

Strengthening international scientific collaboration and teaching at the Oukaimeden **Observatory in Morocco through collaboration between University of Cadi Ayyad and** University of Antwerp





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DE PHYSIQUE DES HAUTES ENERGIES ET ASTROPHYSIQUE

1. Introduction

Astronomy can be viewed as a gateway for people to get into science and technology (STEM). This project is to help further the use of astronomy, including its practitioners, skills and infrastructures, as a tool for development by mobilizing the human and financial resources necessary in order to realize the field's scientific, technological and cultural benefits to society. As in any other human venture, diversifying the roster of players is key in continued growth and meaningful discoveries. Morocco and Senegal are only a few examples of emerging markets with a largely untapped potential of ideas and of researchers that could rejuvenate scientific thinking and practices in the 'developed' world. Crosspollination of ideas through truly international collaborations is the only way forward to ensure equal participation and universal access to not only the consumption of knowledge but also its production. We need to build and maintain an environment of mutual benefit, not just between wealthy nations but across a variety of countries, especially involving those emerging markets poised to supply the next generation of scientists and engineers The increasingly active Oukaimeden Observatory in Morocco is an important asset for leveraging such cooperation. Involving European partners and African institutions, our collaboration sheds light on the importance and need for scientific literacy and astro-environmental awareness among African stakeholders. In this regard, a collaboration scheme is set up:VLIR-UOS project for strengthening scientific collaboration in astrophysics With the support of European partners, this network for human capacity building and scientific research will contribute more efficiently to the development of Astronomy and Space Sciences in Africa and therefore to the broader continental development.



VLIR-UOS project for strengthening

scientific collaboration in astrophysics

Fruitful online exchanges took place between the two teams. From these exchanges, a master's thesis has already been defended, and a new one is underway and supervised in partnership with Morocco and Belgium.

Also, Courses will be given by the Moroccan promoter to the Antwerp students.



network for astrophysics : for Training, and Education

In collaboration with the French Institute and the Academy of Secondary Education in Marrakech, We have planned a STEM training for a group of mixed science teachers during 2021 and for 2022. This training will be jointly supervised by Professor K. Kolenberg and Professors from Cadi Ayyad University, partners of the Project.. Also a Concert Conference: "Music of the stars provided by Prof. Katrien Kolenberg for all the public and was organized in collaboration with the French Institute in Marrakech



2. Project Goals

In this project, we focus on further establishing the Oukaimeden Observatory as an important pole for the development of astronomy research in Morocco and in the wider African region.

This project's goals are twofold and complementary: *First,* the project will establish and strengthen the scientific collaboration between Moroccan and Belgian researchers, involving researchers from the wider African region (Senegal) as well. (This concerns the development of the theme of spectroscopy of variable stars at Oukaimeden Observatory.) Second, there is a considerable focus on scientific literacy at multiple levels. In the course of the project, joint teaching materials and online tutorials will be developed to improve efficient teaching of astronomy at the University of Cadi Ayyad (Morocco), the University of Antwerp (Belgium), and the University of Cheikh Anta Diop (Senegal). In addition, specific outreach projects concerning astrophysics will be divulged through a dedicated teacher training workshop to be held at Oukaimeden Observatory.

Throughout the project and its two objectives in research capacity and training/education, special attention will be given to improve gender balance and environmental awareness, two transversal focus areas of the VLIR-UOS programs.

We have strengthened international collaboration and research at the Oukaimeden Observatory, indeed in 2020 we continued our campaign of spectroscopic measurements on the Variables stars RR Lyr and R Scuti at the Oukaimeden Observatory from June until November 2020. This allowed us to harvest more than 60 nights of data. The processing results of this campaign are currently the subject of a Master in Astrophysics from the student Houda Sakkou jointly supervised by Professors A. Benhida and K. Kolenberg. The participation of two members of the team in the conference in New Mexico in October 2019 allowed the edition in 2020 of 4 publications in the journal Astronomical Society of the Pacific Conference Series. https://rrl2019.nmsu.edu/

Thanks to the VLIRUOS Project Fund, new equipment will be acquired to improve spectroscopy manipulation at oukaimeden. Also the acquisition of a new robotic Telescope prototype, which will be presented to

3. Conclusion

The project VLIRUOS promote inclusive growth of Africa, as we are convinced that Africa should not remain excluded from the scientific and technological developments in A&SS from the rest of the world. Otherwise we will continue to lose huge potentials (in terms of human and natural resources) for the global development of science and society. The present and future discoveries made by African astronomers are a source of inspiration and proudness for the African population, who realize that African research institutions can contribute to fundamental sciences, which are the mother of innovation.





several African partners.



4. References

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