Training Activities on GNSS Science and Applications: The ICTP-Boston College Partnership

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For 50 years, the Abdus Salam International Centre for Theoretical Physics (ICTP) has been a driving force behind global efforts to advance scientific expertise in the developing world.

Founded in 1964 by the Nobel Laureate Abdus Salam, ICTP seeks to accomplish its mission, which is to:

- Foster the growth of advanced studies and research in physical and mathematical sciences, especially in developing countries.
- To develop high-level scientific training programmes and encourage international scientific exchange.
- Conduct research at the highest international standards.
Boston College’s Institute for Scientific Research (ISR)

Mission: Conduct ethical and innovative research in both experimental and theoretical aspects of space physics, space weather, space and plasma chemistry, solar-terrestrial research and ionospheric studies.

Through research and workshops, ISR also fosters the intellectual development of young scientists from around the world.

“Ever to excel”
The ICTP and ISR joined together to host a workshop for the first time in December 2006. The workshop was on Satellite Navigation and Positioning and its Relevance for Developing Countries.

Forty six scientists from sixteen countries from Africa, the Americas, Asia and Europe participated in the workshop.

The main conclusion of the meeting was the importance of providing a series of workshop on different aspects of GNSS science and applications for the benefit of developing countries with particular emphasis on the effects of the ionosphere on GNSS operations.
An International Partnership for Education in Satellite Navigation Science and Technology for Africa

To formalize the cooperation between the ICTP and the BC both institutions signed a MoU in July 28, 2009. By this document it was established a general framework to promote GNSS science and technology programs in developing countries with particular emphasis on Africa.
Partnership Goals

1) To help build a knowledgeable GNSS African workforce
2) To encourage the use of GNSS for societal and economic development and scientific exploration
   • Conduct workshops for university professors, lecturers, graduate students
   • Provide equipment and training materials to collaborating universities
   • Provide opportunities and guidance for international scientific research collaborations within Africa and with developed nations for GNSS (space physics, space weather, applications)
GNSS Applications for Africa

- Increase food security; manage natural resources; wildlife conservation
- Provide efficient emergency location services; disaster relief
- Improve mapping and surveying
- Provide greater precision and safety in land, sea and air navigation
- Scientific research and exploration
The ICTP-BC workshops series


**2010**, 6 April - 23 April; Second Workshop on Satellite Navigation Science and Technology for Africa, **Trieste**, Directors: Patricia H. Doherty, Sandro M. Radicella.

**2012**, 11 April - 1 May; Workshop on Science Applications of GNSS in Developing Countries (11-27 April), followed by the: Seminar on Development and Use of the Ionospheric NeQuick Model (30 April-1 May), **Trieste**, Directors: S.M. Radicella, Patricia H. Doherty

**2013**, 6-17 May; Workshop on GNSS Data Application to Low Latitude Ionospheric Research, **Trieste**, Directors: S. M. Radicella, P. Doherty, R. Prieto, B. Nava
The ICTP-BC workshops series


**2015**, 2-13 March; Workshop on Ionospheric Effects on SBAS and GBAS Applications at Low Latitudes, **Trieste**, Directors: S. M. Radicella, P. Doherty, B. Nava.


Acknowledgements

The series of workshops were possible thanks to the sponsorship and financial support of several institutions. In particular, the contribution of the ICG allowed the participation of diverse developing country scientists to these activities.
The series of ICTP-BC workshops

Our lecturers are highly skilled professors, scientists, engineers and research associates from different prestigious Institutions around the world.

Lecturers and presenters are really passionate about topics.
Workshops always provide an opportunity for “hands-on” or skill-based practice and learning.

Laboratory sessions include demonstration of methods of practical application like GNSS data acquisition, analysis, robotics, precision farming, surveying, analyzing atmospheric and ionospheric data and signal structure.
EXTENDED WORKSHOP ON SPACE WEATHER EFFECTS ON GNSS OPERATIONS
The Abdus Salam ICTP, Trieste, Italy, 22 May – 2 June 2017

Participants:
50% FEMALES
Lecturers:
40% FEMALES
TOTAL:
46% FEMALES

TOTAL ICTP VISITORS:
25% FEMALES

Lecturers and Participants: 50 from 24 countries
Americas – 12, Europe – 15, Africa – 14, Asia – 9
The ICTP-BC workshops series

Through our workshops we successfully trained more than 400 participants.

In average there were 72 participants (lecturers included) in each workshop.

We continue to empower women participation in our activities.

Women’s Dinner at Trieste, 2016
% of the Total Nº of papers published on “Equatorial Ionosphere”, by African scientists
(source: Web of Science Core Collection)

Papers with first author being African scientist working in Africa.

80% of the papers published from 2010 to 2017 are by scientists that had participated in the training done under the ICTP-BC Partnership.
10° Workshop

23 April – 4 May 2018
Trieste, Italy

Directors:
P. Doherty
S. Radicella
B. Nava

Participants: 44 (45% Women)

10 African countries
9 Asian/Oceanian
4 South American
2 European

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• An International partnership between ICTP and BC has been established in 2009 with very successful results along these years.

• The ICTP-BC partnership is helping to build a knowledgeable GNSS workforce and encouraging in the use of GNSS for socio-economic benefits and scientific exploration.

• A series of training activities have been organized in Trieste and Africa and their curricula include formal lectures with hands-on practice in GNSS.

• Our workshops benefit from long time collaboration with other research institutions, projects and colleagues around the world over years.
Thanks for your attention!

Muchas Gracias!

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