

Small telescopes for science communication: Some personal experiences

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USE OF SMALL TELESCOPES IN THE GIANT ERA II

26-29 February 2024, Complesso di Sant'Apollonia, Florence

Sila - Ampollino Lake (Italy, 22 January 2018)

Lessons learned from 3 experiences on *Terza Missione*:

- Astronomical Park “*Lilio*” (la Sila, KR) 
- Betelgeuse Occultation by an asteroid 
- Small-telescopes national network 

- Astronomical Park “*Lilio*” (Ia Sila, KR)

In a dark location in Italy

London



Moscow



Astronomical Park "Lilio"
(Savelli, La Sila National Park)



Astronomical Park "Lilio"

Wanted by prof. **Filippo Frontera**
(University of Ferrara, originally from Savelli)



Inauguration day

Provincia di Crotona Regione Calabria Comune di Savelli

VENERDÌ 5 AGOSTO 2016 ORE 18:00
Inaugurazione
PARCO ASTRONOMICO "LILIO"
di SAVELLI

Savelli (Kr) - Località Caccianinni - Strada per Pino Grande (SP28)

PARTECIPANO:

- Vincenzo De Vivo**
Prefetto di Crotona
- Giuseppe Capoccia**
Procuratore della Repubblica di Crotona
- Dorina Bianchi**
Sottosegretario del Ministero dei Beni e Attività Culturali
- Mario Oliverio**
Presidente della Regione Calabria
- Antonella Rizzo**
Assessore Regionale all'Ambiente
- Flora Sculco**
Consigliere Regionale
- Sonia Ferrari**
Commissario del Parco Nazionale della Sila
- Michele Laudati**
Direttore del Parco Nazionale della Sila
- Franco Parise**
Presidente f.f. Provincia di Crotona
- Ugo Pugliese**
Sindaco di Crotona
- Francesco Spina**
Sindaco di Savelli
- Filippo Frontera**
Ideatore del Parco e Ordinario Università di Ferrara
- Antonio Scarmato**
Responsabile Scientifico del Parco Astronomico

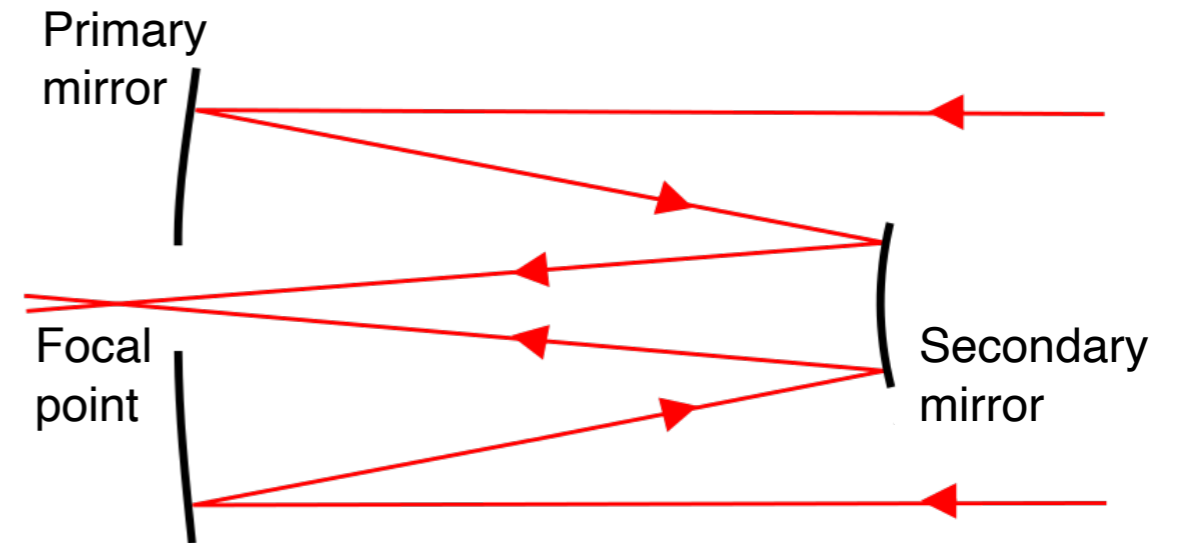
Segreteria organizzativa:
Antonino Brosio - Michele Caccia
Tel. 392.1494615 - email: info@astrosavelli.it

Astronomical Park “*Lilio*”

- Altitude: about 1000 m
- Optical telescope 50 cm
- Radio antenna
- Solar refractor telescope 180 mm F/9 with filters (included H α)
- Planetarium



Parco Astronomico *Lilio* (Savelli, KR, la Sila)



- 4 SDSS standard filters: u, g, r, i
- g -band limiting magnitude: $m \approx 20.3$
- Possible remote observations

Optical telescope Richey-Chrétien 50 cm primary mirror

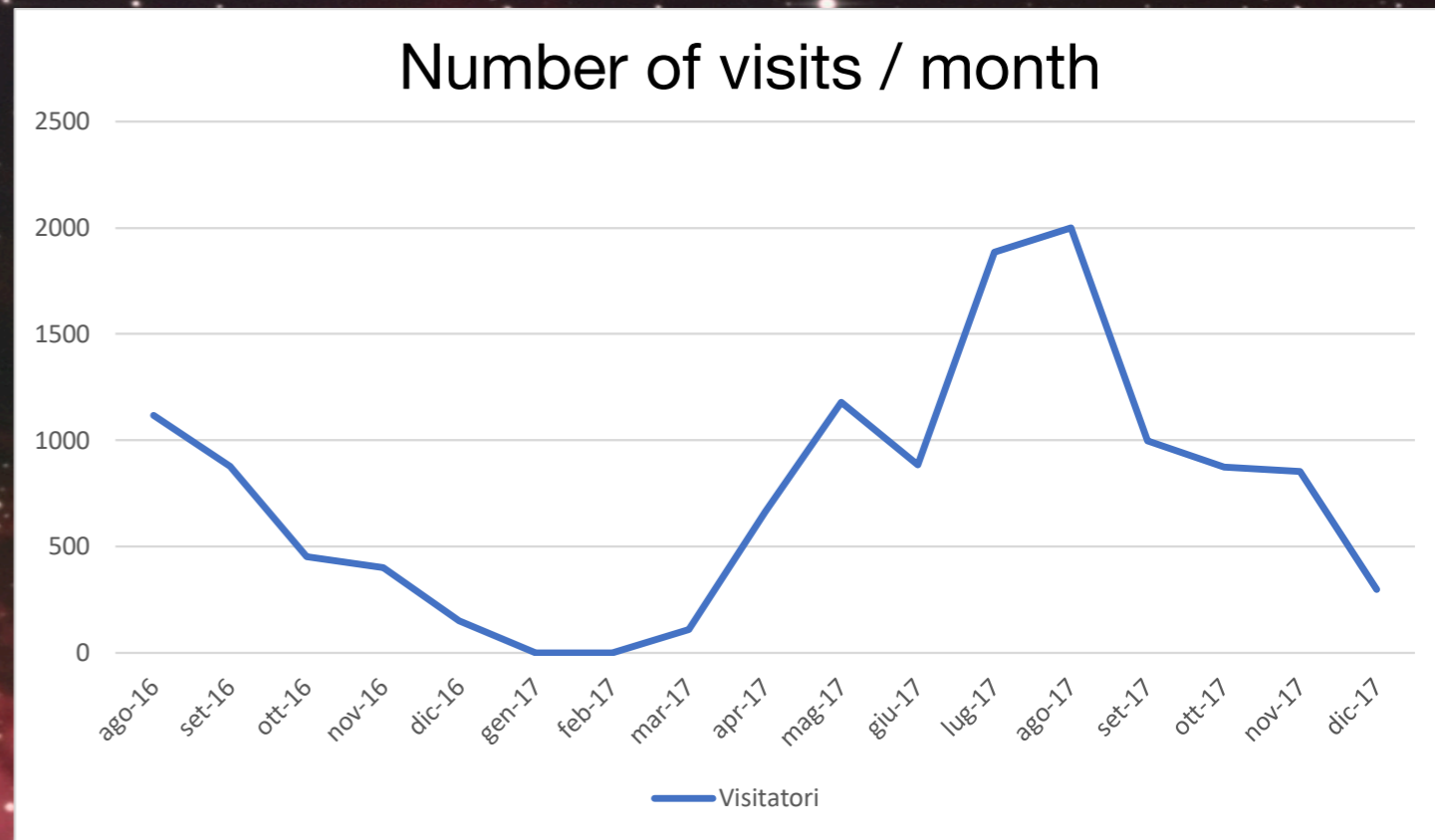
Technical characteristics

- 50 cm Hyperbolic primary mirror
- Focal ratio $F/3$
- Professional CCD (1K×1K, pixel size $24 \mu\text{m}$)
- Field of view: $21.1 \times 21.1 \text{ arcmin}^2$
- Filter wheel
- Possible remote observations
- Limiting magnitude in clear: $m \approx 21$
- Measured with g filter: $m \approx 20.3$ (without Moon)

Messier 16 (Eagle Nebula)

Distance: 5700 light years

M16 - Eagle Nebula



Dati Parco Astronomico Lilio

Image taken by Science Director **Antonino Brosio**
Parco Astronomico *Lilio* (Savelli, KR)

Public events online to *touch the sky* from home



Cerca



Osservazione al Telescopio con Sandra Savaglio e Antonino Brosio



Parco Astronomico Lilio

343 iscritti

Iscriviti

14



Condividi

Clip

Salva



337 visualizzazioni Trasmesso in streaming 10 mesi fa

Activity with University students



 UNIVERSITÀ
DELLA
CALABRIA

Latitudine: 39.3 gradi
Longitudine: 16.7 gradi





Astrophysics Laboratory, Master course, University of Calabria
Prof. Sandra Savaglio & Science Director Antonino Brosio

Detection of supernovae

The image shows a dark field of stars with two primary galaxy systems. On the left is a bright, circular galaxy. To its right is a smaller, more irregular galaxy system. A white arrow points from the text 'Supernova SN2022hrs' to a small, bright point within the smaller galaxy system. The background is filled with numerous faint, distant stars.

Supernova SN2022hrs

Discovery date 16 April 2022

Discovered by Amateur Astronomer Koichi Itagaki

Peak magnitude: $m = 13$

Interacting galaxy: *Messier 60*

Distance: 17.38 Mpc

Galaxy: *NGC 4647*

Distance: ~ 19.3 Mpc

Galaxy *NGC 3362*

Distance: 118.7 Mpc



SDSS image
Spiral galaxy Sc
R.A.: 161.2157
Dec.: 6.5967
Apparent magnitude: $m(i) = 12.8$
Redshift: 0.027

SN 2019cda

Discovery magnitude $m = 18.1$

Discovery date: March 24 2019

Supernova type: Ic



Parco Astronomico "Lilio"

March 2019

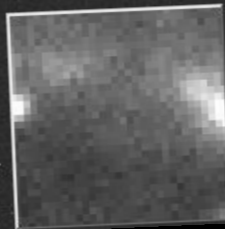
Filter: r

Most recent and last supernovae observed at Parco Astronomico *Lilio*

Parco Astronomico Lilio
Filter: SDSS r
Exposure time: 240 seconds

SN2023dbc

Obs: A. Brosio S. Savaglio
Msr: A. Brosio S. Savaglio
Stn: K70
Tel: 0.50-m f/8.0 reflector



Messier 108

Distance = 8.8 Mpc

Redshift $z = 0.0023$



SDSS image

Gamma-Ray Burst **GRB 201020B**

Astronomical Park Lilio, October 2020

Apparent magnitude (g): $m = 20.3$

Redshift: $z = 0.804$

Explosion occurred 6.9 billion years ago (half the age of Universe)

GRB201020B (g = 20.30)

Stella di campo (g = 21.33)



The plan was: detection of optical counterpart of gravitation-wave (GW) sources

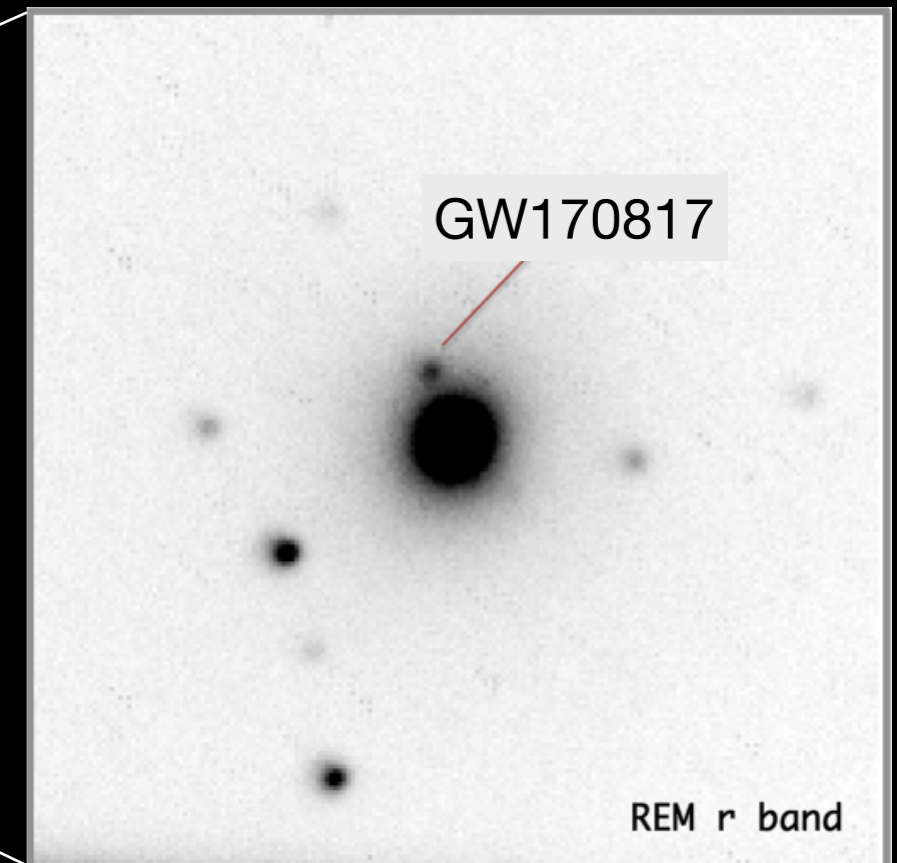
Observed at Parco Astronomico *Lilio* (la Sila)
February 2019



It could have been detected!

Host galaxy *NGC 4993*
Apparent magnitude (V): $m = 12.4$
Distance: 44 Mpc

Observed at La Silla (Chile)
August 2017



First & only optical counterpart of GW source ever detected

All possible effort for promotion of Parco Astronomico *Lilio*



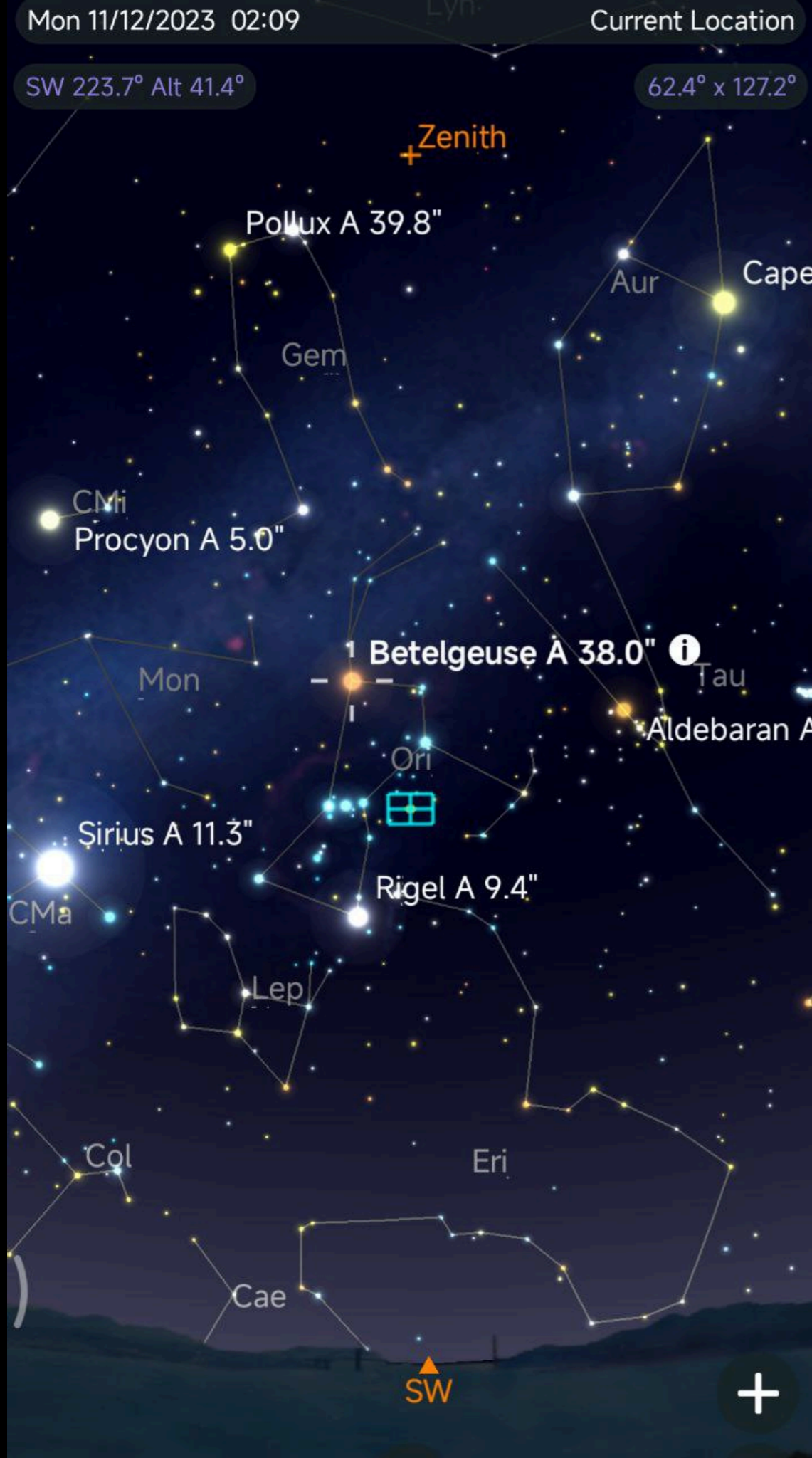
Part 1: Astronomical Park *Lilio*

- **Great** opportunity to attract students & general people
- **Great** opportunity for interesting science
- **It failed** for lack of long-term vision of parties involved
- **Lost** opportunity to do fantastic things with public money in most depressed Region of Italy
- Now **in the hands** of “Science Director” with no science background but with knowledge on **astrology**

- Betelgeuse Occultation by an asteroid

Asteroid (319) Leona

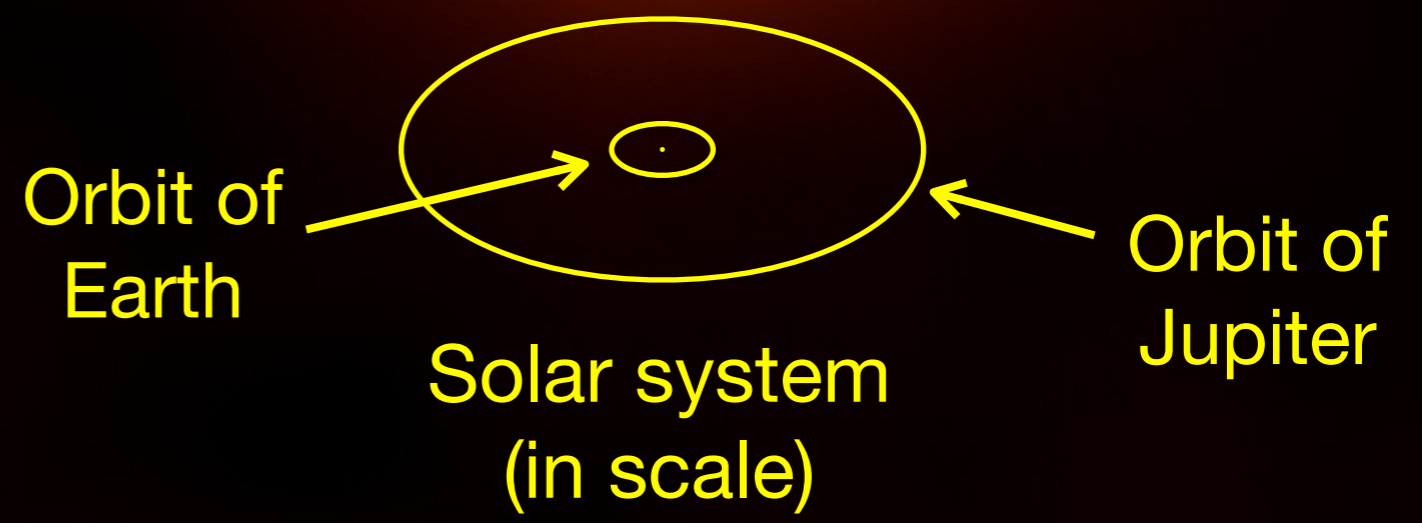
Italian observational campaign
organised by **AstroCampania ETS**
&
Andrea Di Dato (INAF Naples)



Betelgeuse

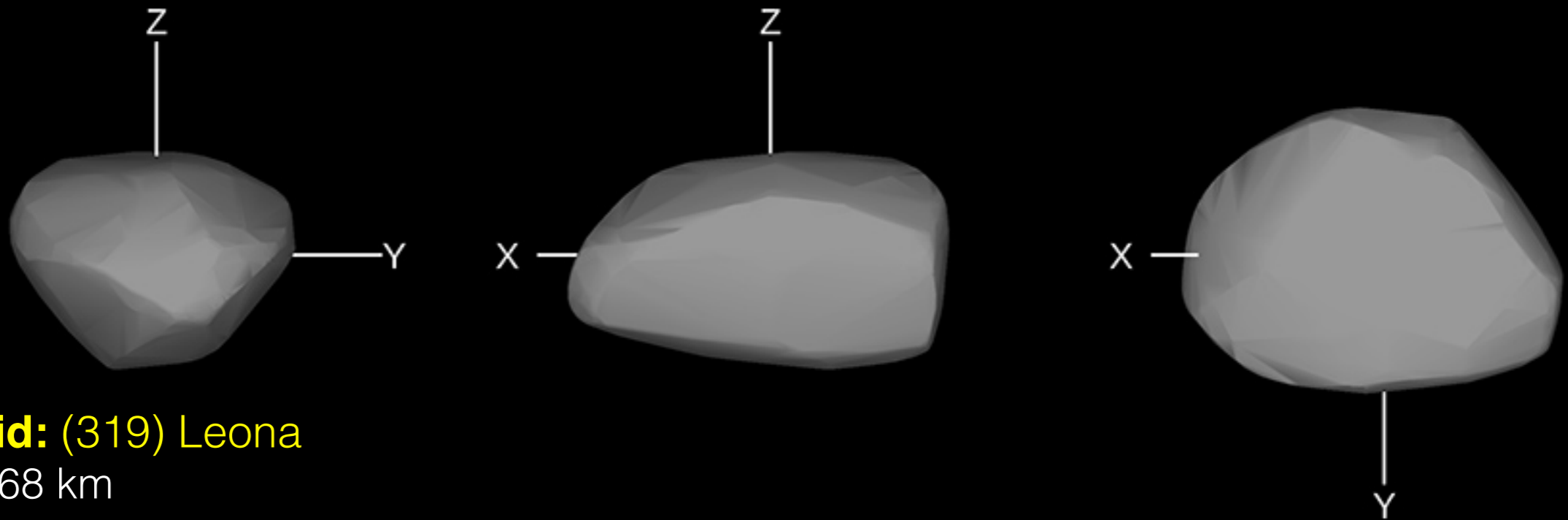
Distance: 640 light years

Mass: 18 M_{\odot}



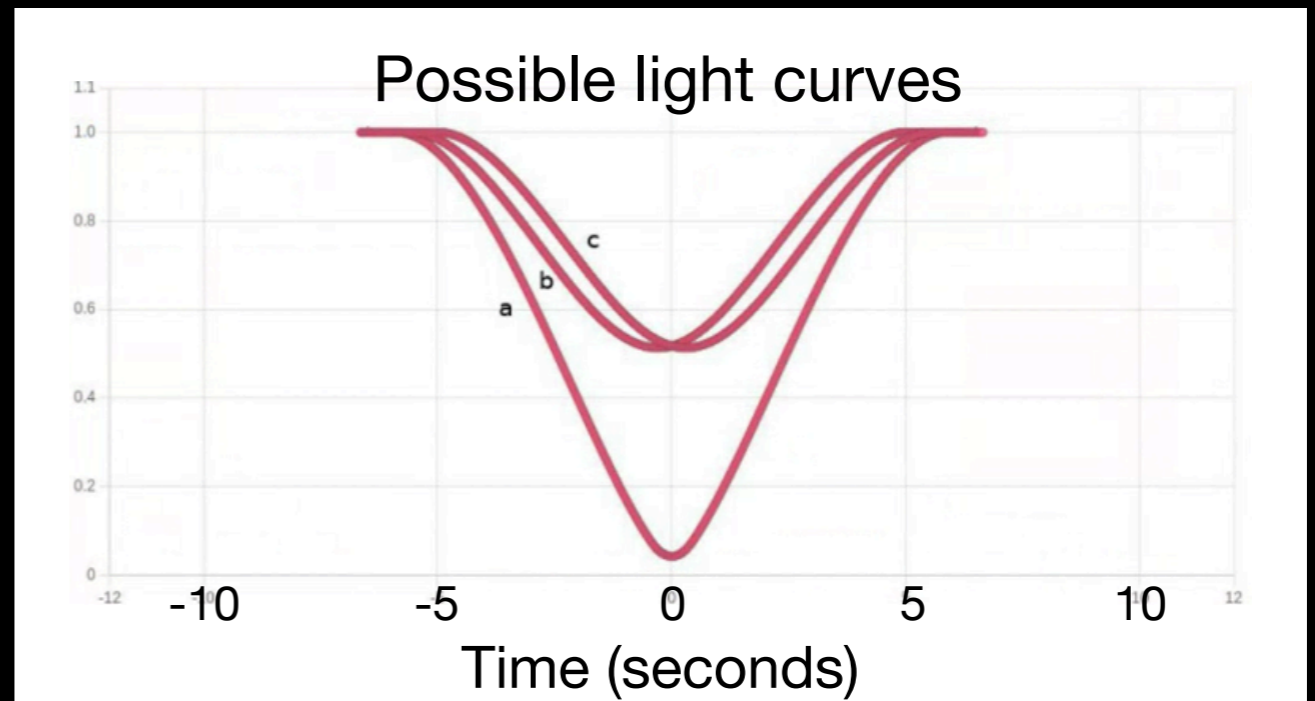
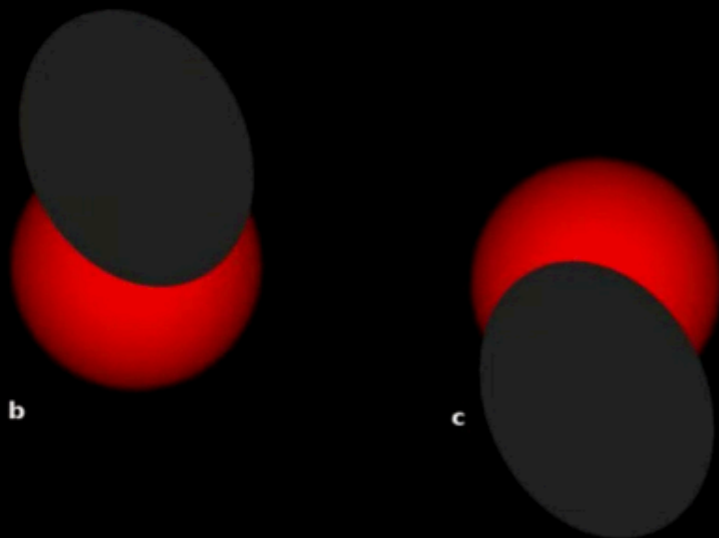
Expected occultation of Betelgeuse by asteroid (319) Leona

Date: 12 dicembre 2023 Time: 2:17am

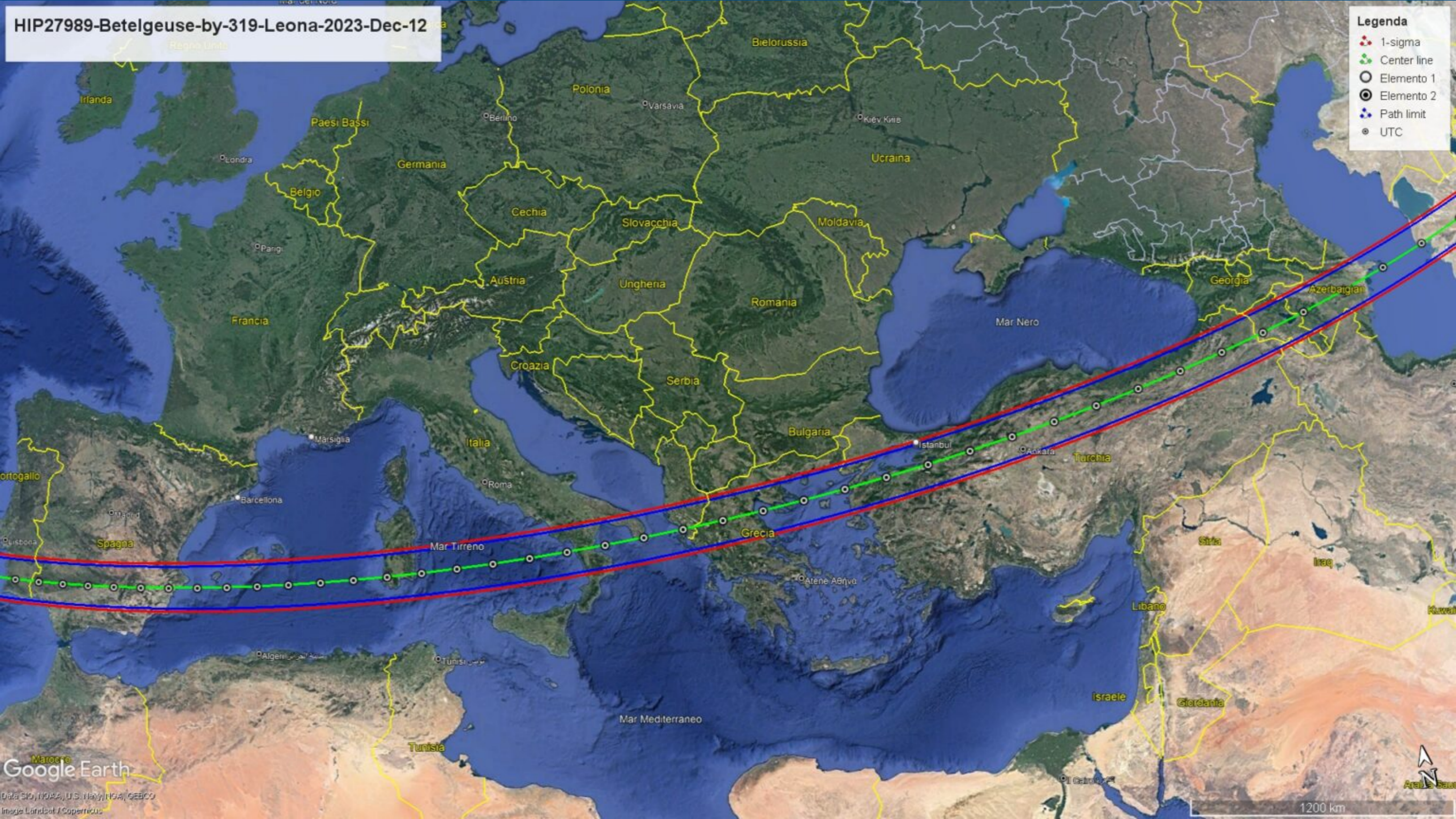


Asteroid: (319) Leona
Size: ~ 68 km

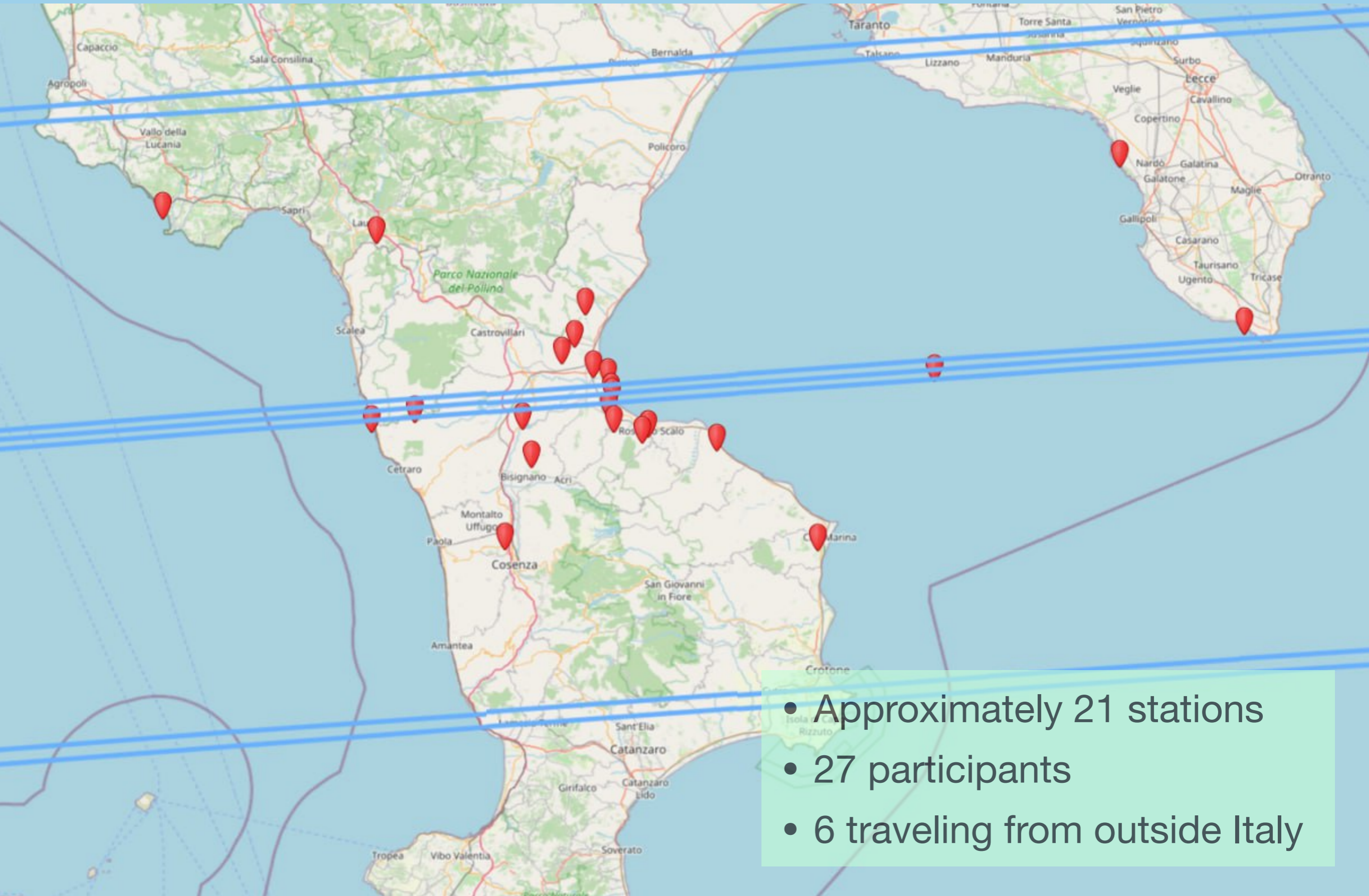
Expected occultation



Latest path prediction

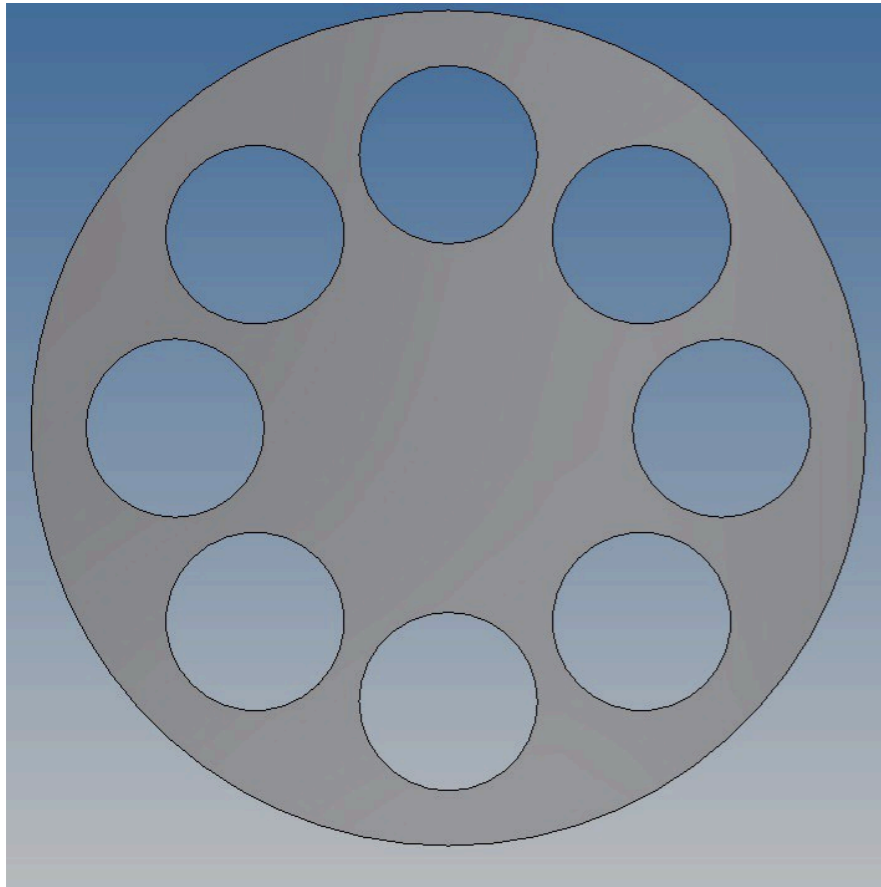


Participation



Correction of astronomical scintillation: multi-hole mask for large-field telescope

(Emilio Costa - Padua University)

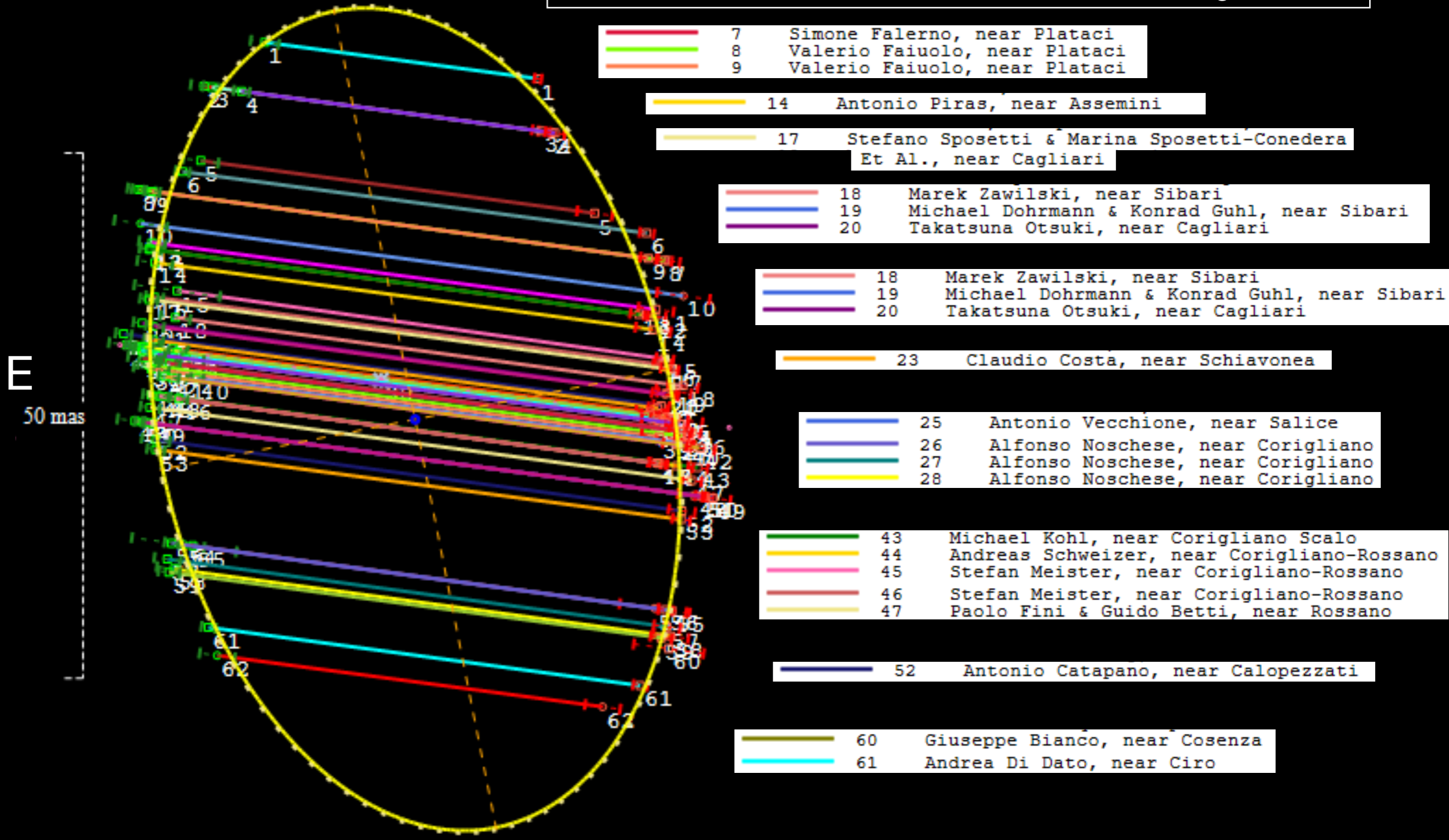


Suggested by Costantino Sigismondi

61 chords across Leona, plus predicted center line & best-fit ellipse

N

Observers in Calabria & Sardinia and their observing location





UNIVERSITÀ DELLA CALABRIA
DIPARTIMENTO DI
FISICA

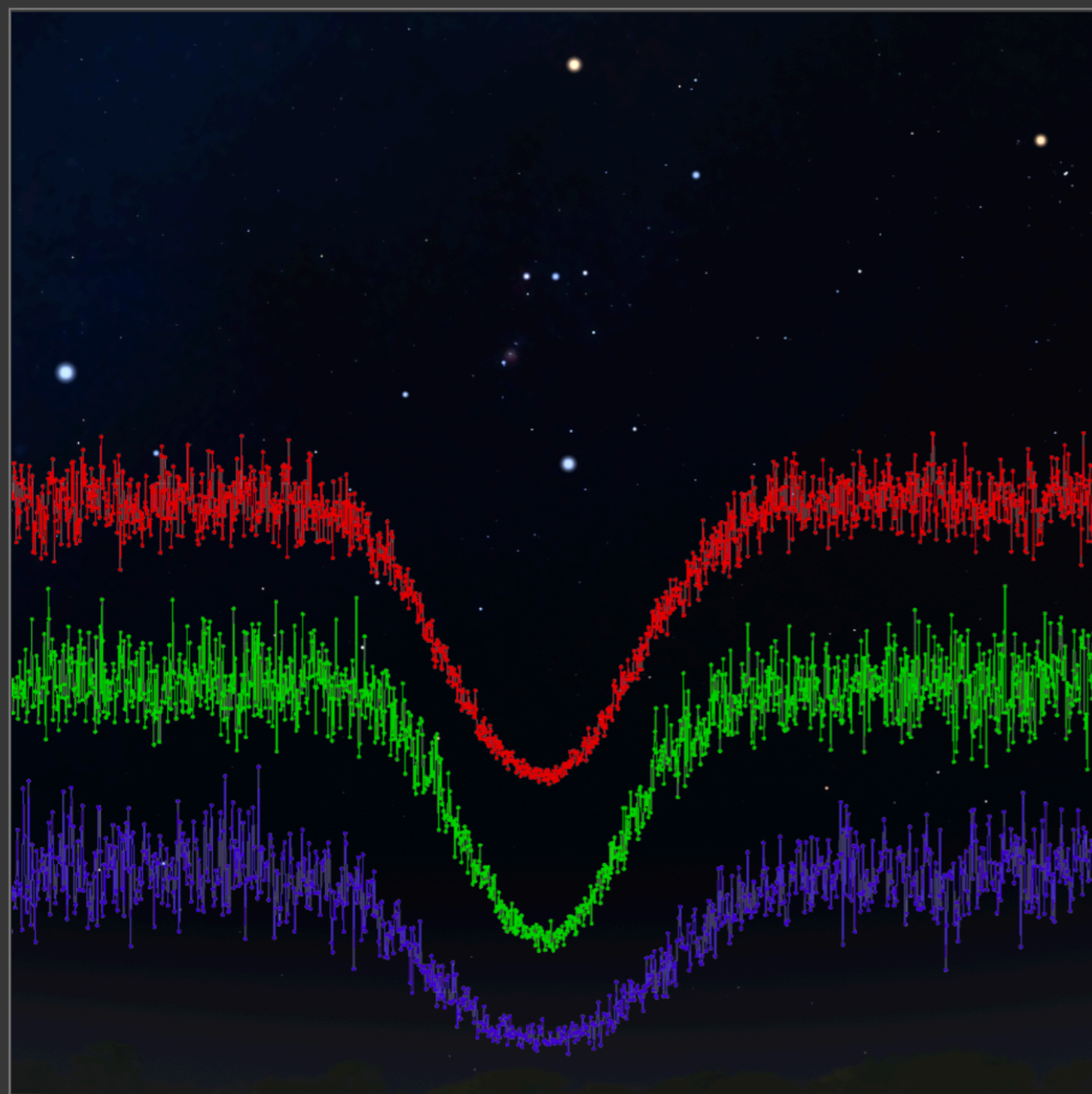


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Observations of the Occultation of Betelgeuse by (319) Leona

“Such successful predictions were unthinkable a few years ago. It has not been only simply thanks to technology that has made it possible to obtain precise data of celestial bodies. It has also been a reward for the tireless work of the entire professional and amateur occultation community, and what a fine example of that is published quarterly in Journal for Occultation Astronomy. Congratulations on all the work and happy 2024!”

Carles Schnabel
International Occultation Timing Association /
European Section

Data by Alfonso Noschese
Taken near Corigliano (CS)

Part 2: Betelgeuse occultation

- **Very positive** collaboration between amateur & professional astronomers
- Data collected by amateurs & delivered to professionals to unveil **information on:**
 1. Leona (shape)
 2. Betelgeuse (stellar atmosphere)

- **Small-telescopes national network**

Participation to PRIN funding opportunity in 2022

Conceived a network of 7+ national small-telescopes

1. Osservatorio Astronomico Regionale del Parco dell'Antola Fascia (Liguria)
2. Osservatorio Astronomico Salvatore Di Giacomo (Campania)
3. Parco Astronomico Lilio (Calabria)
4. Fondazione GAL Hassin (Valle d'Aosta)
5. Centro Internazionale per le Scienze Astronomiche, Isnello (Sicily)
6. ABObservatory (Rosarno, Calabria)
7. Osservatorio Polifunzionale del Chianti (OPC, Tuscany)
8. Parco Astronomico della Regione Autonoma della Valle d'Aosta (OAVDA, Valle d'Aosta)
9. Observatoire des Baronnie Provençales[13] (OBP, in France not far from the piedmontese border)
10. Osservatorio Astronomico Aresta di Petina (OAAP, in Campania)

Final ranking in spring 2023

- It positively passed experts' review
- First not funded project

Project title:

NOCTIS: Network Osservativo Coordinato di Telescopi per l'Insegnamento e la Scienza

PI: TOSI Silvano (Università degli Studi di Genova)

Substitute PI: SAVAGLIO Sandra (University of Calabria)

Goals

- Citizen Science project
- First Italian network of robotic optical telescopes
- Standardisation of data taking, analysis & archive
- It will cover Italy (from Valle d'Aosta to Sicily over more than 1000 km)
- Contributions for multidisciplinary studies
- Support for large international facilities
- Dissemination of science culture for students & in the society
- Dissemination of environmental awareness (dark skies & cleanness)

The Project

- Several observatories host medium/small-size telescopes performing public outreach
- Each site has a vast experience
- Top-class automatic and robotic instruments to produce science on wide range of topics
- Complementary to overly-committed professional large facilities to produce:
 - Long-term monitoring
 - Follow-up observations of transients
- Targets are:
 - NEO
 - Exoplants
 - Optical counterparts of GW
 - Explosive events (GRBs, supernovae)
 - AGN
- Networks ensures: minimisation of uncertainties & downtime
- A network of telescopes ensures a high volume of sky time observations
- Future goal: enlarge network with national & international collaborations

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1. Quality of the research project :

This is a project aimed at creating the first Italian network of robotic optical telescopes across the country. The idea behind it is to “upgrade” the existing telescopes that only mainly do public outreach into more professional telescopes. The proposal explains in detail what each telescope can deliver, and what are the necessary steps to make these linked telescopes deliver science. While the idea is novel, it was unclear how this project could be supported beyond the timescale of this present PRIN funding. Moreover, it was not clear whether they will start with three or seven telescopes (both are mentioned as initial set up).

2. Research team & feasibility

The team is well suited, although on the technological/software part of the project it was mentioned, but not explicitly described, that the project would benefit from "external collaborators and technicians". The concept of citizen science is ambitious and important and the type of science that can be done is well explained. The actual work seems straightforward and feasible but as it is mainly a management and software project, the proposal could have benefitted from a better explanation of what type of Post-Docs the proponents are looking for. It seems a project better suited to software engineers and outreach personnel. The project is divided in 6 WPs. The deliverables were not so well explained in connection to the actual tasks within each WP, especially for WP6.

3. Project Impact:

The societal impact is high as this network of telescopes would likely be central to several outreach and dissemination events. The scientific impact, especially for the internationalisation of Italian research, is not so clear, beside the great potential for the didactic in forms of summer schools, PhD training courses etc. Particularly novel is the idea to prepare pre-processed data for interactive master classes which potentially could be used everywhere. In terms of technology, the proposal mentions the potential impact on future telescopes e.g. the possibility to test new instruments.

Part 3: Small-telescopes national network

- **Positive** reviews
- **Encouraging** to try again and do better
- **For instance:** enlarge network with national & international collaborations

Astronomy with small telescopes for education and science communication

- Unique for power of visual contact with cosmos
- It answers fundamental questions about the universe
- Connected to technology and other sciences
- Encouraging society for active participation
- Large community of amateur astronomers world wide make important discoveries
- A global phenomenon helping collaboration between countries & political peace
- Necessary improve communication between professional vs. amateur astronomers