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FOREWORD

BRICS Research on Multi-messenger and Multi-wavelength Astronomy

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We are pleased to bring you this special issue of the Annals of the Brazilian Academy of Sciences, which gathers a collection of papers presented at the 2019 BRICS Astronomy Workshop. The scientific workshop, promoted by the BRICS Astronomy Working Group (BAWG), focused on the topic of Multi-messenger and Multi-wavelength Astronomy, and was held at the Brazilian Center for Physics Research (CBPF), in Rio de Janeiro, from September 29th to October 2nd, 2019. It gathered astronomers from Brazil, Russia, India, China, and South Africa to discuss the present status and the future perspectives of this emerging field of astrophysics, with a special focus on the collaboration between the BRICS countries.

Astronomy was identified as one of the priority fields for collaboration in the framework of the BRICS Science, Technology and Innovation agreement. Since 2015, the BRICS Astronomy Working Group has been planning possible actions to foster the integration and collaboration between the astronomy communities of the BRICS countries (Nemaungani 2021). This fourth workshop on BRICS astronomy has shown the status of maturity of the BRICS collaboration on astrophysics and the role and impact that these countries together can have on world science.

Multi-messenger astronomy – astronomer's newfound ability to see the same cosmic events in light, particles, and gravitational waves – gives us a more complete picture of some of the Universe's most mysterious phenomena and is today at the forefront of research. It is expected to play an increasingly important role in observational astrophysics in the coming decades. Multi-messenger astronomy represents a natural focus area for multilateral collaboration amongst the BRICS countries, as the search and study of the electromagnetic counterparts of gravitational waves and transient neutrino events require the coordinated cooperation of a large number of facilities across the electromagnetic spectrum, in worldwide geographical distribution.

The principal aim of the workshop was to discuss and set out a strategy to promote integration and multilateral collaboration among the BRICS countries, and to launch the seeds for the creation of a BRICS transients and Multi-Messenger network, as the backbone of such collaboration. By bringing together the scientific communities and the available observational and data infrastructure, the Group is establishing novel research collaborations and projects at the frontier of knowledge. In particular, the creation of a BRICS Network, benefiting from the vast range of astronomical facilities available within the countries of the Bloc, and dedicated to the discovery and follow-up of transient astronomical events – in particular those associated to neutrino or gravitational waves –, was

identified as a flagship project with potential for worldwide scientific impact. Thanks to its strong links to aspects of high-performance computing and data science, both at the core of the fourth Industrial Revolution, the project is also expected to have important impact beyond the fields of Astronomy and Astrophysics, with positive consequences for technological development, innovation and education in the participating countries.

The present issue gathers a comprehensive set of papers presented at the Meeting (http://lnapadrao.lna.br/eventos/brics-astronomy-working-group-2019) and aims to remain as a reference of the scientific activities in course within the BRICS Astronomy Working Group. In our vision as organizers, the workshop has fulfilled its objectives, contributing to strengthening the relationships between the BRICS and their scientific communities. We hope that the steps taken until now will open doors for further fruitful collaborations among the BRICS, not only in Astronomy, but also in other fields of research, improving the numerous potential synergies within this unique group of countries.

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