

The ALMA Regional Centre in the Czech Republic and the ALMA Winter School in Prague

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The scope of the work of the Atacama Large Millimeter/submillimeter Array (ALMA) Regional Centre in the Czech Republic is briefly outlined and a short report is presented on the recent Winter School held in Prague.

The Atacama Large Millimeter/submillimeter Array (ALMA) is under construction on the Chajnantor plateau in Chile and will consist of up to 66 antennas to observe in the frequency range from 30 GHz to 950 GHz, with very high sensitivity and angular resolution. ALMA is an international collaboration between Europe, East Asia, North America and Chile. Astronomers from the different participating countries will interact with ALMA via ALMA Regional Centres (ARCs). In Europe, the main Regional Centre is located at ESO Garching and seven ARC nodes are spread over the continent.

The Czech ARC node should provide regional support to applicants from countries of the Central and Eastern European region, e.g., from Poland, Slovakia, Hungary, etc., that are not yet ESO members, and to Czech ALMA users. In particular it will provide the following services:

- 1) scientific and technical support to ALMA users in the fields that are not yet covered, or are covered only partially, by other existing European ARC nodes, and especially: (i) solar and (extra)galactic astrophysics, (ii) laboratory measurements of molecular spectral lines;
- 2) observation planning and data quality checking;
- 3) data storage and processing and data reduction using CASA (Common Astronomy Software Applications package, which is used to process both interferometric and single-dish data from ALMA).



Figure 1. The participants of the ALMA Winter School in Prague in front of the entrance of the Astronomical Institute.

Our node is to be formed as a consortium of the Astronomical Institute, Academy of Sciences of the Czech Republic (ASCR) and the Institute of Chemical Technology in Prague, with further cooperation with the Charles University in Prague and the Masaryk University in Brno.

ALMA and solar research

In Europe the Czech ARC node is the only one devoted to solar physics. For solar research it is important to know the limitations of ALMA and the requirements for solar observations:

1. The field of view (FoV) of ALMA is rather small ($21 \text{ arcseconds} \times \lambda_{\text{mm}}$). For a detailed study of the “quiet” chromosphere for example, this FoV is sufficient. However, for phenomena in which global effects are important (e.g., in solar flares), it would be desirable to increase the FoV, e.g., by an observing technique called “on-the-fly” (OTF).
2. Compared with other astrophysical radio sources (e.g., molecular clouds, galaxies) the solar radio flux is very strong and the ALMA detectors are very sensitive. Therefore, for solar observations an appropriate attenuation of the signal is necessary.

3. To reduce the solar electromagnetic flux reflected to the antenna focus, it will be very useful to scatter the visible/infrared part of the spectrum by milling the surface of the antennas.
4. ALMA can directly measure temperature maps in the chromosphere. For this purpose a precise calibration technique is necessary.
5. For transient phenomena such as solar flares, a flexible communication protocol between scientists and observing staff regarding observing targets is necessary. In proposals for flare observations, it would be very difficult to specify the observing targets in advance.

Since the observing capabilities of ALMA are so advanced, involvement of the solar community is highly desirable. To encourage potential observers, the new Czech ARC node is being built under the supervision of ESO. Although we are fully aware of the problems that are specific to solar observations (small field of view, strong radio flux, calibration and so on), we hope that advanced OTF mapping and calibration techniques will overcome these difficulties. ALMA has the potential for new insights and new discoveries, especially in a mostly unexplored wavelength range, making it highly desirable for solar research. More information about solar research with ALMA can be found in Karlický et al. (2011).

ALMA Winter School in Prague

The purpose of this two-day Winter School, which took place at the Astronomical Institute of the Academy of Sciences in Prague, was to prepare the European astronomical community for ALMA Early Science operations in Cycle 1, which is expected to start in January 2013.

The first day was devoted to theoretical issues related to ALMA. At the beginning the ALMA project was presented with particular focus on the role of the Czech ARC node. During the day we had lectures about radio interferometry, molecu-

lar spectroscopy, CASA and the AOT (ALMA Observing Tool). The AOT is the tool used for the preparation and submission of proposals for ALMA. We finished the day with practical exercises using the AOT.

The second day was mainly devoted to practical exercises with the CASA package. To learn the CASA package we used science verification data for the M100 spiral galaxy. Also examples of proposals were presented and the submission process was explained. In addition a lecture on solar research with ALMA was given.

Around 20 people from Croatia, the Czech Republic, the Netherlands, Poland and the United Kingdom participated in our ALMA Winter School. Invited speakers at the School were Dirk Petry and Andy Biggs, both from ESO.

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References

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Volunteer Outreach Activities at ESO Chile

The ESO-Chile Outreach Volunteer Team^{1*}

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ESO staff in Chile are often asked to disseminate astronomical knowledge to schools and to the general public. A significant number of volunteers are now involved in these activities and the most recent projects in low-income schools and neighbourhoods are described and possible perspectives discussed.

Introduction

The Chilean public has been aware of Chile's extraordinary dark-sky treasures for a long time. Discoveries and upcoming new telescope projects are often reported in the press and interest in the achievements of astronomers and engineers is steadily growing. But astronomy is more than scientific publications and their accompanying press releases: it is a wonderful educational tool at each stage in life. It can often offer uncharted paths to the discovery of essential concepts in physics and mathematics, but also more generally to the development of scientific reasoning based on observation and experimentation.

ESO staff in Chile are often approached to spread astronomical knowledge to schools and the general public. In recent years some of these initiatives have grown and have involved a significant number of volunteers. We report on the most recent developments in low-income schools and neighbourhoods in order to "democratise the sky", and also discuss various aspects of these activities.

Estrellas en las Escuelas

The study of astronomy and the Universe is part of any school programme and appears at different stages in a pupil's career. Several national and local initiatives in Chile have been set up to support both pupils and teachers in the development of teaching activities in science. One of the most renowned programmes, called *Enseñanza de las Ciencias Basada en la Indagación* (ECBI), is the result of the joint efforts of the Chilean Academy of Science, the Department of Medicine of the Universidad de Chile and the Ministry of Education (with financial support from the European Union). Its primary goal is to reinforce children's capability to establish scientific reasoning based on experiments. The ECBI programme, when funding permits, already helps active elementary school teachers in the teaching of science. Since astronomy is not always a priority, volunteers from ESO have been approached to develop pedagogical activities with teachers and pupils, under the supervision of the ECBI executive director (P. Reyes) and with the collaboration of the

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