Summary of the International Reference Ionosphere 2015 (IRI 2015) Workshop

2-13 November, 2015

King Mongkut's Institute of Technology Ladkrabang

Bangkok, Thailand

http://www.iri2015.kmitl.ac.th/

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1. Training Week: 2-6 November, 2015

Ten lecturers and thirty-three trainees participated in the 5-day Training session that took place in the computer lab #109 of the Engineering Instructional Building, Faculty of Engineering, KMITL. The trainees were competitively selected from 114 applicants and represented 11 mostly Southeast-Asian countries including Thailand, Malaysia, Singapore, Philippines, Indonesia, Vietnam, India, South-Korea, Taiwan, China, and USA. On each Training day, lectures were given in the morning, while the afternoons were devoted to the practical part and the time for Team Projects. On Monday morning, November 2nd, we welcomed Assoc. Prof. Komsan Maleesee, the Dean of Faculty of Engineering, who presided over the Opening session and welcomed the participants. In addition, Prof. Mariano Mendez welcomed the participants and introduced the COSPAR activities and opportunities for fellowships. Prof. Dieter Bilitza gave a welcome message as well on behalf of the COSPAR/URSI International Reference Ionosphere (IRI) project.

[IRI 2015 Workshop (Training) Opening Session: Nov. 2nd, 2015]

[From left to right: Prof. Mendez, Dean of Faculty of Engineering, Prof. Bilitza]

[Group photo, Nov. 2nd, 2015]

The lecture topics during the training week were: Ionosphere-An introduction, IRI-Introduction and open problems, Comparison of IRI with ionosonde data from the Asian sector, IRIweb and related online services, Ionsonde measurements, Real-Time IRI, Ionosondes in the Asian Sector, Ionosonde data online: GIRO and SPIDR, GNSS data and ionospheric studies, Irregularities at equatorial latitudes, TEC comparisons with IRI in the Asian sector, Access to GNSS data, Coupling between ionosphere and thermosphere at low latitudes, Ion densities and plasma temperatures, Solar irradiance and Upper atmospheric chemistry, Incoherent scatter radar, and Ionospheric storms.

On the first training day the trainees were divided into 8 teams and the 8 science problems were distributed to the teams via lottery . A lecturer was assigned to each problem to work as adviser with the specific team. Below are the topics/problems assigned to each team.

Team Members:

Teams	Members
Team 1	Malini Aggarwal (India), Siti Aminah Bahari(Malaysia), Wang Zheng(China), Sanit

	Arunpold(Thailand)
Team 2	Sanjay Kumar (India), Dr. Ernest P. Macalalad (Philippines) , Rata Suwantong (Thailand), Supachai Nakapan (Thailand)
Team 3	Rafi Ahmad (India), Nouf Abd Elmunim Ahmed Ismail (Malaysia), Steven Brown (USA), Acharaporn Bumrungkit (Thailand)
Team 4	Azad Ahmad Mansoori (India), Dessi Marlia (Indonesia), V. Rajesh Chowdhary (Thailand), Sarawoot Rungruenwajiake (Thailand)
Team 5	Chinmaya Kumar Nayak (India), Ednofri (Indonesia), Adrian Teck Keng TAN (Singapore), Punyawi Jamjareegulgarn (Thailand)
Team 6	Nilesh Patel (India), Trang T. Nguyen (Vietnam), Rohaida Binti Mat Akir (Malaysia), Noraset Wichaipanich (Thailand)
Team 7	JeongHeon Kim (South Korea), Suhaila Binti M Buhari (Malaysia), Nakornping Namkam (Thailand), Somjai Klinngam (Thailand)
Team 8	Nicholas Ssessanga (South Korea), Lan Tran (Vietnam), Zhe Yang (China), Sukhanit Skawrattananont (Thailand)

Lecturers: Profs. Bodo Reinisch and Ivan Galkin (University of Massachusetts, USA), Prof. Dieter Bilitza (George Mason University, USA), Assoc. Prof. Pornchai Supnithi (KMITL), Asst. Prof. Prasert Kenpankho (KMITL), Prof. Andrzej Krankowski (university of Warmia and Mazury, Poland), Prof. Shigeto Watanabe (University of Hokkaido, Japan), Dr. Vladimir Truhlik (Institue of Atmospheric Physics, Czech Republic), Dr. Takashi Maruyama (National Institute of Infromation and Communications Technology, Japan), Dr. Susumu Saito (Electronic Navigation Research Institute, Japan).

List of Problems

Problem 1: Compare the annual and semi-annual variation of foF2 in the two hemispheres. What are the differences? What could be possible causes? What does IRI predict?

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Problem 3: Investigate storm effects on foF2, hmF2, and TEC at a location in the Northern hemisphere. What are the differences? What is the storm effect on the slap thickness? Compare with IRI and IRI-Real-Time predictions. Use the Halloween storm (Oct 28 - Nov 1, 2003) or select your own storm event.

Problem 4: Investigate storm effects on foF2, hmF2, and TEC at a location in the Southern hemisphere. What are the differences? What is the storm effect on the slap thickness? Compare with IRI and IRI-Real-Time predictions. Use the Halloween storm (Oct 28 - Nov 1, 2003) or select your own storm event.

Problem 5: Different profile functions have been proposed for the representation of the topside electron density profile. Which ones are used in IRI and other models? Which give the best results? With each profile type a different scale height is defined how do the compare to the theoretically expected scale height.

Problem 6: How well is the Equatorial Ionization Anomaly (EIA) represented in IRI? Use the EIA parameter model developed by Xiong et al. (2013) based on CHAMP and GRACE data. Compare with EIA parameters determined from IRI. Suggest ways to improve IRI.

Problem 7: An East-West Coast difference has been reported over the continental US. Investigate analogous effects in the South-Asian sector. What are the causes for these differences? Are these differences reproduced by IRI?

Problem 8: E-region physics. Investigate improvements of the representation of foE and hmE for use in IRI. IRI currently depends on the 12-month running mean of sunspot number. Find out if a daily or monthly index can be used. Do you see a dependence on magnetic activity.

[Atmosphere in the lecture/computer room]

[Atmosphere during lunchtime]

Besides the academic program, some social activities and an excursion were included.

On Sunday, November 1st, all trainees and lecturers were invited to attend an Ice Breaker dinner where everyone introduced him/herself and learned a little bit about Thai culture and about general issues to be aware of while being in Thailand.

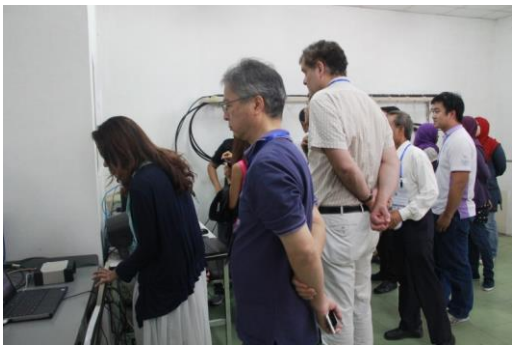
[Icebreaker: Nov. 1st, 2015]


On Wednesday, November 4th, we all visited the Ladkrabang Satellite Ground Station, a backup site of the Thai Geo-Informatics and Space Development Agency (GISTDA). We were given a tour of the facility and an overview of the activities of the stations. GISTDA operates the Thai THEOS satellite, which produces panchromatic (2-m resolution) and multispectral (15-m resolution) imagery of Thailand. This site can receive satellite signals from many remote-sensing satellites. After the overview, we were all invited to witness a Landsat satellite fly-by as well as the real-time image production.

[GISTDA Visit: Nov. 4th, 2015]


During lunch on Wednesday and Thursday, there was a brief tour of the Rooftop Laboratory, where GNSS receivers and satellite beacon receiver are operated, and a brief overview of some ionospheric research activities at KMITL was given.

[Space and Atmospheric Communication and Informatics Laboratory Visit: Nov. 4th, 2015]



On Saturday, November 7th, there was a tour to the Emerald Buddha Temple, the Grand Palace as well as the Reclining Buddha Temple.

[Emerald Buddha Temple and Grand Palace Visit: Nov. 7th, 2015]


2. Presentation Week: 9-13 November, 2015

During this week, a conference format with oral presentations and poster presentations was organized. We had received 116 abstract submissions from 25 countries. The accepted presentations were distributed in sessions entitled 'Improved Accuracy of IRI at Equatorial Latitudes I, II, III', 'Progress Towards Real-Time IRI', 'F-peak Modelling and Comparisons', 'Description of Plasma Temperatures and Ion Composition in IRI', 'TEC and Topside Modeling and Comparisons', 'Description of the Ionosphere Below the F-peak', Poster session, 'New Inputs and Applications'. The opening session on Monday morning , November 9th, was presided by Assoc. Prof. Supan Tungjitkusonman, Vice Provost in Academic and Research Affairs, and Assoc. Prof. Komsan Maleesee, the Dean of Faculty of Engineering. In addition, Prof. Dieter Bilitza, COSPAR/URSI IRI Committee Executive Secretary, and Assoc. Prof. Pornchai Supnithi, the General Chair of the IRI 2105 Workshop and Asst. Prof. Prasert Kenpankho, representative of the Technical Program Committee, made Welcome Remarks. Representatives of the sponsor organizations received an Appreciation Certificate and a small gift.

[IRI 2015 Workshop (Conference) Opening: Nov. 9th, 2015]

A Welcome reception was organized on Monday evening, where participants enjoyed light snacks, drinks, and Thai dance performances. In addition, everyone learned some basic Thai dances in circles.

[Welcome Reception: Nov. 9th, 2015]



On Wednesday afternoon, two excursions were organized. One to the PTEC, the other to the Ladkrabang Satellite Ground Station.

[GISTDA Satellite Ground Station Visit: Nov. 11th, 2015]


[Product Testing Electronics Center (PTEC) Visit: Nov. 11th, 2015]

On Wednesday evening, the Workshop Banquet took place during a Chaopraya River Cruise. The participants enjoyed the dinner buffet and views of the Chaopraya river, the main artery of Bangkok, the Old Historic section and the new modern section of Bangkok.

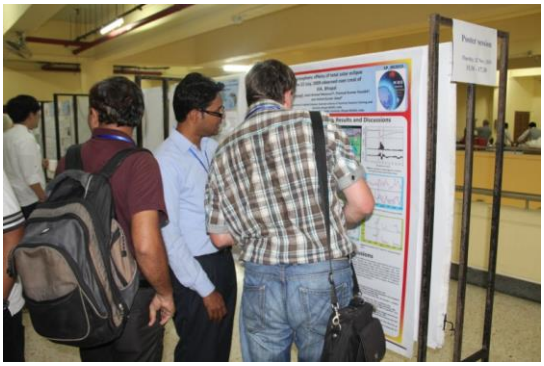
[River Cruise Banquet: Nov. 11th, 2015]

During a special session on Thursday, representatives of each Team Project from the First Week made presentations about their findings and results. A lively question/answer period ensued after each presentation. Three judges (Profs. Shigeto Watanabe, Shunrong Zhang, and Yongliang Zhang) were assigned to choose the best three teams, which will receive awards during the Final session on Friday. At the end of this session, certificates from COSPAR were given out to each Trainee.

[Workshop Certificates for Trainees: Nov. 12th, 2015]

The last session of Thursday was the Poster session where poster presentations were made.

[Atmosphere during Poster Sessions: Nov. 12th, 2015]



On Friday morning, participants were invited by the KMITL president to attend the Welcome session of Her Royal Highness Princess Maha Sirindhorn who graciously presided over the opening of 4 new buildings on KMITL campus and the graduation ceremony.

[Group Photo following Royal Princess Welcome Session: Nov. 13th, 2015]

During the last session on Friday the IRI **Business Meeting was held in conjunction with Final Discussions and decisions regarding the next version of the IRI model**. As a result of the presentations at the workshop new improved descriptions will be introduced into the IRI model for the topside electron density, the F-peak height hmF2, the ion composition at very low solar activities, and the occurrence probability of spread-F. High priority was assigned to the inclusion of GNSS measurements into the Real-Time IRI algorithm.

The venue for the next IRI 2017 Workshop was discussed and proposals were presented for Havana, Cuba and Irkutzk, Russia. Drs. Pornchai Supnithi and Prasert Kenpankho were elected as new members for the IRI Working Group.

Finally, the awards for the best teams were given to:

[Team Project Presentation Awards: Nov. 13th, 2015]

Gold award: Team 5/ Problem 3 (Chinmaya Kumar Nayak, Adrian Teck Keng TAN, Punyawi Jamjareegulgarn, Ednofri)

Silver award: Team 1/ Problem 1 (Malini Aggarwal, Siti Aminah Bahari, Wang Zheng, Sanit Arunpold)



Bronze award: Team 4/Problem 4 (Dessi Marlia, Azad Ahmad Mansoori, Sarawoot Rungruenwajiake, V. Rajesh Chowdhary)