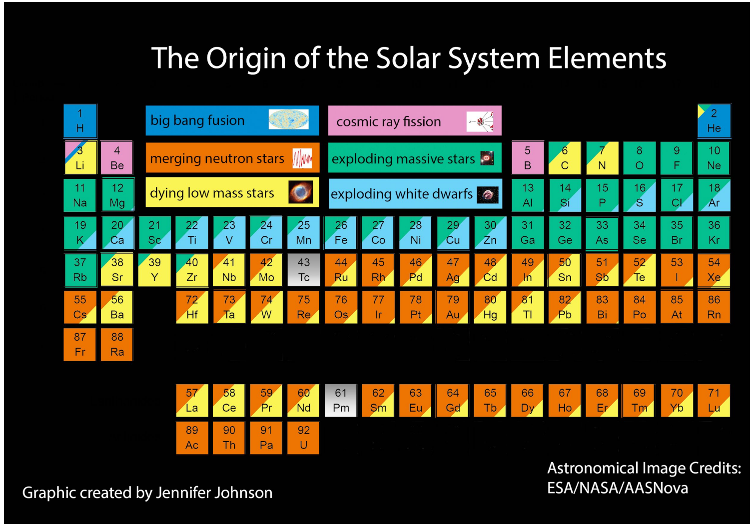
AHEAD 2020

ESCAPE European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

EGO VIRGO

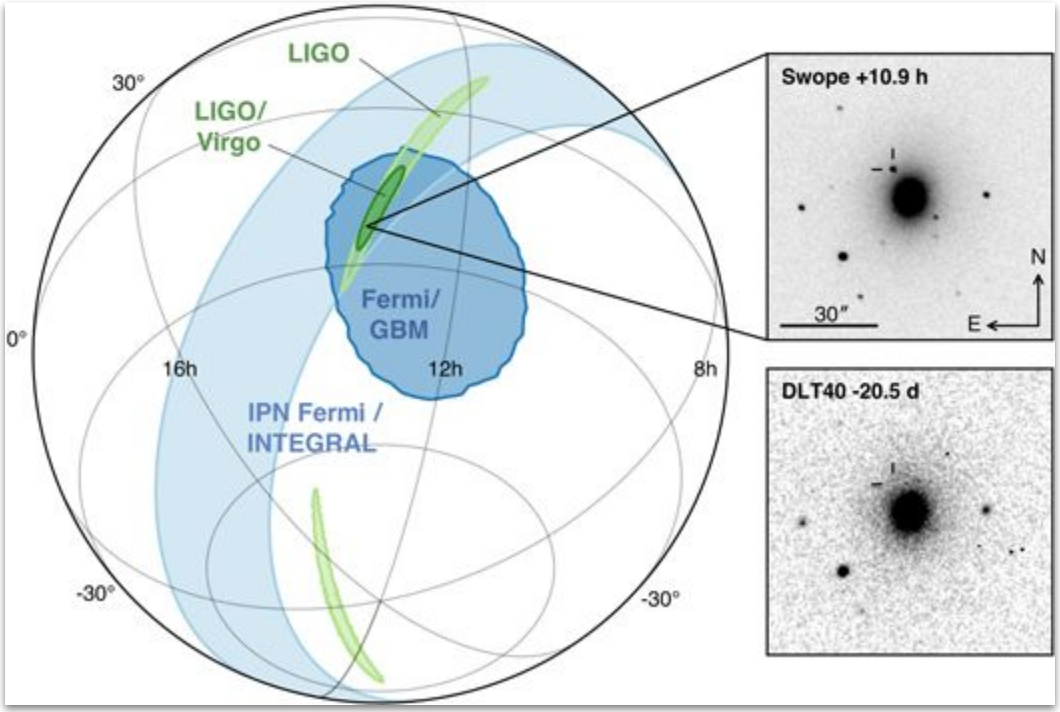
ET EINSTEIN TELESCOPE

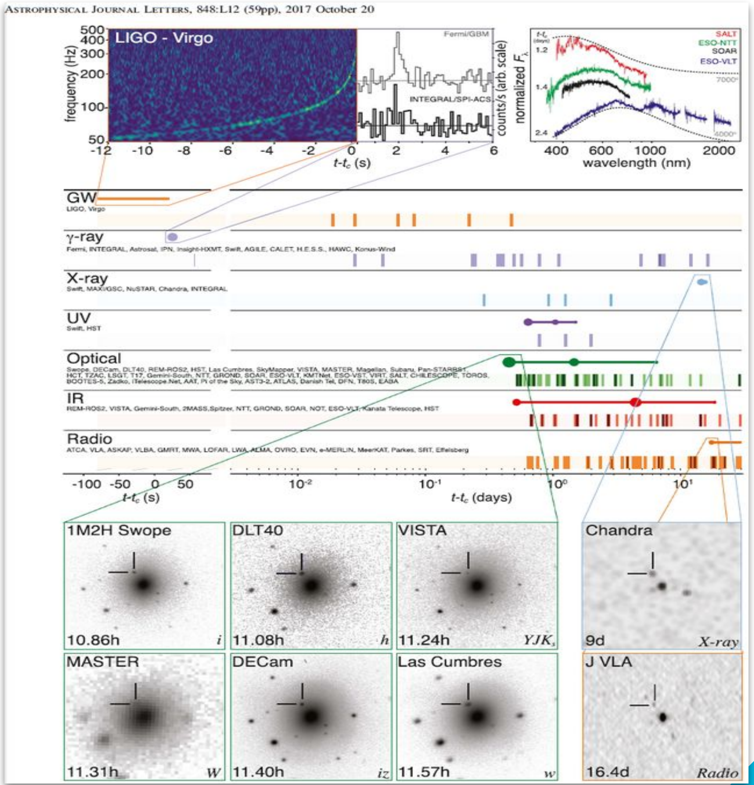




Animazione video di GW170817/GRB 170817/AT2017gfo

Multi-messenger Observations of a Binary Neutron Star Merger

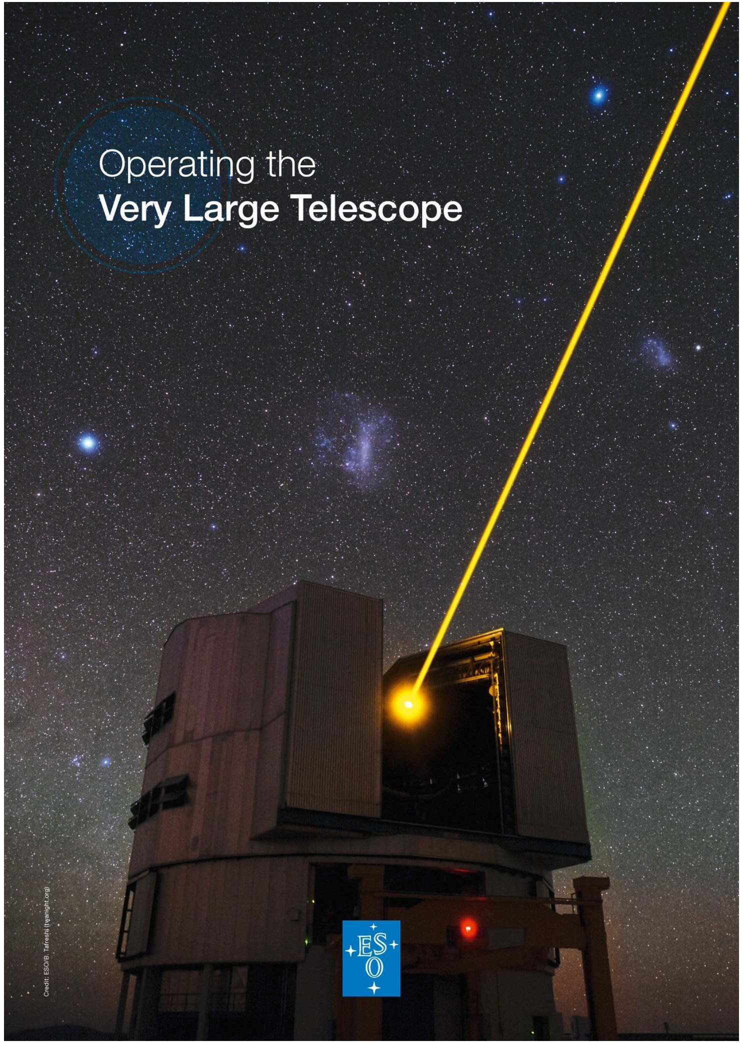


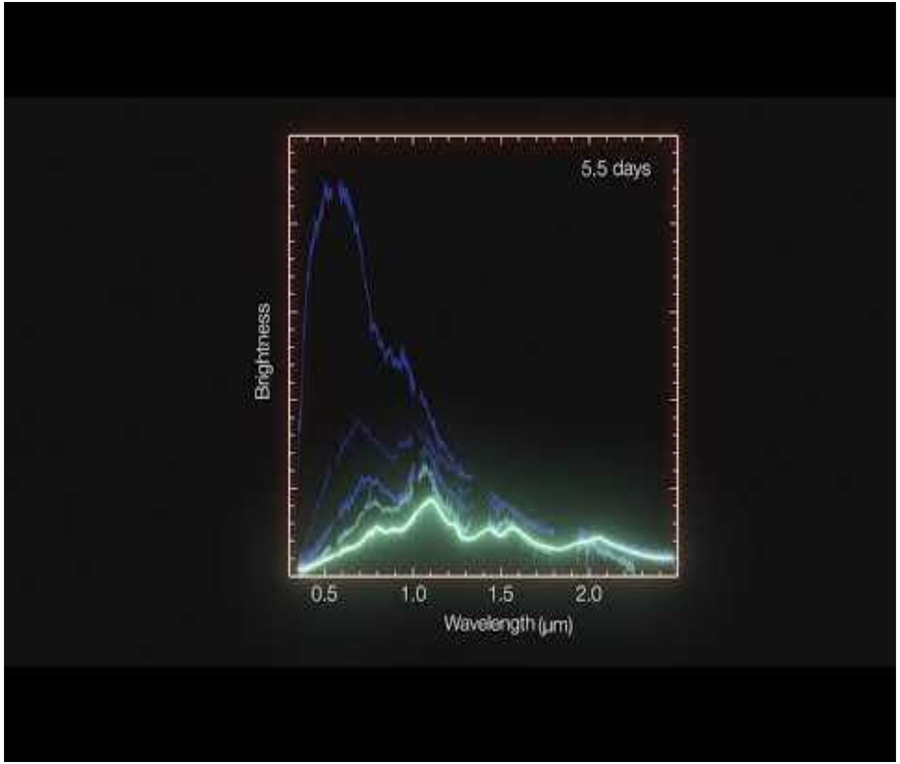


La Nascita dell'astronomia multimessaggera!

GW170817/GRB170817/AT2017gfo (NGC4993)

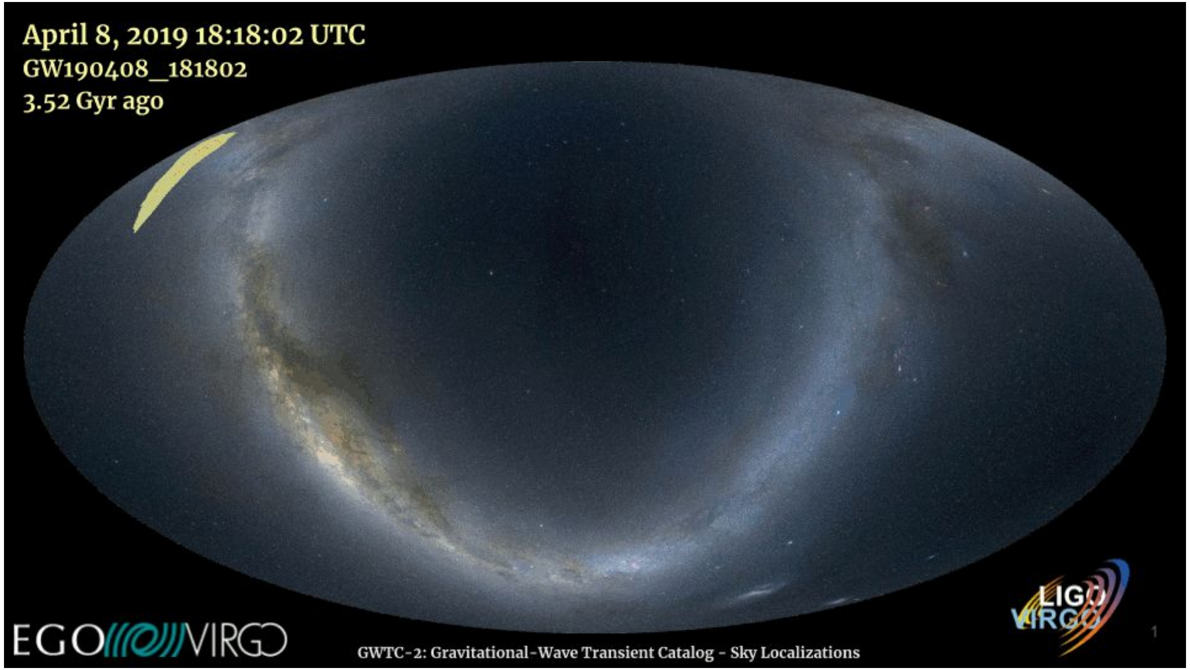
B. P. Abbott *et al* 2017 *ApJL* 848 L12



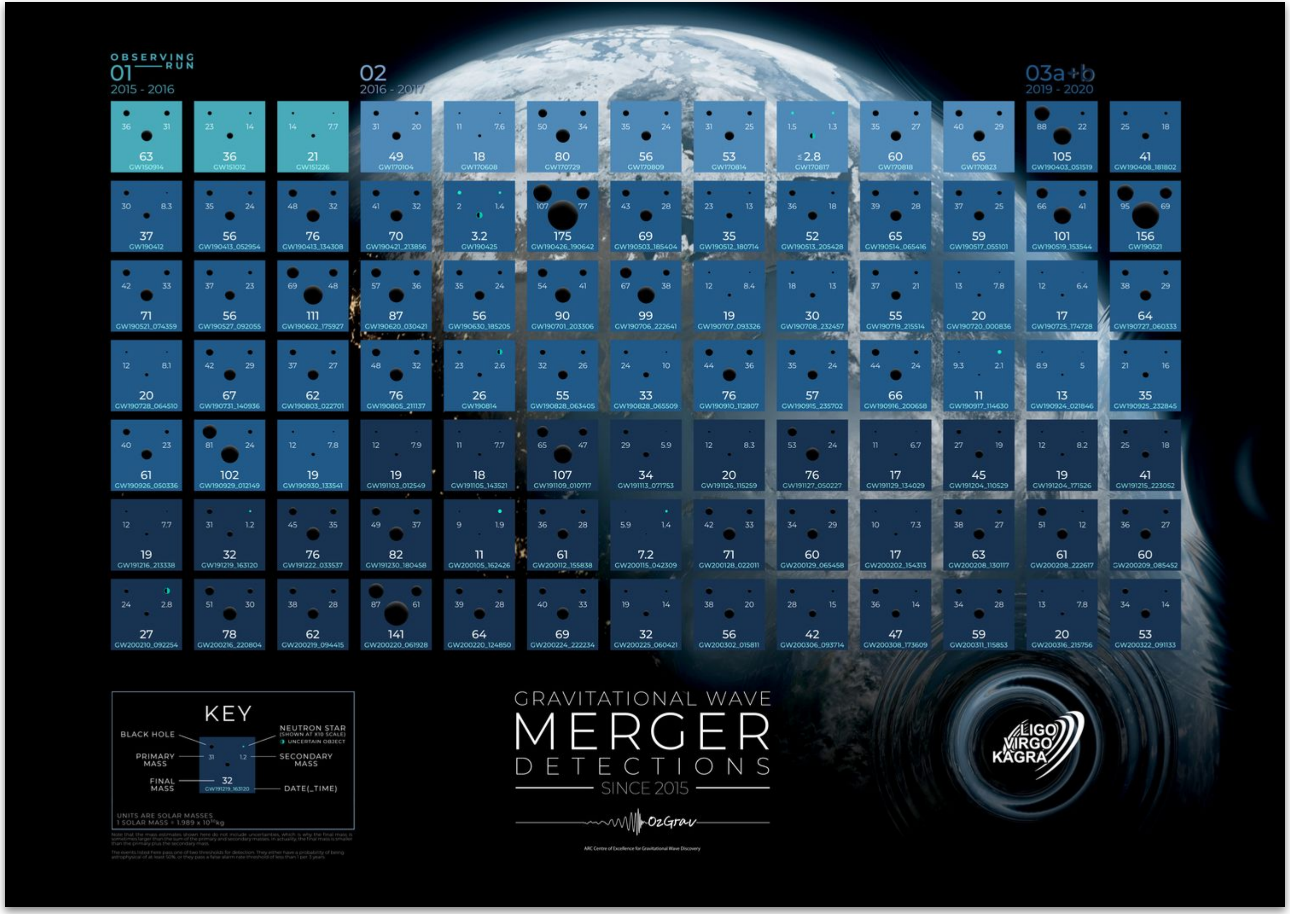


This animation is based on a series of spectra of the kilonova in NGC 4993 observed by the X-shooter instrument on ESO's Very Large Telescope in Chile. They cover a period of 12 days after the initial explosion on 17 August 2017. The kilonova is very blue initially but then brightens in the red and fades.

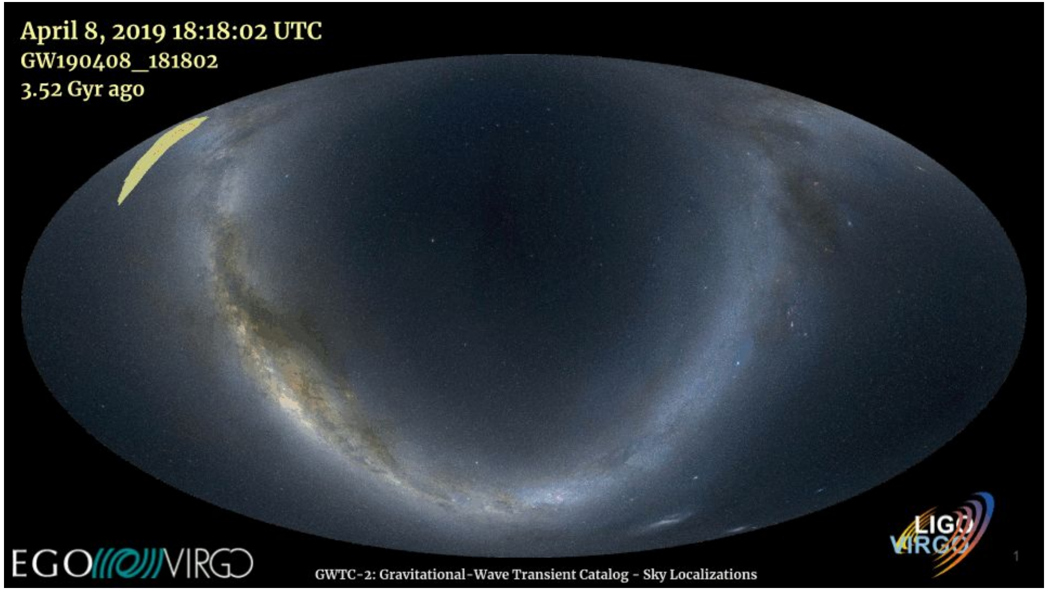
Localizzazioni di sorgenti di onde gravitazionali

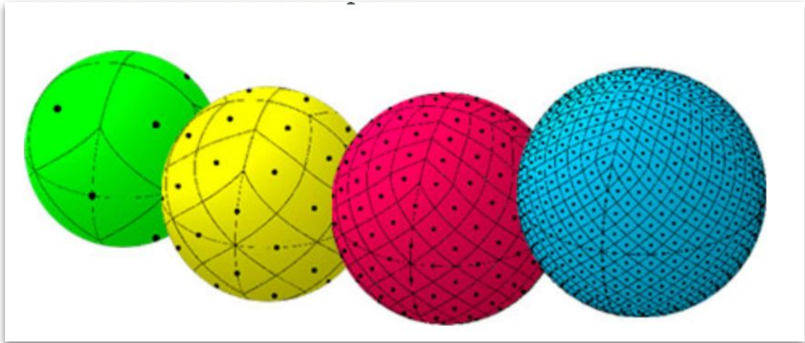


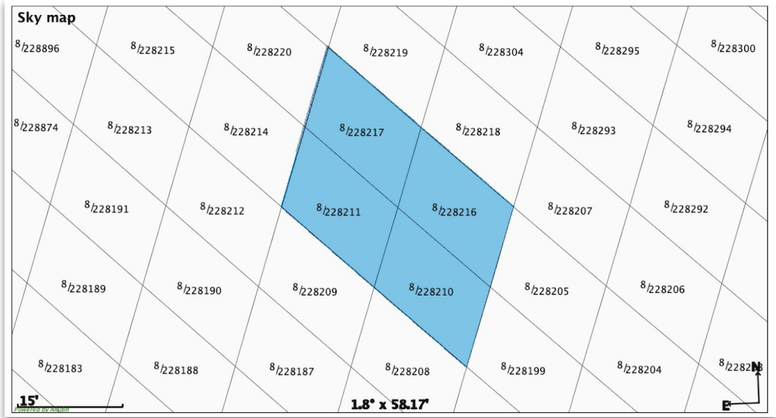
1. Come mapparle?
2. Come effettuare confronti?
3. Come interagire con i database?



Studi sulle popolazioni e conseguenze astrofisiche







Virtual Observatory: software e librerie standard (HEALPix, MOC maps...)

IVOA and VO

The Virtual Observatory (VO) is a collective term referring to an ecosystem of **standards** and the organizations and tools which use those standards.

VO standards are defined by the International Virtual Observatory Alliance (IVOA) which is composed of nation-level organizations.

Good Ingredients to be FAIR!

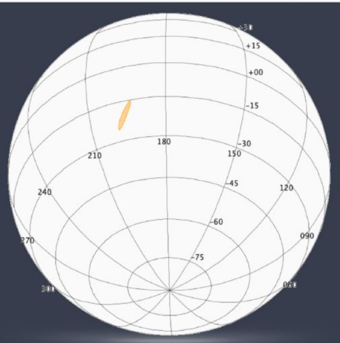


Fig.11 The final sky localisation of GW170817 from the GWTC-1.

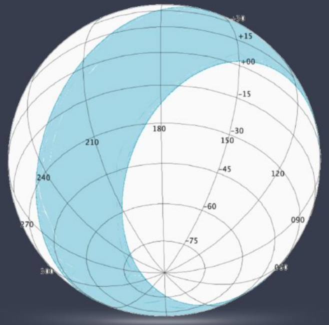


Fig.13 The IPN triangulation of GRB 170817 from the time delay between Fermi and INTEGRAL.

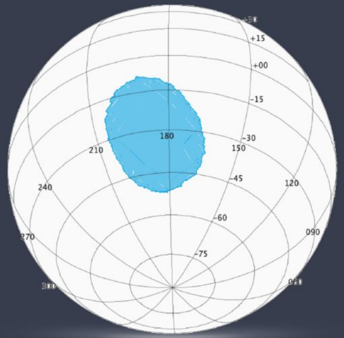


Fig. 12. The error Box of GRB 170817 from Fermi/GBM.

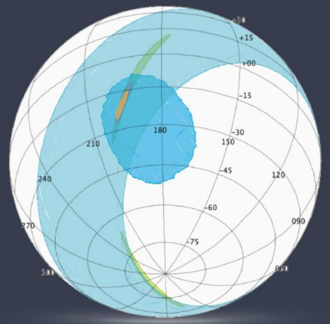
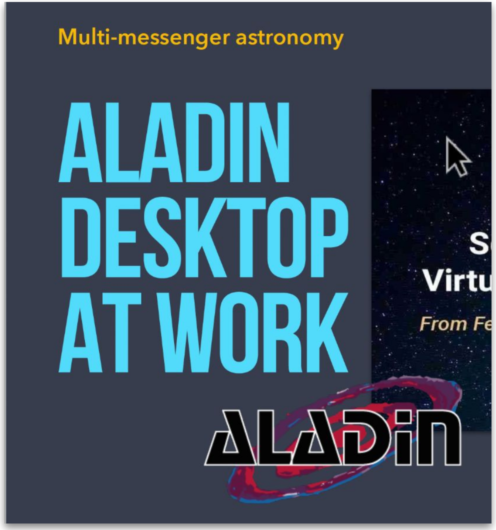


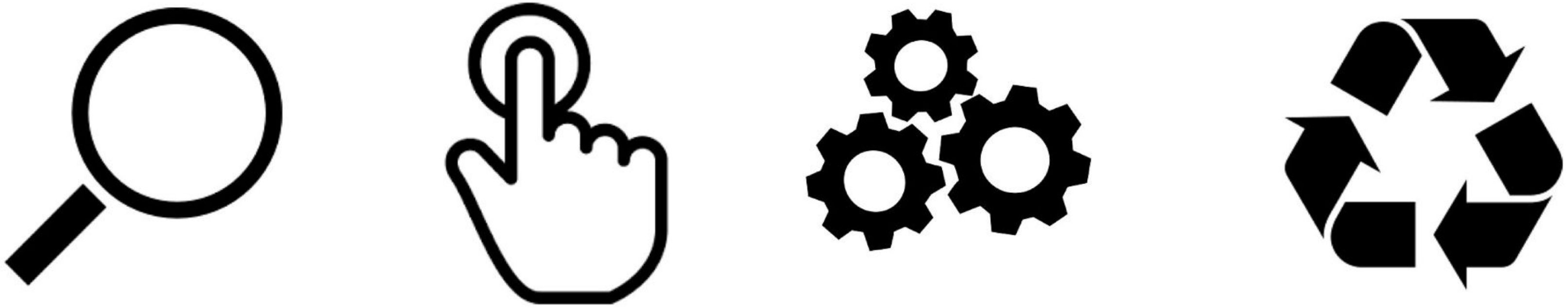
Fig. 14. Overlapping sky maps from Fig.9 to Fig.13.



Possibilità di tirocini e periodi di studio presso il VO dell'Osservatorio Astronomico di Strasburgo.

Esercitazioni con il software Aladin, Topcat and Jupyter notebook in python

Findable Accessible Interoperable Reusable



Good Ingredients for Open Science

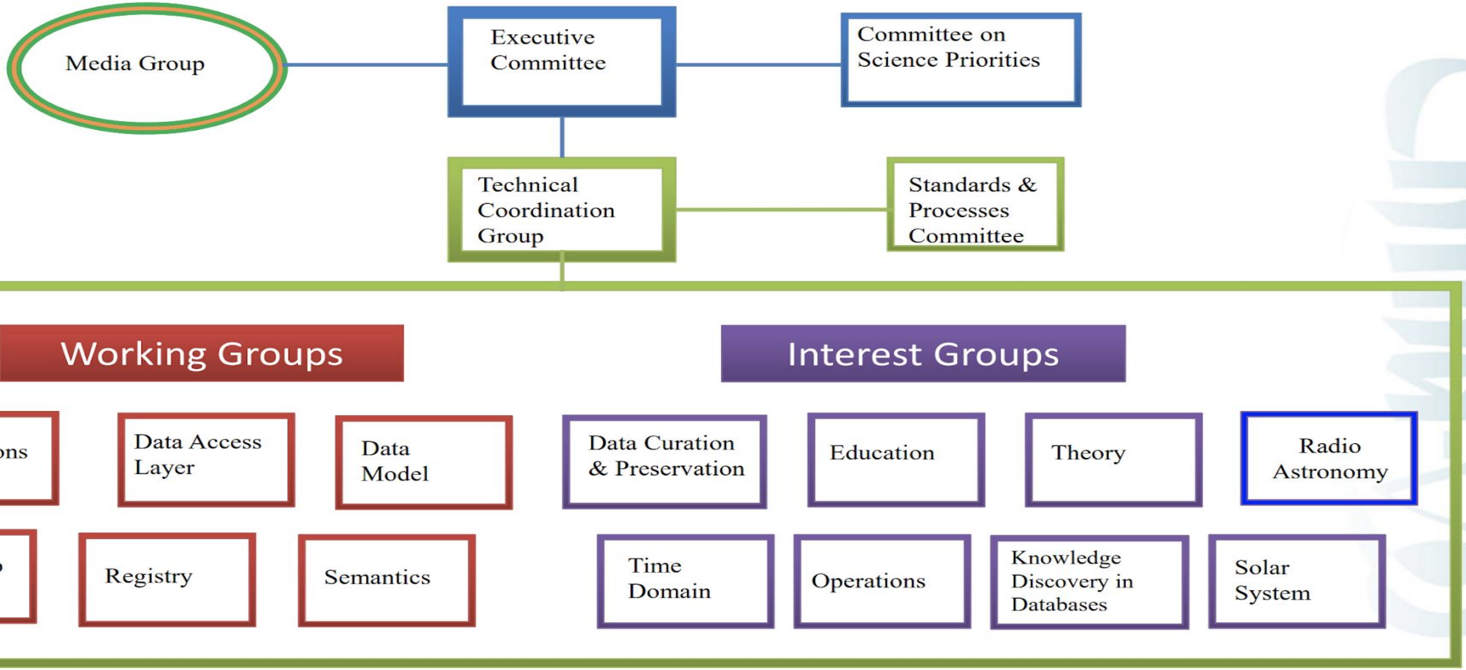
La Ue dice sì al caricatore unico per tutti i dispositivi elettronici

di Bruno Ruffilli

Oggi la discussione finale all'Europarlamento: approvate le nuove norme, obbligatorie dal 2024. La situazione attuale sarà solo "un ricordo di vecchi, strani tempi di costi inutili, sprechi e disagi", per la vicepresidente della Commissione Margrethe Vestager

04 OTTOBRE 2022 AGGIORNATO ALLE 14:20 | 2 MINUTI DI LETTURA

IVOA Organization Chart



UNIVERSITY OF CAMERINO

SCHOOL OF SCIENCE AND TECHNOLOGY

Bachelor's Degree in Physics (L-30)

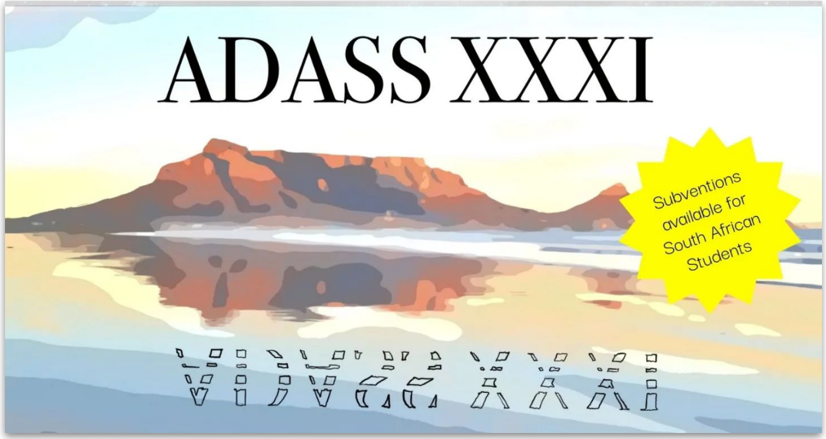
LOCALISATION OF ELECTROMAGNETIC COUNTERPARTS AND GRAVITATIONAL-WAVE SIGNALS: A VIRTUAL OBSERVATORY PLUG-IN TO HANDLE 3D VOLUME RECONSTRUCTIONS

Thesis in Physics

Student — Arianna Bartolomei

Supervis — Dott. Flavi

Tesi presentata a Astronomical Data Analysis Software and Systems



ESCAPE INFN PERUGIA CDS UNICAM Università di Camerino AHEAD 2020

LOCALIZATION OF EM COUNTERPARTS AND GW SIGNALS: A NEW PYTHON PLUG-IN FOR ALADIN

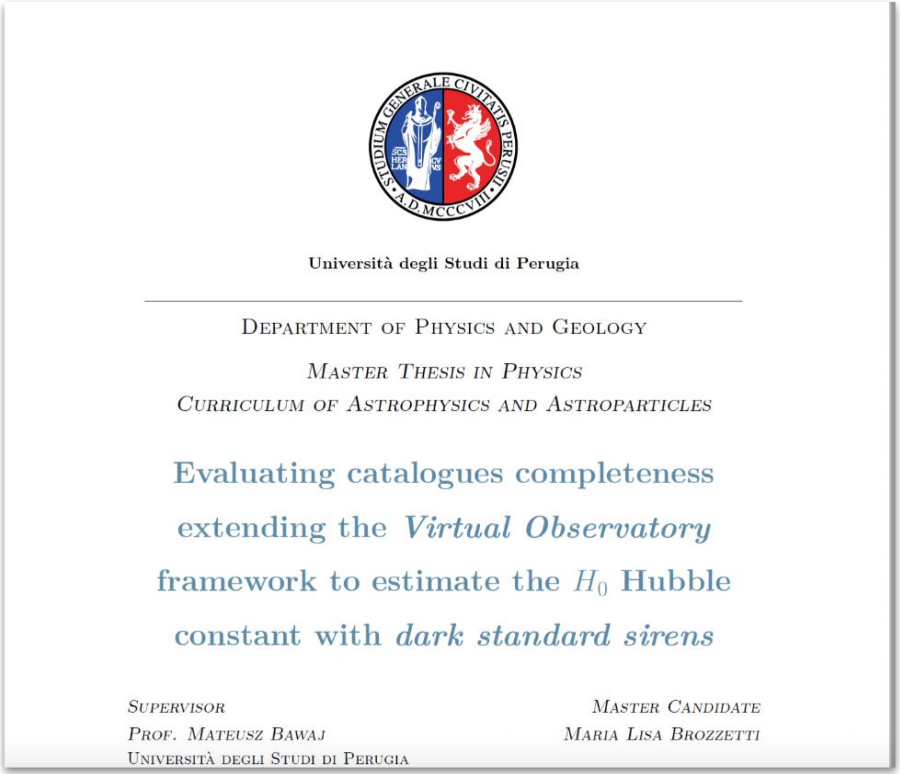
Arianna Bartolomei[1], Elisa Cartechini[1], Giuseppe Greco[2,3], Flavio Travasso[1,3], Mateusz Bawaj[2,3]

[1]University of Camerino; [2]University of Perugia; [3]INFN Perugia

Abstract

We describe a new plug-in for Aladin Desktop to analyze 3D sky maps of gravitational-wave sources. Aladin is the most used VO (Virtual Observatory) software for digitized astronomical images and

Tesi triennale: plugin per Aladin Desktop



Università degli Studi di Perugia

DEPARTMENT OF PHYSICS AND GEOLOGY

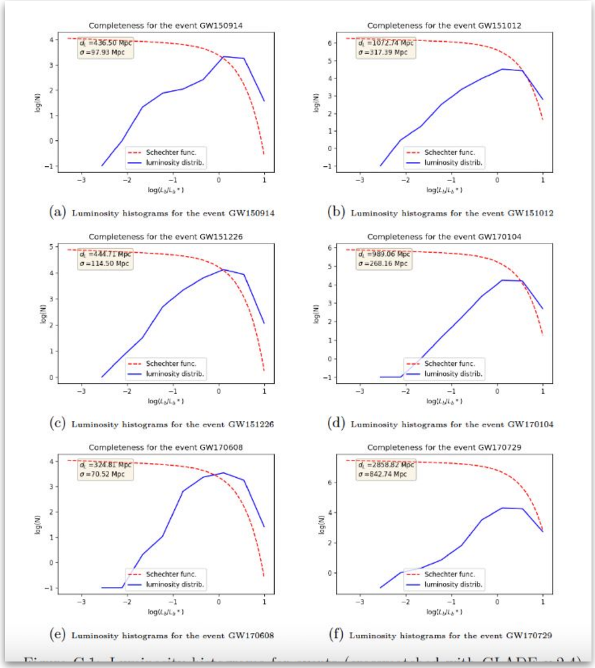
MASTER THESIS IN PHYSICS

CURRICULUM OF ASTROPHYSICS AND ASTROPARTICLES

Evaluating catalogues completeness extending the *Virtual Observatory* framework to estimate the H_0 Hubble constant with *dark standard sirens*

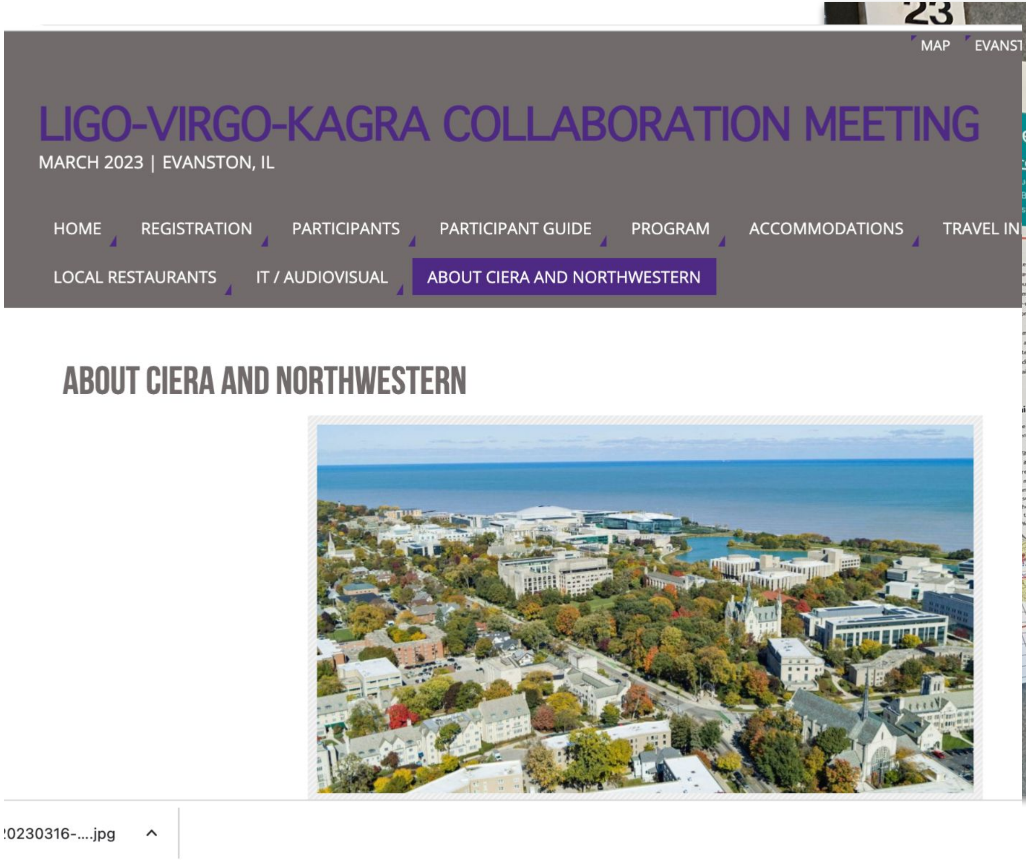
SUPERVISOR
PROF. MATEUSZ BAWAJ
UNIVERSITÀ DEGLI STUDI DI PERUGIA

MASTER CANDIDATE
MARIA LISA BROZZETTI



(a) Luminosity histograms for the event GW150914
(b) Luminosity histograms for the event GW151012
(c) Luminosity histograms for the event GW151226
(d) Luminosity histograms for the event GW170104
(e) Luminosity histograms for the event GW170608
(f) Luminosity histograms for the event GW170729

Tesi magistrale: cosmologia con le onde gravitazionali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EVANST
LIGO-VIRGO-KAGRA COLLABORATION MEETING
MARCH 2023 | EVANSTON, IL
HOME
REGISTRATION
PARTICIPANTS
PARTICIPANT GUIDE
PROGRAM
ACCOMMODATIONS
TRAVEL IN
LOCAL RESTAURANTS
IT / AUDIOVISUAL
ABOUT CIERA AND NORTHWESTERN
ABOUT CIERA AND NORTHWESTERN
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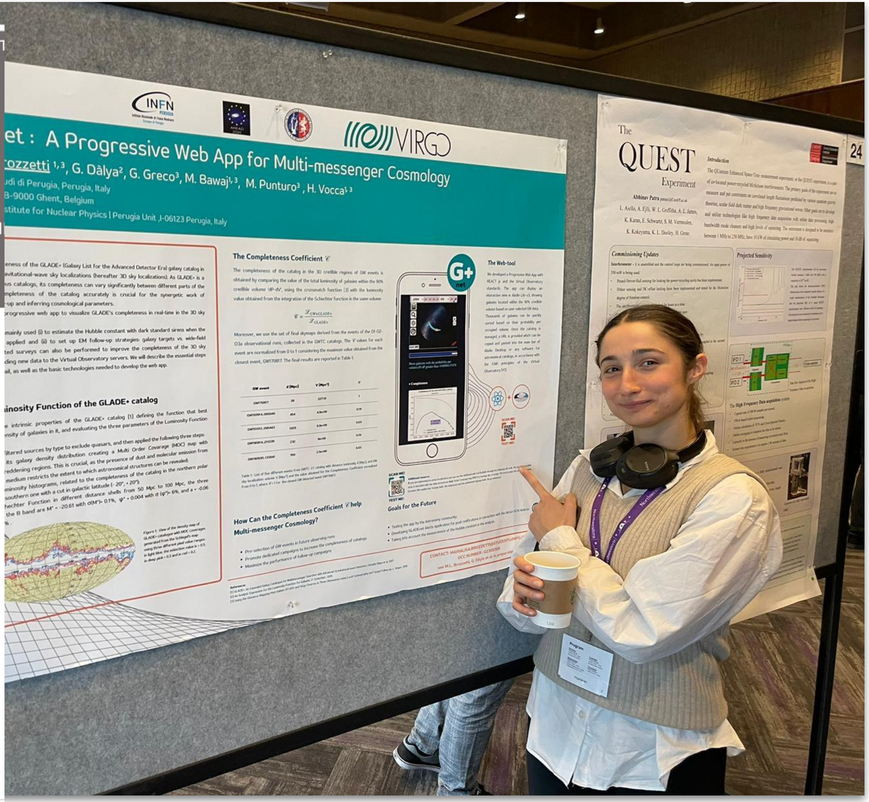
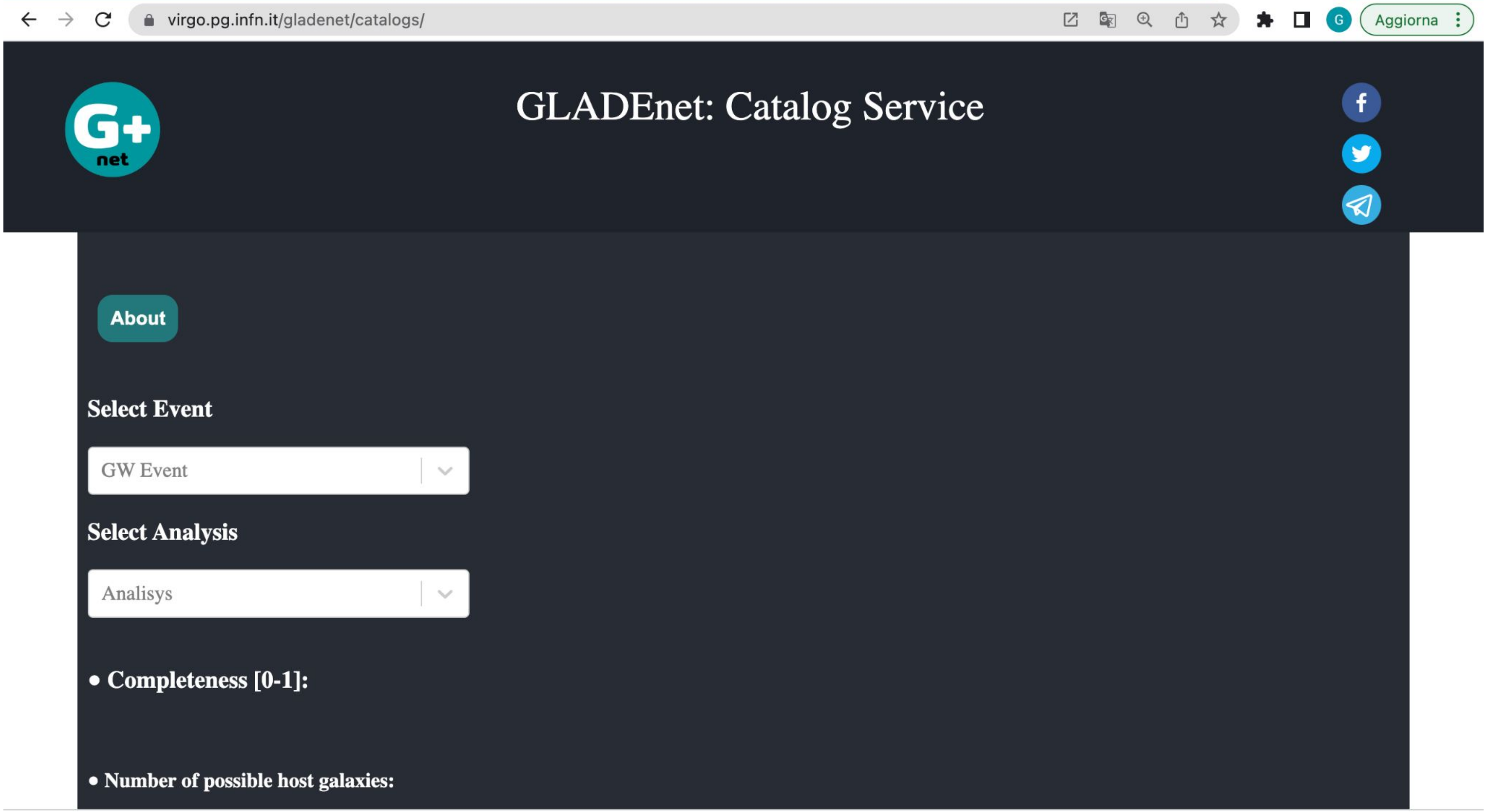

23
INFN
VIRGO
et : A Progressive Web App for Multi-messenger Cosmology
The Completeness Coefficient
The Web-tool
How Can the Completeness Coefficient help Multi-messenger Cosmology?
Goals for the Future
The
QUEST
Experiment
24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About
Select Event
GW Event
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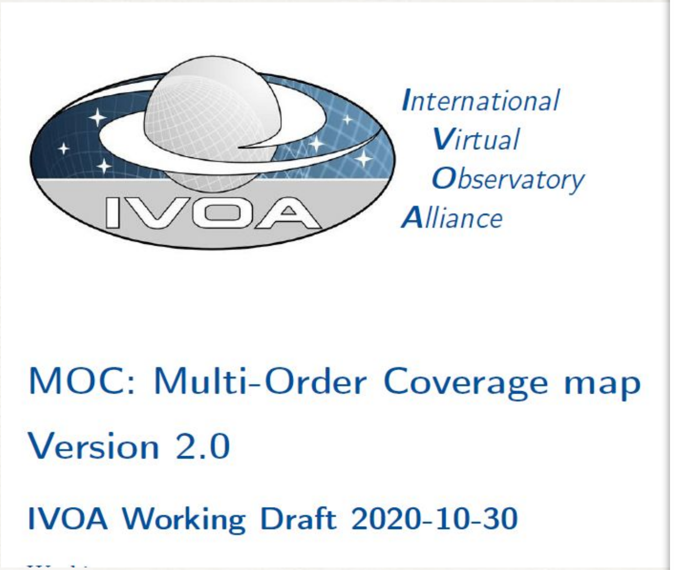
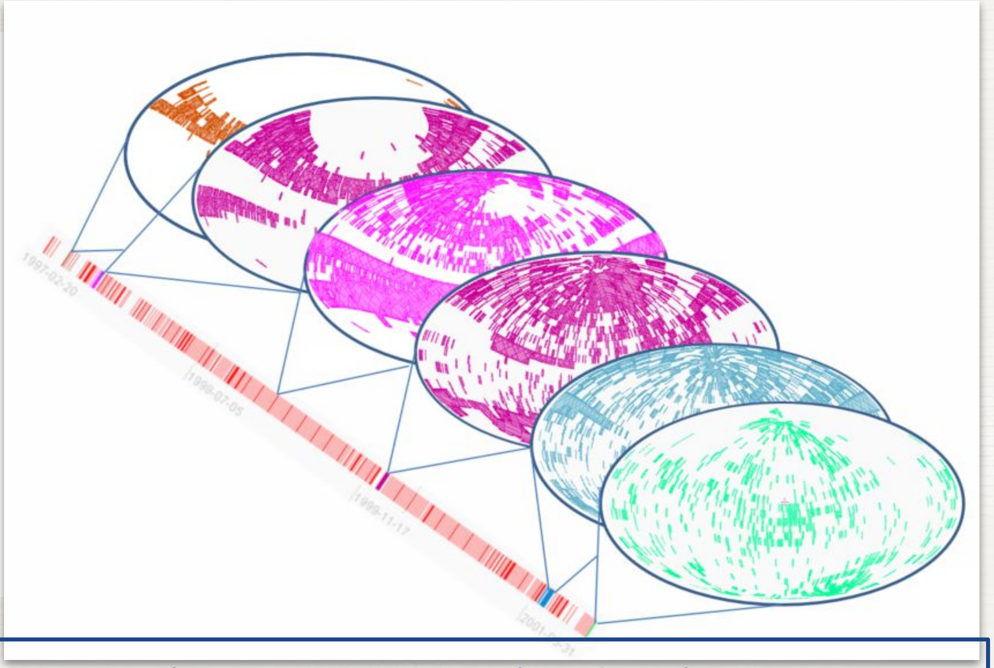
Spatial and Temporal MOC: ST-MOC


International Virtual Observatory Alliance

MOC: Multi-Order Coverage map

Version 2.0

IVOA Working Draft 2020-10-30



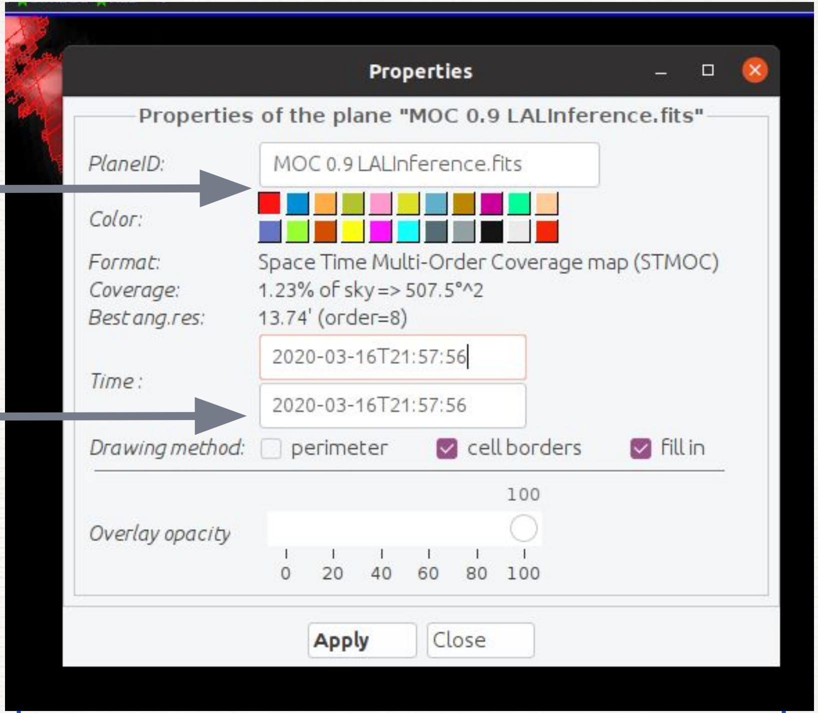
At a given Time range we obtain the corresponding Spatial coverage.

GW credible regions in Space and in Time

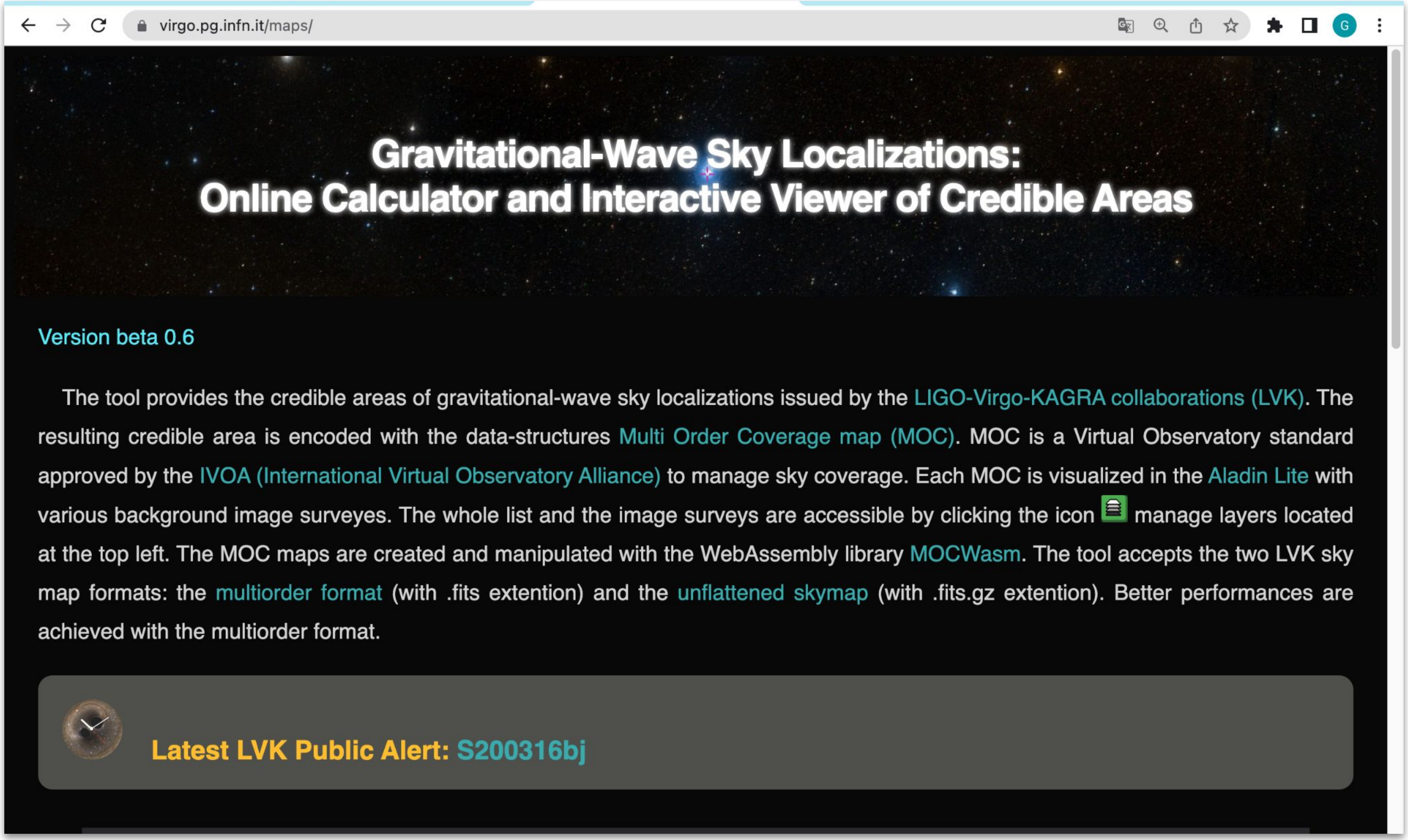
In *PlaneID* a credible region is selected.

In *Time* the merger time is added.

To search for any electromegnetic emissions before or after the compact binary coalescence, the time values can be modified accordingly producing a new ST–MOC.



Generation of a ST–MOC from a gravitational-wave sky localization using Aladin Desktop (beta version).



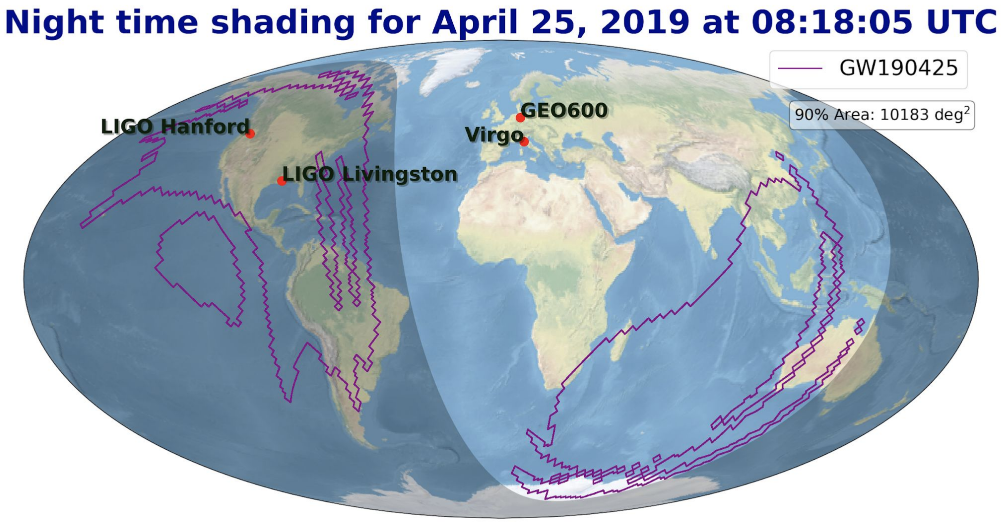
https://virgo.pg.infn.it/maps/

A practical example: an ideal observation campaign

Multi-messenger team:

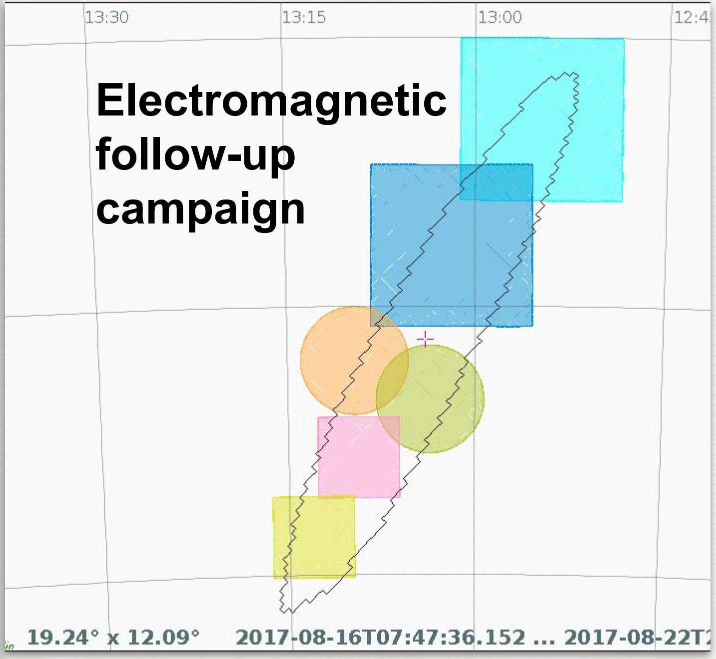
1. Haleakala Observatories in Hawaii, USA
2. Paranal Observatory in Chile
3. Siding Spring Observatory (SSO) in Australia

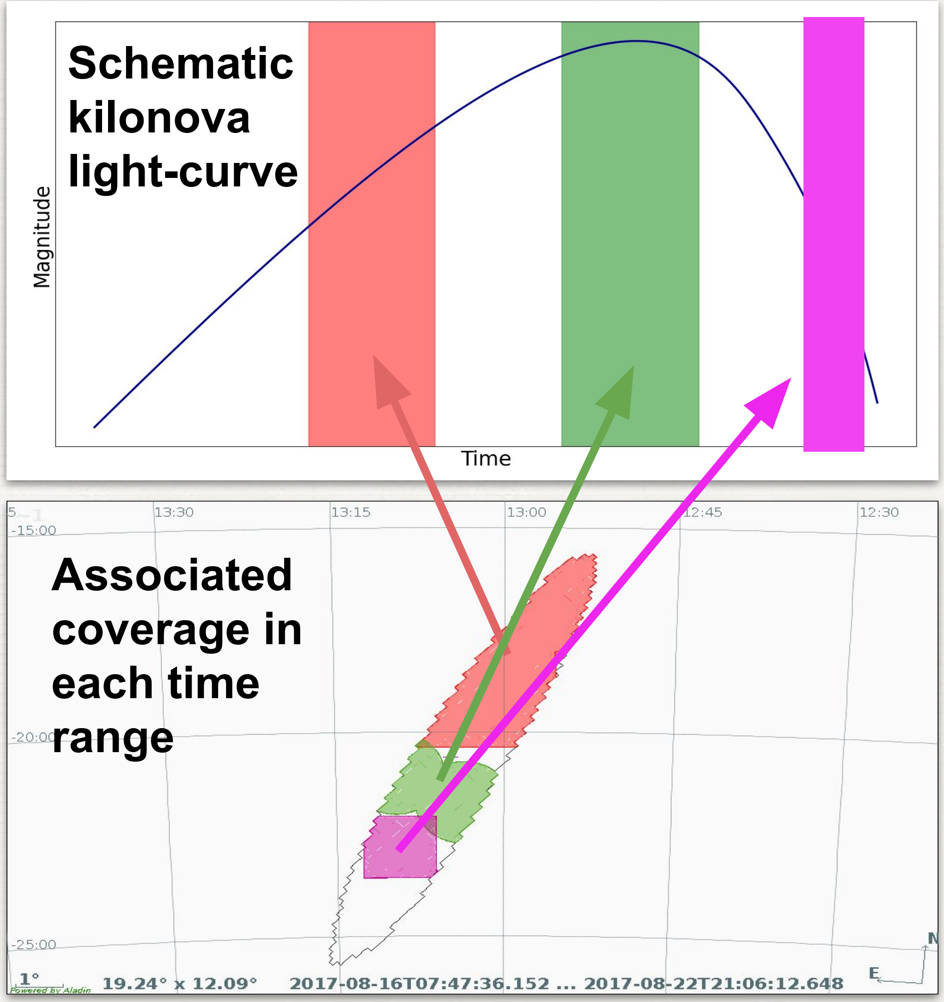
With astroplan we define three **Observer** classes. Observer is an astroplan container class for information about an observer's site

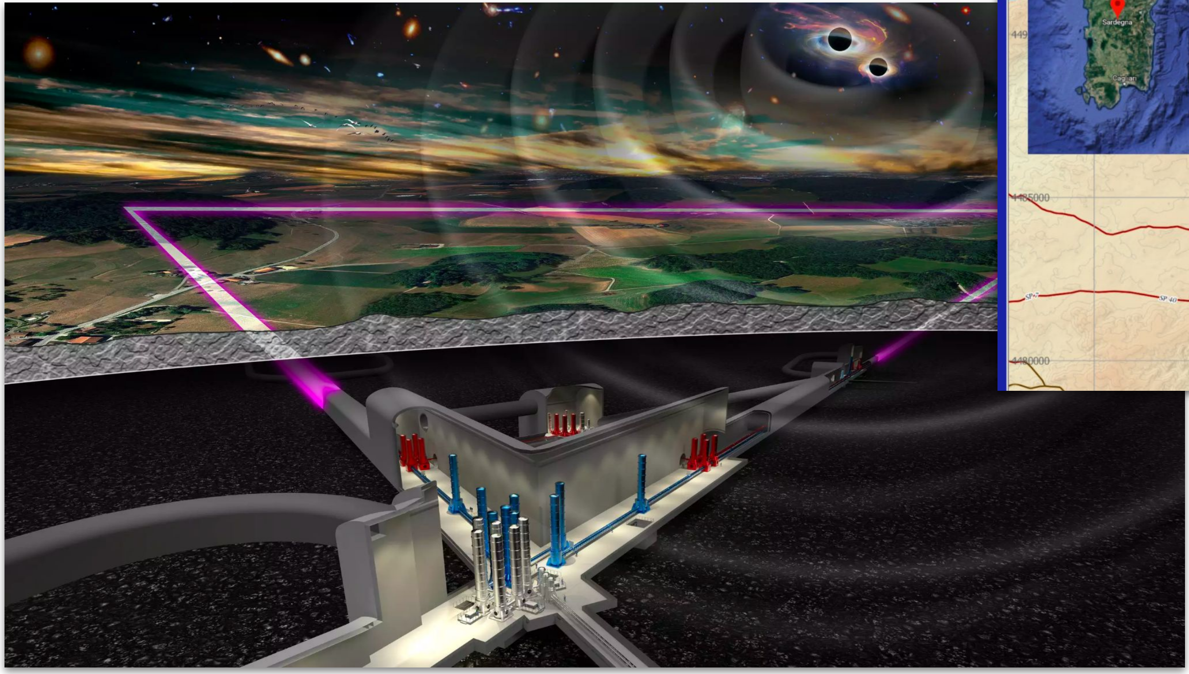


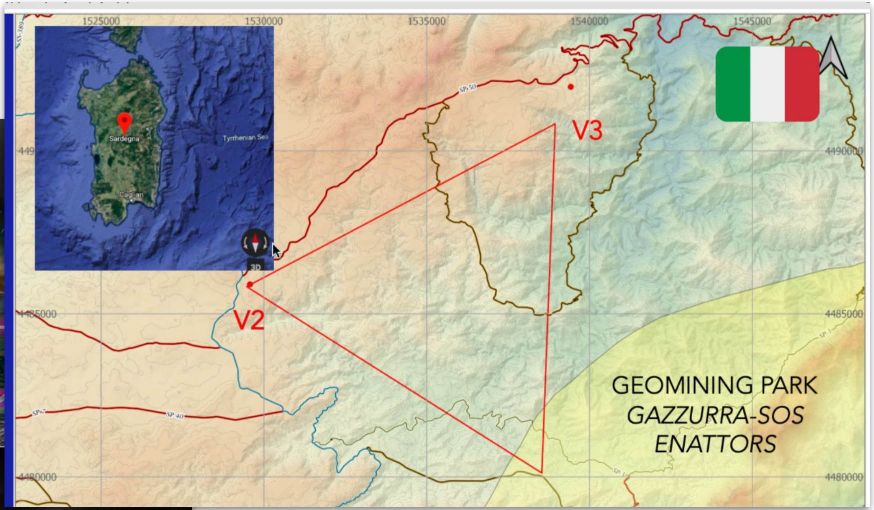
Observation of GW190425. The signal has been observed on 2019 April 25, 08:18:05 UTC, during the third observing run (O3) of the LIGO–Virgo network. The network consists of two Advanced LIGO interferometers in Hanford, Washing-ton, USA (LHO) and Livingston, Louisiana, USA (LLO) and the Advanced Virgo interferometer in Cascina, Italy. At the time of GW190425, LHO was temporarily offline with only LLO and Virgo taking data.

ST-MOC application: EM-followUP









Italia candidata ad ospitare ET

Tesi sull'astrofisica multimessaggera con ET e sulla gestione del sistema di invio di allerte.

Einstein Telescope Observatory