



EduCosmos: participative science for students

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Observatoire
de la CÔTE d'AZUR

Summary of the presentation

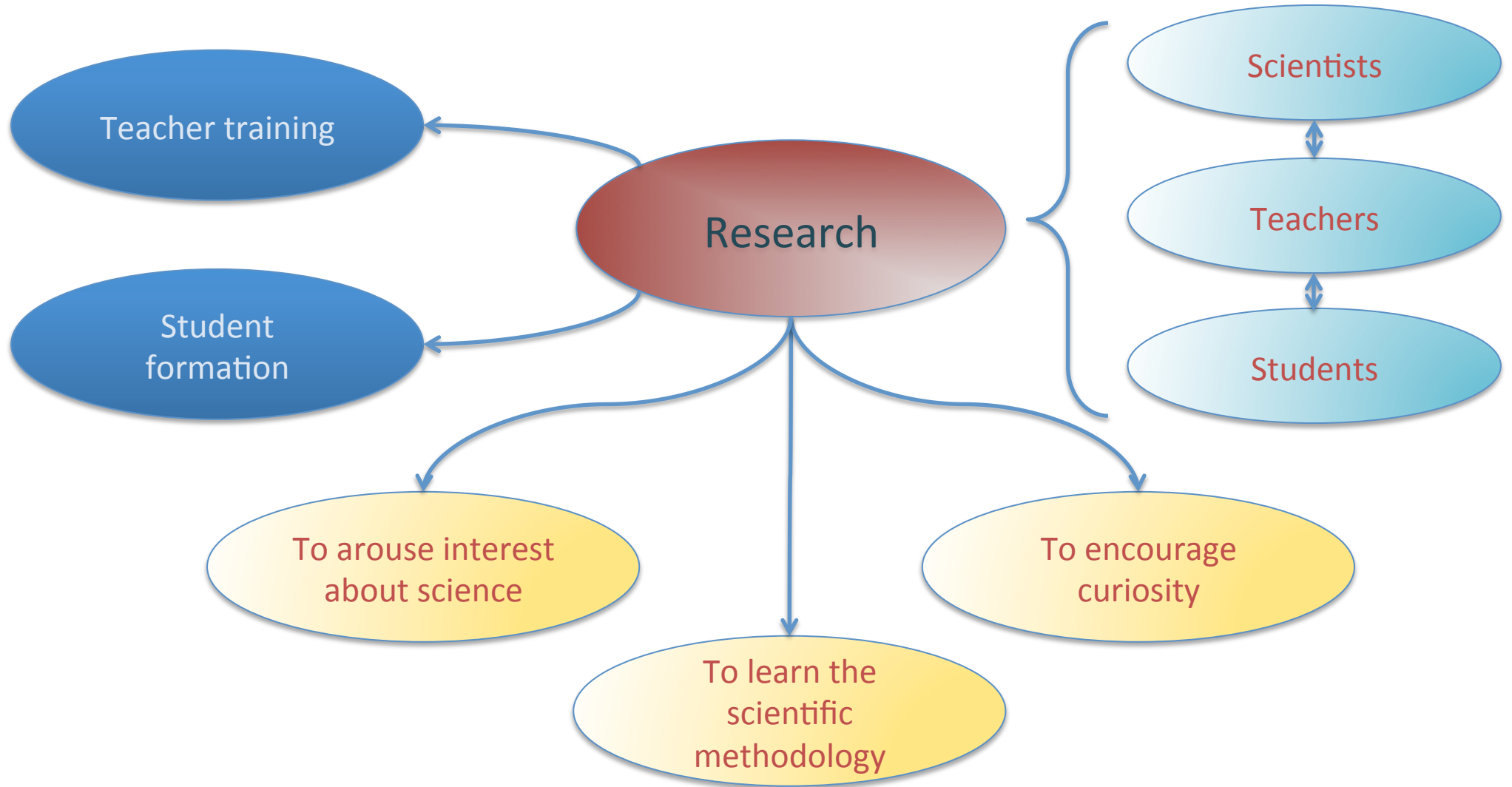
- ✦ EduCosmos : objectives and schema
- ✦ Origin : C2PU project (the history, refurbishing of the telescope, the images, the science)
- ✦ EduCosmos : the project
 - ✧ Teacher training
 - ✧ Observations
 - ✧ Scientific program

EduCosmos

- ✦ This project allows secondary-school classes to participate into a real research project lead by scientists from the « Observatoire de la Côte d'Azur » - Nice, France
- ✦ Students will use two 1-m telescopes belonging to a larger project based on research and education: *C2PU – Centre Pédagogique Planète et Univers*
- ✦ Telescopes located at 1200m altitude, and ~ 60 km from Nice
- ✦ Objectives:
 - ✧ To arouse students' interest by scientific subjects
 - ✧ To introduce students to the scientific methodology
 - ✧ To bring scientists and teenagers closer to each other



Conceptual diagram of EduCosmos



The C2PU project

(Centre Pédagogique Planète et Univers-

Center for education in Astronomy and Earth Sciences)

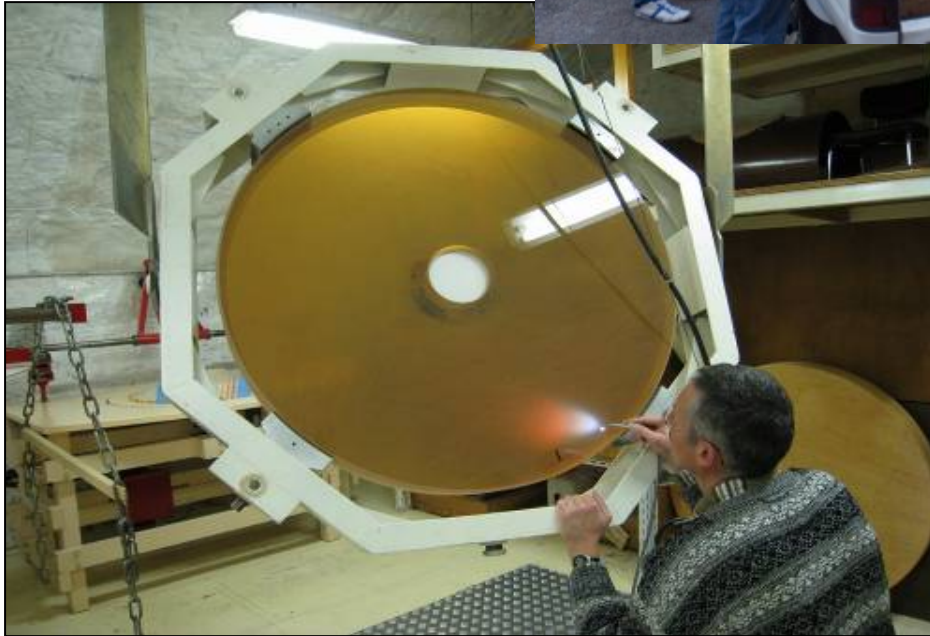
- ✦ Use of two 1-m telescopes for research and University education.
C2PU team : J.P.Rivet, Ph.Bendjoya, L.Abe, O.Suarez (OCA)
- ✦ Old telescopes used in the 90's for interferometry studies.
- ✦ Beginning of the refurbishing of the telescopes – June 2010
- ✦ First light of the West telescope – 2012



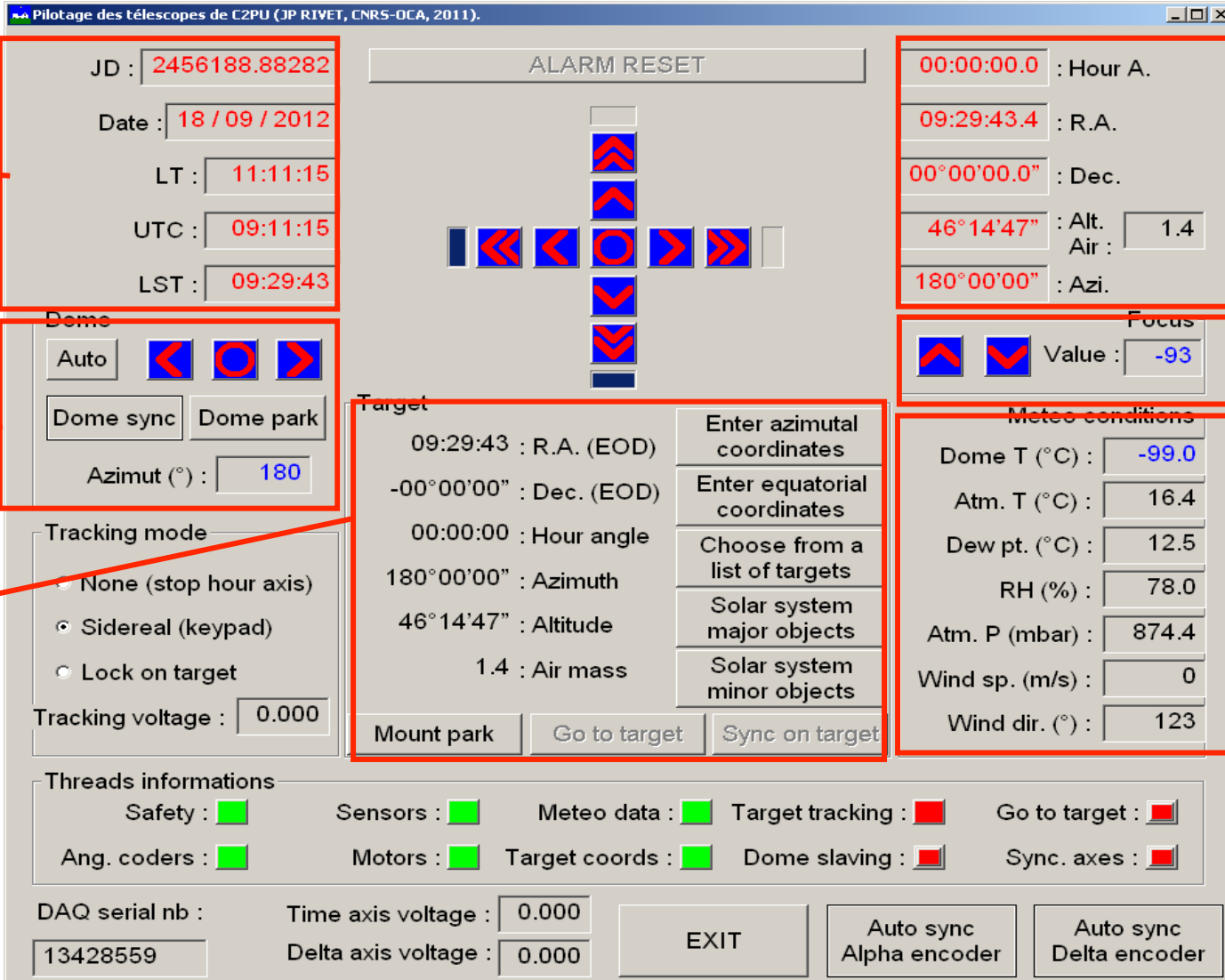
Mirror : transport-polishing; mechanics

Blank in Zerodur - diameter
106 cm

Polishing : David Vernet
(Collège de France)



Control software



Date/time

JD : 2456188.88282
 Date : 18 / 09 / 2012
 LT : 11:11:15
 UTC : 09:11:15
 LST : 09:29:43

Dome

Auto [Left Arrow] [Center Arrow] [Right Arrow]
 Dome sync Dome park
 Azimut (°) : 180

Target

Tracking mode
☐ None (stop hour axis)
☒ Sidereal (keypad)
☐ Lock on target
 Tracking voltage : 0.000

Telescope position

00:00:00.0 : Hour A.
 09:29:43.4 : R.A.
 00°00'00.0" : Dec.
 46°14'47" : Alt.
 180°00'00" : Azi.

Focus

Value : -93

Weather

Meteo conditions
 Dome T (°C) : -99.0
 Atm. T (°C) : 16.4
 Dew pt. (°C) : 12.5
 RH (%) : 78.0
 Atm. P (mbar) : 874.4
 Wind sp. (m/s) : 0
 Wind dir. (°) : 123

Target
 09:29:43 : R.A. (EOD)
 -00°00'00" : Dec. (EOD)
 00:00:00 : Hour angle
 180°00'00" : Azimuth
 46°14'47" : Altitude
 1.4 : Air mass

Enter azimuthal coordinates
 Enter equatorial coordinates
 Choose from a list of targets
 Solar system major objects
 Solar system minor objects

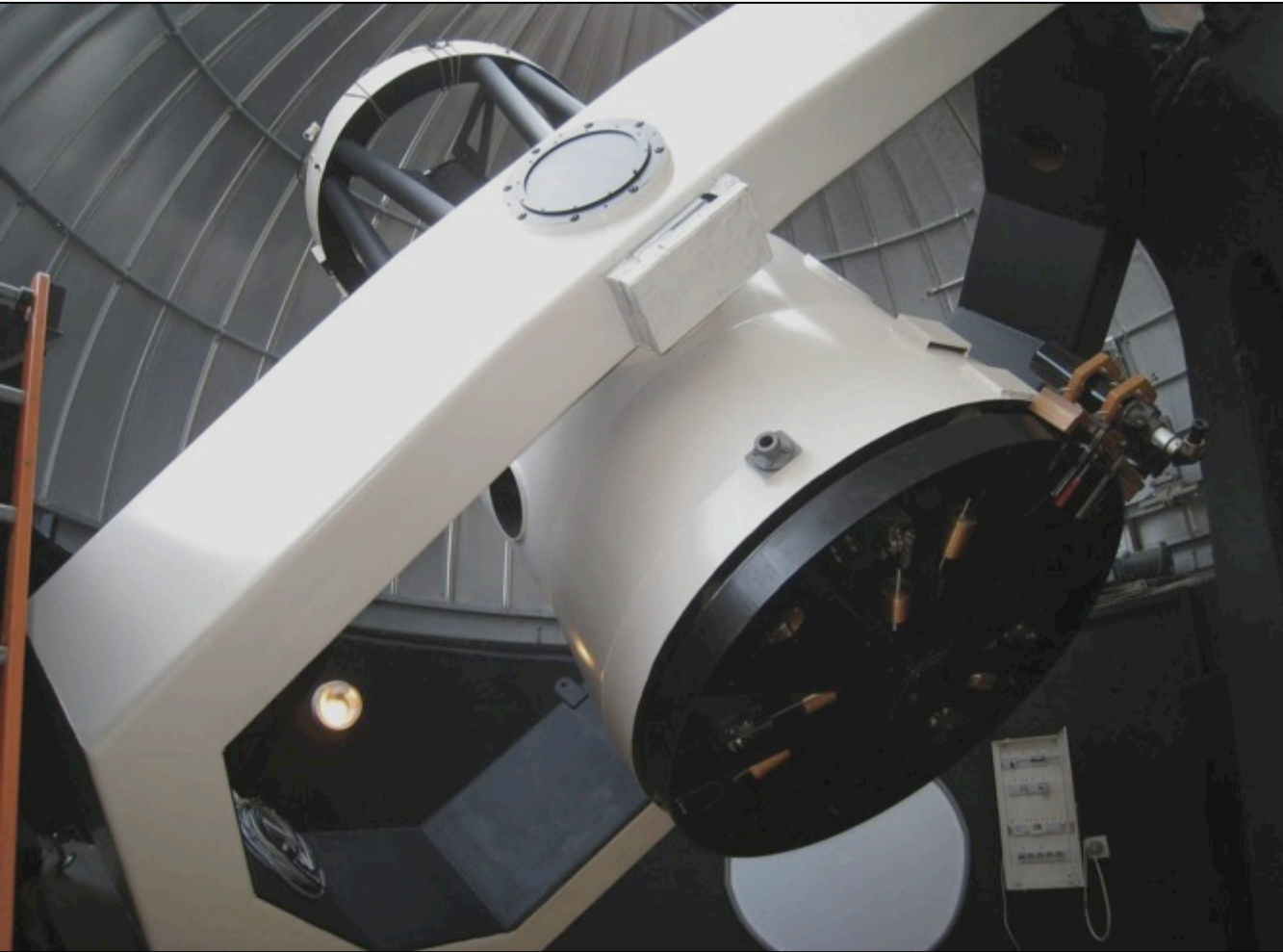
Mount park Go to target Sync on target

Threads informations
 Safety : ☒ Sensors : ☒ Meteo data : ☒ Target tracking : ☒ Go to target : ☒
 Ang. coders : ☒ Motors : ☒ Target coords : ☒ Dome slaving : ☒ Sync. axes : ☒

DAQ serial nb : 13428559
 Time axis voltage : 0.000
 Delta axis voltage : 0.000

EXIT Auto sync Alpha encoder Auto sync Delta encoder

West telescope

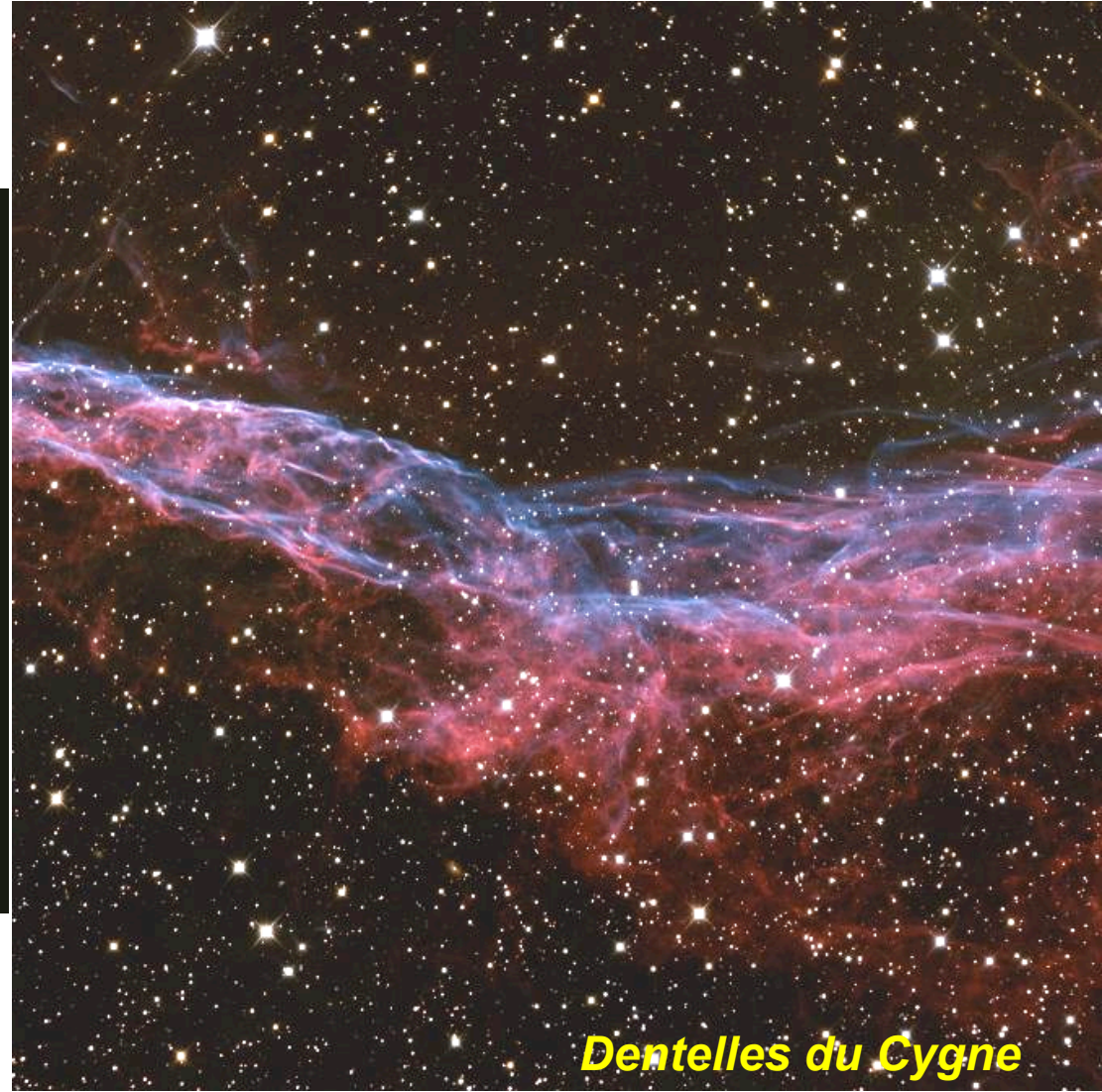


First light

- ✦ West telescope first light in August 2012



Galaxy NGC891



Dentelles du Cygne

First light



First light



Nébuleuse NGC6946



**Nébuleuse M20
(NGC6514)
« Trifide »**





Observatoire
de la CÔTE d'AZUR

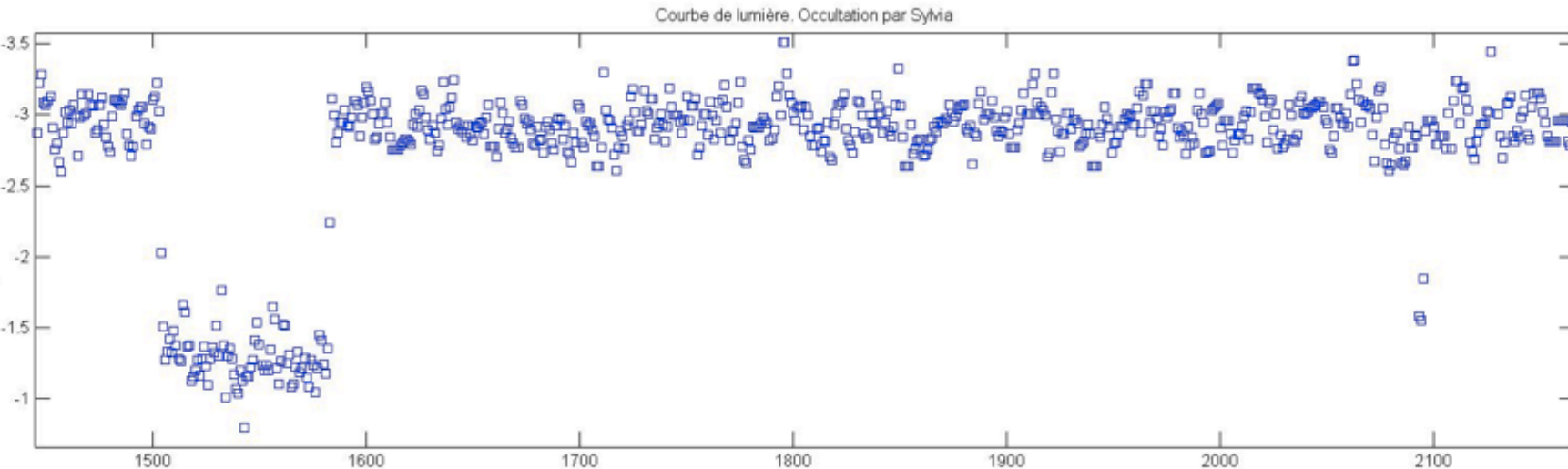
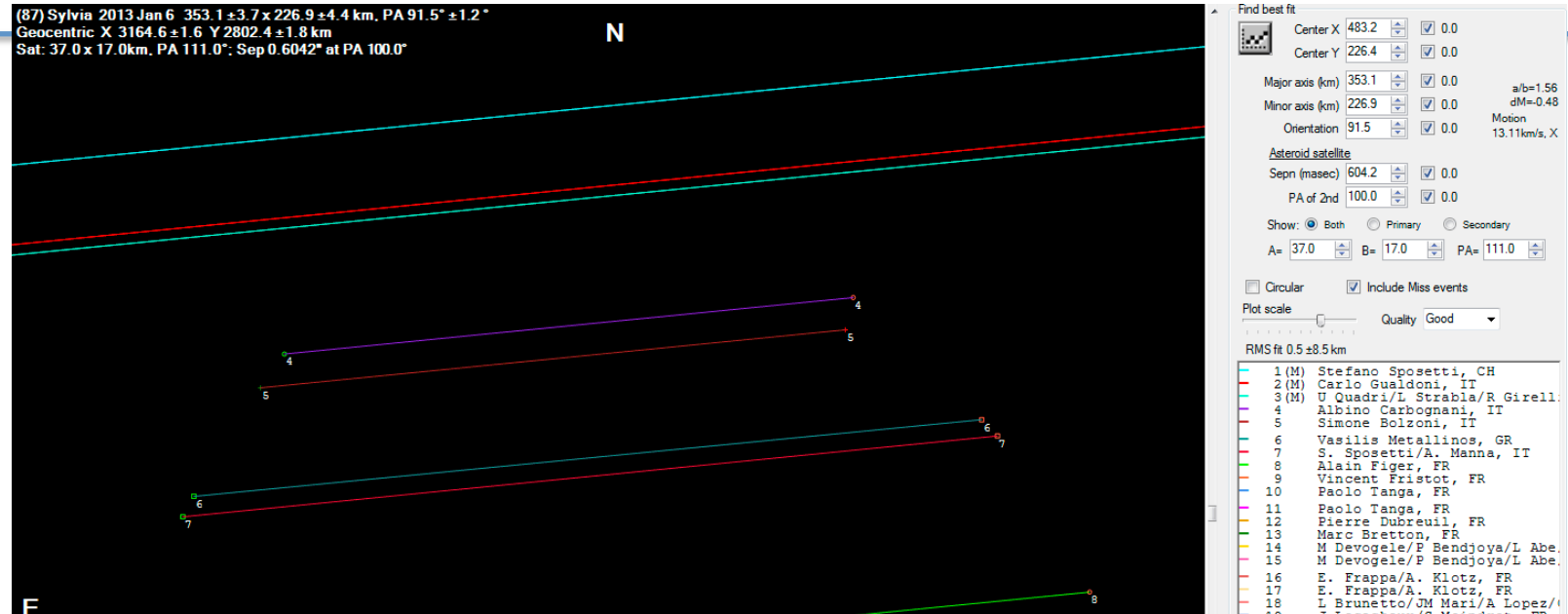
Last image (12th July 2013)



M51

First scientific data

Star occultation by the
asteroid Sylvia and its
satellite –
5th January 2013
Collaborative work

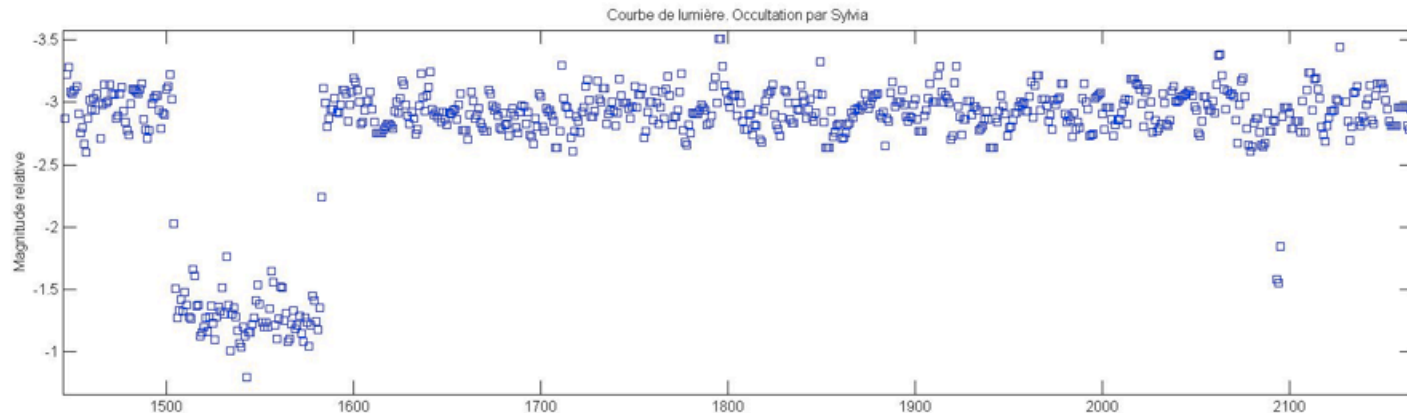


- ✦ Teacher training
 - ✧ Objectives :
 - To provide teachers with the scientific knowledge necessary for the scientific program
 - Presentation of the possibilities of working with students
- ✦ Sessions teacher - students
 - ✧ Introduction to the scientific program
 - ✧ Scientific methodology
 - ✧ Preparation of observations
 - ✧ Preparation of data reduction
- ✦ Observations – 2 sessions during the school year
 - ✧ Remote or local



Research project

- ✦ Research project: asteroid lightcurve + asteroid occultations (Col : C2PU team, P.Tanga, M.Delbo-OCA)
- ✦ Data reduction: simplified method – comparison with professional treatment
- ✦ Online publishing of the data – collaborative work
- ✦ Interest: solar system on the school programs, asteroids-attractive subject
- ✦ GAIA – FUN (Follow-up network)



Teacher training

- ✦ First training scheduled on November 2013
- ✦ Agreement with national education
- ✦ One or two training courses per year – max. 15 teachers/course
- ✦ Plateau de Calern (Observatory) – 2 days + 1 night observation
- ✦ Astronomy :
 - ✧ General astronomy
 - ✧ Research program – asteroids: lightcurves, occultations:
Description and context
 - ✧ The telescopes, observations, data reduction
- ✦ Pedagogy :
 - ✧ Approach to students
 - ✧ Adaptation of the scientific subject to the school curriculum
 - ✧ Organization of the work with the students



After the training : the teacher – students work

- ✦ Learning sessions between the teacher and students
- ✦ Depending on the class level
 - ✧ Approach to the scientific program
 - ✧ Approach to the scientific procedure
 - ✧ Session with the researches involved on the scientific program – possibility of direct interaction or via videoconference
 - ✧ Observation preparation
 - ✧ Learning of the data reduction procedure



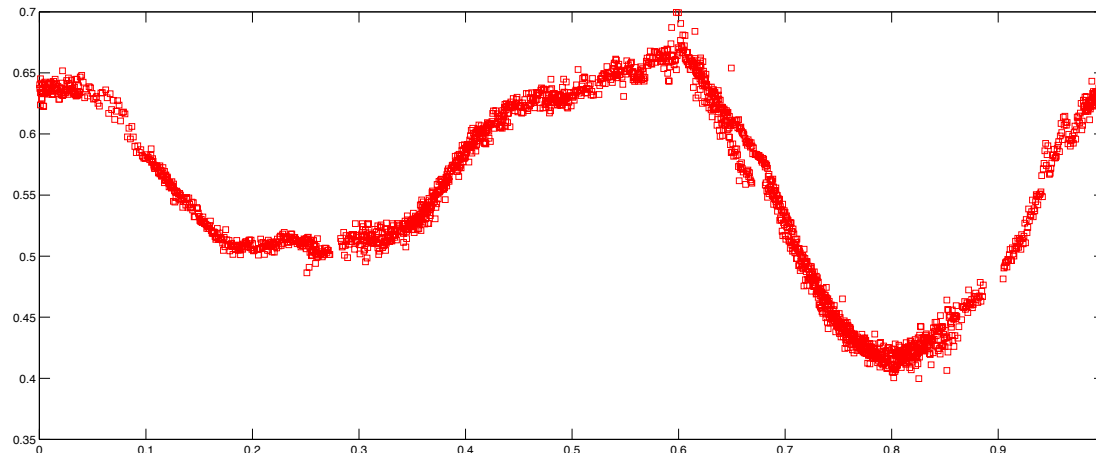
The observations

- ✦ Possibility to observe remotely or locally - 2-3 hours sessions
- ✦ Remotely:
 - ✧ Need of a telescope operator at the Observatory
 - ✧ High-school opened during night hours
 - ✧ Guide of the observations in the classroom or by videoconference
- ✦ At the telescope:
 - ✧ Student trip to the Observatory
 - ✧ Possibility to sleep at the observatory
 - ✧ Real life of an observatory and the night sky
 - ✧ Cold!
- ✦ Students work in parallel by groups – importance of the preparation



Data analysis

- ✦ Simplified method
- ✦ Importance of rigorous analysis
- ✦ Help of EduCosmos team
- ✦ Reduced data available on-line
- ✦ Sharing of data with other teams



Estimate of participation

- ✦ 15 teachers/training course (participation of several teachers from the same center is encouraged)
- ✦ First year (2013/2014): 10-15 classes with 20 students each = 200 students
- ✦ Following years: teachers that have followed the training are allowed to continue in the project the following years + 15 new teachers/year
- ✦ Limit : 1 EduCosmos observation/week ~ 20-30 classes/year (~500 students)

International projection and funding

- ✦ Project with possibility of international opening – remote observing
- ✦ Possibility to participate to joint scientific projects with different institutions
- ✦ Possibility to share telescope time
- ✦ Funding:
 - ✧ OCA – telescopes C2PU, personnel
 - ✧ Local authorities

- ✧ Answer to European and French call for proposals



Thanks !

