

Workshop on "Astrophysics in Antarctica"

September 14-15, 2011, CPPM, Marseilles

organized by L. Abe, N. Epchtein (Fizeau, Nice); C. Tao, A. Tilquin (CPPM, Marseille)

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Excused: C. Abia (11), W. Ansorge (12), S. Argentini (13), J. Brinchmann (14), M. Busso (15), M. Carbillet (1), M. Chadid (1), M-R. Cioni (16), T. Le Bertre (17), B. Le Roux (18), E. Ruch (19), I. Vauglin (7), A. Ziad (1), H. Zinnecker (20)

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- (14) Sterrewacht Leiden, Netherlands
- (15) Università degli Studi, Perugia, Italy
- (16) University of Hartfordshire, UK
- (17) LERMA, Observatoire de Paris, France
- (18) LAM, Marseilles, France
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On September 14/15, 2011, about 20 researchers and engineers from Australian, Chinese, French, and Italian laboratories, agencies and industrial companies met at CPPM in Marseilles to discuss the present status and prospects of astrophysics in Antarctica. This meeting was mainly intended to set up a possible international collaboration for a single project, following the Australian PILOT phase A study, the Chinese decision to foster an observatory at Dome A and KDUST in particular, (see Phys. Today, Jan, 2011), the recent release of the European roadmap (ARENA, 2009) for Astrophysics at Dome C and the recent European proposal for a conceptual study of a Large Polar Telescope (PLT).

After a presentation of the activities of the different countries involved (Australia: Storey, China: Tao; France: David), the current status of site qualification at Dome C (Fossat, Genthon, Argentini), a report on a recent relevant meeting (SCAR in Sydney: Storey), the first results of ASTEP (Abe), the status of IRAIT (Durand, Busso), the science case for PILOT (Saunders), the PLT proposal (Epchtein) and the interest of the industrial company EIE (Marchiori), the meeting addressed the question of a possible collaboration between the different countries involved in astronomical activities in Antarctica to foster a joint project for a medium size facility resulting, for instance, from the merging of the presently most advanced projects in this category, the Australian PILOT, the European PLT and the Chinese KDUST.

Among the 4 active polar stations in the inner antarctic continent, Amundsen-Scott (AS), Dome A, C and F (DC, DA, DF), 2 of them are already well trained for winter-over activity (AS, and DC). DA is likely to be the most appropriate for optical/IR astronomy, although probably not dramatically better than the 2 others, although thorough comparisons have still to be carried out on a more significant statistical basis. Other sites (ridge A) could be even better, although probably impracticable to set up a facility in this decade.

The only facility that has been studied in some details (mostly during the phase A study of PILOT) is a 2.5 meter class optical/IR telescope that would take maximum benefit from the exceptional seeing conditions (above the boundary layer) and the low thermal sky background. There are however two different possible approaches: a multipurpose, multiwavelengths telescope (mode "*observatory*") for PILOT and KDUST, and, following the recommendations of the ARENA WG, an infrared *survey* facility (PLT). Each has its own motivations and advantages. PLT would be designed to take maximum benefit from all the antarctic advantages, simultaneously, and emphasize the time domain exploration in a still scarcely investigated spectral domain (2.3-5 μm).

Some Conclusions:

- Antarctic astronomy is not yet been perceived as mature enough by agencies in Europe and Australia to engage big money in it, so far, although the US astronomers have already successfully installed and are currently operating several medium to relatively large size facilities such as the South Pole Telescope, SPT (a 10 meter aperture radiotelescope) at the AS station. China recently started funding of KDUST and a 5m THz telescope.
- Small (less than 1 m aperture) optical/IR instrument (such as SPIREX, ASTEP, AST3, IRAIT) are feasible and can be managed by a limited staff. They have produced or are producing scientifically valuable data that could not be obtained elsewhere from the ground. The time of development and implementation is generally underestimated (*see e.g.*, IRAIT, which will hopefully be in full operation in 2012 and will give first IR data from DC)
- Building a larger facility (in or above the 2m class) that would produce astronomical breakthroughs resulting from a long range programme (i.e., a legacy: survey, monitoring, alert mode...) cannot be reasonably undertaken by a single country. It can be successful only within a well organized, stable consortium, gathering various skills and expertise such as the one that was proposed for PLT considering not only the construction of the facility itself, but also the logistics and on-site operation and management of the enormous amount of data that it would produce.
- According to the conclusions of the ARENA relevant activity group (NA4), the present logistic means available at DC provided by IPEV and PNRA (now ENEA) are probably sufficient to manage the construction of such a facility without significant upgrading and extra costs, although the period of construction would certainly occupy a large fraction of the IPEV staff at DC during several seasons (5?)
- In the present general economical context that leads to uncertainties or at least unexpected delays on already approved and on-going very large projects (E-ELT, JWST), it is difficult to introduce new risky projects in the 100 M€ cost range. However, studies for future such projects should not be given up. They could be considered as possible much cheaper "plans B" as substitute of future costly (space?) missions. There is also a need to follow up space mission observations, such as those expected from EUCLID (source monitoring, better angular resolution, spectroscopic follow up...)
- There is a need to compare the quality of the different polar sites, by using the same instrumentations, same calibrations and procedures. Samples of comparable size (a few years) should be obtained at the 3 envisaged sites, and the most appropriate site should be eventually selected to eventually set up the facility. In the meantime careful studies of the instrument, R&D developments (for instance concerning wide field GLAO) could be done.
- Although the proposal to make a conceptual study of the PLT has received a positive scientific evaluation from the EC expert panel, it will not be funded, and there is no hope to receive EC funding in the next couple of years
- The AAA working group of SCAR chaired by J. Storey is the only existing international structure that could help in defining an international roadmap for Antarctic developments. It (its working groups) should make clear without ambiguity which science and which instruments are put in top priority
- The Antarctic facility should be inserted in the stream of other large instruments of the decade (e.g., E-ELT, JWST, EUCLID, LSST...) and should help in enhancing the scientific impact of them as well as in completing them at different wavelengths, with different time scales...
- The IAU Symp 288 to be held in August 2012 in Beijing, will be a unique opportunity to discuss at a larger scale the future of Astrophysics in Antarctica