COSPAR-CBW report

**"Atmospheric Correction of Earth Observation Data for Environment monitoring :
Theory and Best practices**
4-8 November 2013

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The COSPAR training and capacity building course was held at GISTDA Training Facility,
Bangkok, Thailand Bangkok, 4 – 8 November 2013. This educational component of the
COSPAR Symposium took place within the framework of the COSPAR Capacity Building
Program relevant to Scientific Commission A on Space Studies of the Earth's Surface,
Meteorology and Climate.

The objective of this one-week workshop was to expand and improve the knowledge and skills of young
researchers (below 35) who are studying or working in a variety of Earth Science disciplines using Earth
Observation data. The course includes lectures covering issues related to remote sensing concepts and
principles in various spectral domains, including microwaves, thermal and optical ranges. The workshop
program was organized by Dr. Nadine Gobron, from the Joint Research Center in Ispra, Italy. The
workshop title "Atmospheric Correction of Earth Observation Data for Environment monitoring: Theory
and Best practices" was tailored for optical and thermal remote sensing, but radar remote sensing was
introduced in the program to meet the requirements of many researchers in Asia.

The program distribution was 2 days for radar, 2 days for optical and one day for thermal remote
sensing. Formal lectures were supplemented by tutorials in order to provide hands on experience
concerning state of the art modeling and remote sensing tools. The workshop program can be
found in Annex 1 (or through the following link:

http://cospar2013.gistda.or.th/media/upload/file/cbw_program/Program.PD)

Some 19 participants from 10 countries in Asia were selected (Madagascar, Turkey, Nepal,
Egypt, Iran, Thailand, Indonesia, Chine, Vietnam (4), India (9)). At various times during the
workshop, additional participants (from a list of 15) from the local organization GISTDA,
attended the lectures and practical sessions.

Annex (2) gives the list of the workshop participants.

During the first two days, Thuy Le Toan from CESBIO, France provided the participants with
basic knowledge on radar remote sensing, specifically based on Synthetic Aperture Radar (SAR)
data. The lectures included satellites and satellite data, physical content of SAR data, statistical
properties of SAR images, and a range of applications which were used as illustrations during the
lectures. Unlike optical and thermal remote sensing data, SAR data are not affected by
atmospheric conditions. Instead, the emphasis were put on the understanding of the scattering
mechanisms and the knowledge of noise sources in the SAR signal. The lectures were followed
closely by tutorials on the methods of processing and analysis of satellite data. The objective of

the tutorials was to show how satellite remote sensing data may be used for a given application. From the wide range of remote sensing applications the practical sessions were focused on rice monitoring, a topic that interested many of the participants in South East Asia. The participants had to get familiar with SAR images and to perform basic image preprocessing and analysis leading to rice mapping. The emphasis was put on the understanding of SAR data and on the preprocessing specific to SAR images (in particular speckle filtering), data interpretation and derivation of indicators for rice mapping.

The software is the open source NEST software from ESA, downloaded from internet. For the tutorials, a time series of 7 dates of a part of Cosmo-Skymed images of the region of An Giang, Vietnam acquired for the running August- November rice season in 2013: 19-08, 4-09, 20-09, 6-10, 14-10, 22-10 and 30-10- 2013. The use of this very up-to-date data time series was intended to demonstrate the operability of radar remote sensing.

At the end of the 4 tutorial sessions, the participants provided the lecturer with a report showing the different steps of the processing, along with the interpretation of the data and results. The reports provided by 21 participants have shown that in general the participants were interested in the topic, that they were aware of the importance of the basic science of SAR remote sensing, which helps to understand the content of the data and the way to analyze them. They were able to go though the processing steps to provide the final result, even for the participants working in optical remote sensing. However, the sessions were too short for the participants to provide detailed interpretation of the different processing results.

It is worth noting that the lectures and tutorials were in a very good atmosphere, with lively interactions between lecturer and participants. This friendly spirit continued in the evening, when participants from GISTDA took the team to the night market and other spots in Bangkok. During the second day break, participants from India celebrated with the class the successful launch of 'Mars Orbiter Mission'. This gave to the all participants the opportunity to exchange on the space research in India and in Asia.

After the workshop, Thuy Le Toan has received feedback from some participants on the radar remote sensing sessions. In general, they said that they have learned much, and they expressed their willingness to work on SAR remote sensing for their research topics. There was a regret that 2 days lectures and tutorials were too short for a complete initiation. The lecturer will take into account of the comments to improve her future lectures-tutorials.

Day 1 - Monday, 4 November 2013

TIME	TOPIC	LECTURER
08:00 - 09:00	Registration	
09:00 - 09:30	Open Ceremony (if any)	Organizers and Authorities
09:30 - 11:00	SAR Remote Sensing : Introduction	Thuy le Toan (CESBIO)
11:00 - 11:15	Coffee Break	
11:15 - 12:45	Physical Properties of SAR Information Content (1)	Thuy le Toan (CESBIO)
12:45 - 14:00	Lunch and Group Photo	
14:00 - 15:30	Physical Properties of SAR Information Content (2)	Thuy le Toan (CESBIO)
15:30 - 16:30	Tutorial : Getting Familiar to SAR Image	
16:30 - 16:45	Coffee Break	
16:45 - 18:00	Tutorial : Preprocessing : coregistration, speckle, filtering, backscatter extraction - change detection, polarisationrratio - rice monitoring	
19:00 - 21:00	Reception Dinner	

Day 2 - Tuesday, 5 November 2013

TIME	TOPIC	LECTURER
08:30 - 10:00	Statistical Properties of SAR Images (1)	Thuy le Toan (CESBIO)
10:00 - 10:15	Coffee Break	
10:15 - 12:45	Statistical Properties of SAR Images (2)	Thuy le Toan (CESBIO)
12:45 - 14:00	Lunch	
14:00 - 15:30	Applications on Rice Monitoring	Thuy le Toan (CESBIO)
15:30 - 16:30	Tutorial : Getting Familiar to SAR Image	
16:30 - 16:45	Coffee Break	
16:45 - 18:00	Tutorial : Getting Familiar to SAR Image	
19:00 - 21:00	Dinner (Boxed Meal)	