Training on Weather Research Forecasting (WRF) Model Installation, Operation, and Maintenance

9-13 September 2013, Multi-Hazard Early Warning Facility,
Department of Meteorology and Hydrology, Nay Pyi Taw, Myanmar



CONTENTS

1. Background

RIMES capacity building assistance to Myanmar's Department of Meteorology and Hydrology (DMH) in numerical weather prediction, particularly on the use of the Weather Research Forecasting (WRF) model, started through a training of a DMH senior scientist, Mr. Sein Maw Oo, on secondment to RIMES until 2010. Subsequently, DMH acquired a computing system for the WRF model. Transfer of learning to DMH and system establishment were, however, interrupted when Mr. Oo passed away in 2011. In August 2012, in a meeting at RIMES, DMH and RIMES agreed that:

a) RIMES shall provide assistance in establishing the WRF system at DMH;
b) RIMES shall train DMH personnel on WRF system installation, operation, and maintenance; and
c) DMH shall second to RIMES two forecasters for a 6-month training at RIMES on numerical modeling, with focus on the WRF model, as well as climate modeling.

In view of the above, two DMH senior scientists, Mr. Kyaw Lwin Oo and Dr. Tin Mar Htay, were trained on climate and WRF modeling through RIMES secondment scheme from February to August 2013. Subsequently, on DMH request, RIMES made a technical visit to DMH Multi-Hazard Early Warning Facility in Nay Pyi Taw from 9-13 September 2013 to establish the WRF system at DMH, and train DMH personnel on WRF model installation, operation, and maintenance.

2. Training Objective

The training on Weather Research Forecasting Model Installation, Operation, and Maintenance aimed to:

a) Establish an operational WRF system at DMH
b) Build skill of DMH personnel in WRF system installation, operation, and maintenance
c) Build skill of DMH personnel in customizing the WRF model to meet specific requirements

3. Participants

A total of 17 DMH personnel participated in the training (Annex 1). Mr. Kyaw Lwin Oo and Dr. Tin Mar Htay, who were previously trained at RIMES on WRF modeling, assisted in the training. The rest of the participants required skills upgradation on WRF installation and operation, as well as improved understanding of the model's computing platform and model maintenance.

4. Training Highlights

The five-day training covered:

- System set-up, which oriented participants on a multi-user environment
- Basics of Linux Operating System, which introduced participants to the Linux environment and practiced them on basic commands
- WRF libraries and library installation, which mentored participants on searching for and installing the required libraries
- WRF modeling, which introduced and practiced participants on pre-processing, model run, and post-processing

Annex 2 provides the training program.

4.1. Session 1: System Setup

During the first day, the server was setup with remote access, enabling each participant to gain server access for performing tasks during the practical sessions. The participants then performed tasks for a better understanding of working in a multi-user environment.

4.2. Session 2: Basics of Linux Operating System

Session 2 focused on the basics of Linux and working in a Linux environment. Participants were allowed to create their own user accounts in the server, for individual login, familiarization of the Linux environment, and practice on basic commands.

4.3. Session 3: WRF Libraries and Library Installation

WRF model installation requires a few libraries and compilation packages to be installed. Participants were informed on the need for model libraries, and on details about compilers and other data format libraries. Participants were then guided in the installation of all dependent libraries. This included installation of system libraries for C, C++ and FORTRAN compilers, as well as optional libraries for reading GRIB2 format data, such as zlib, Jasper and PNG.

4.4. Session 4: WRF Model Installation

For the training and real time run, the latest WRF model version 3.5 was installed. Model installation was carried out in three steps:

- WRF model installation for actual model runs
- WRF preprocessor (WPS) installation
- Installation of post processing utilities, both WRF2GRADS and ARWPost version 3.1

The above steps were carried out during the practical sessions, where participants performed model installations using their respective user accounts.

4.5. Session 5: WRF Modeling

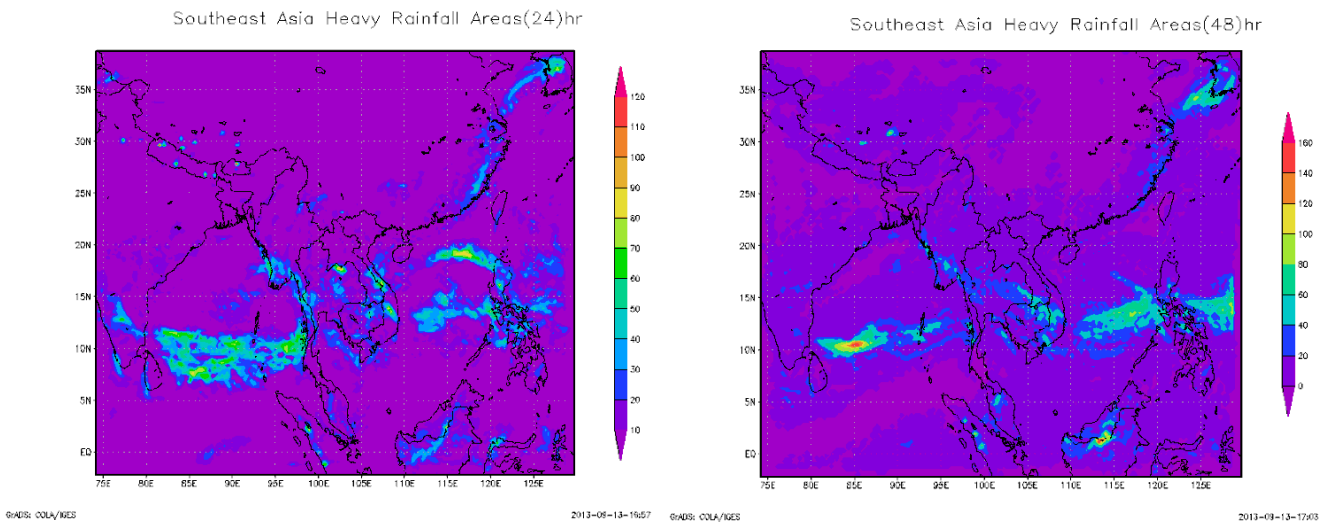
Participants learned about the input parameter files that control the model, and about the initial condition data set. Participants then acquired data from the original source, and ran all three modeling steps: a) preprocessing, b) model run; and c) post processing, after modifying the model parameters with the “namelist” files. All participants were able to successfully complete the model run. Post-processed outputs generated by the participants are shown in the following section.

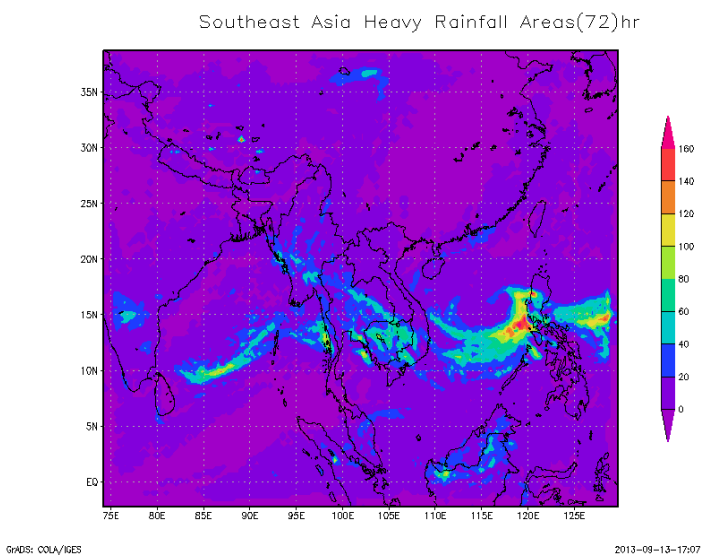
5. Outputs

A practical exercise was facilitated in groups to evaluate participants' knowledge and skills gained during the training. Outputs are presented below.

5.1. Group 1

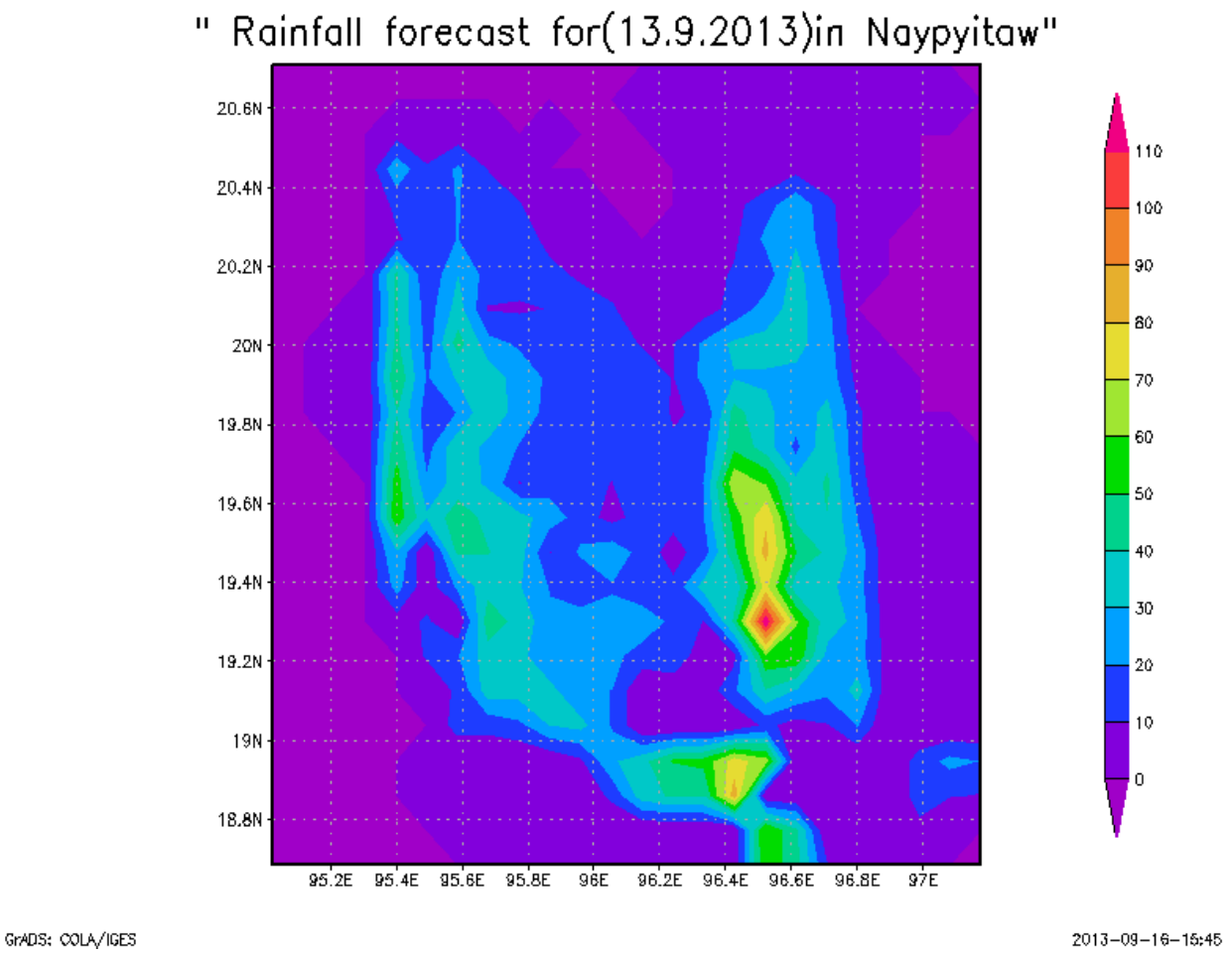
Group 1 was assigned to run the model, and generate 24-hourly accumulated rainfall for three days forecast for the whole South-east Asian region.





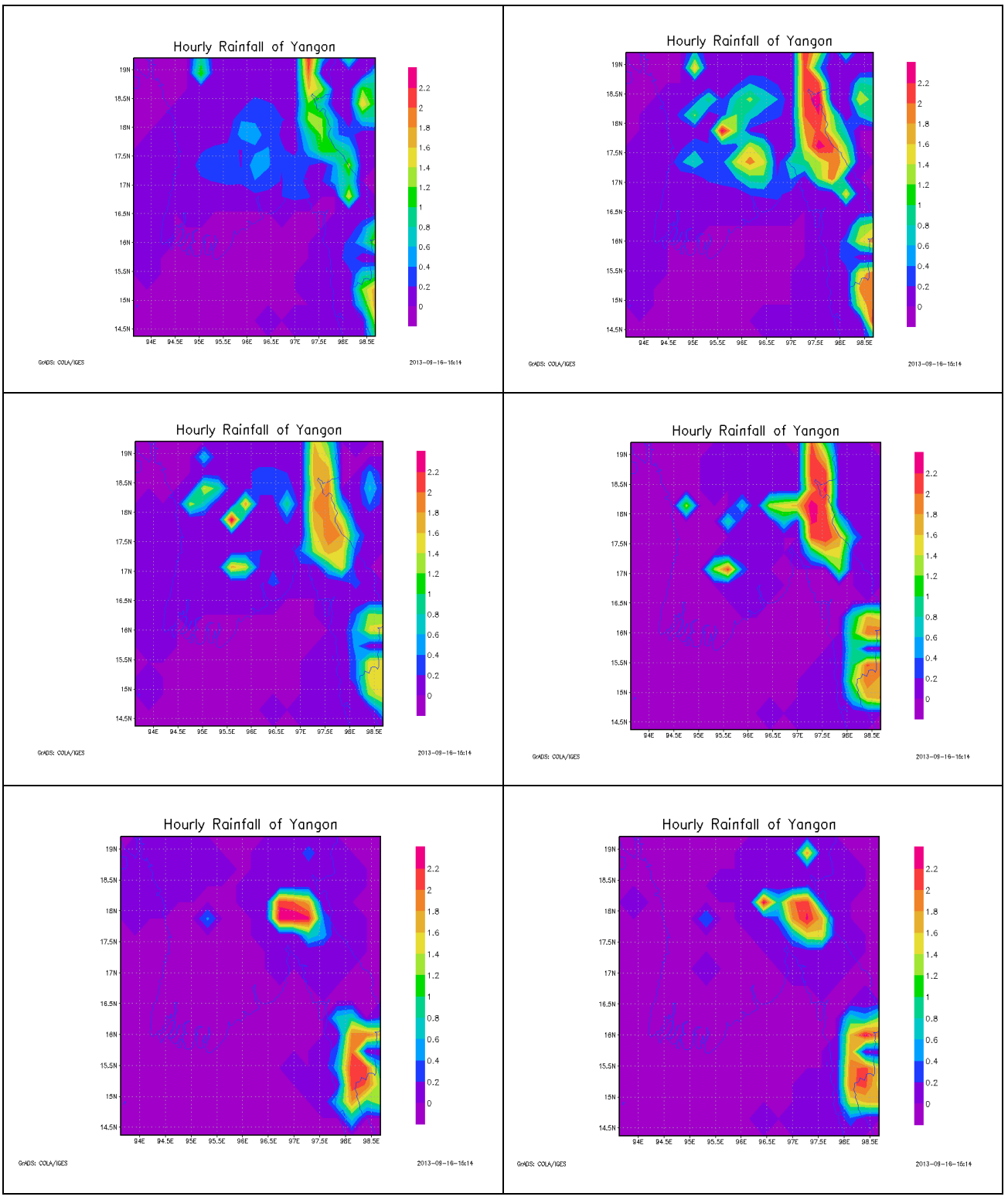
5.2. Group 2

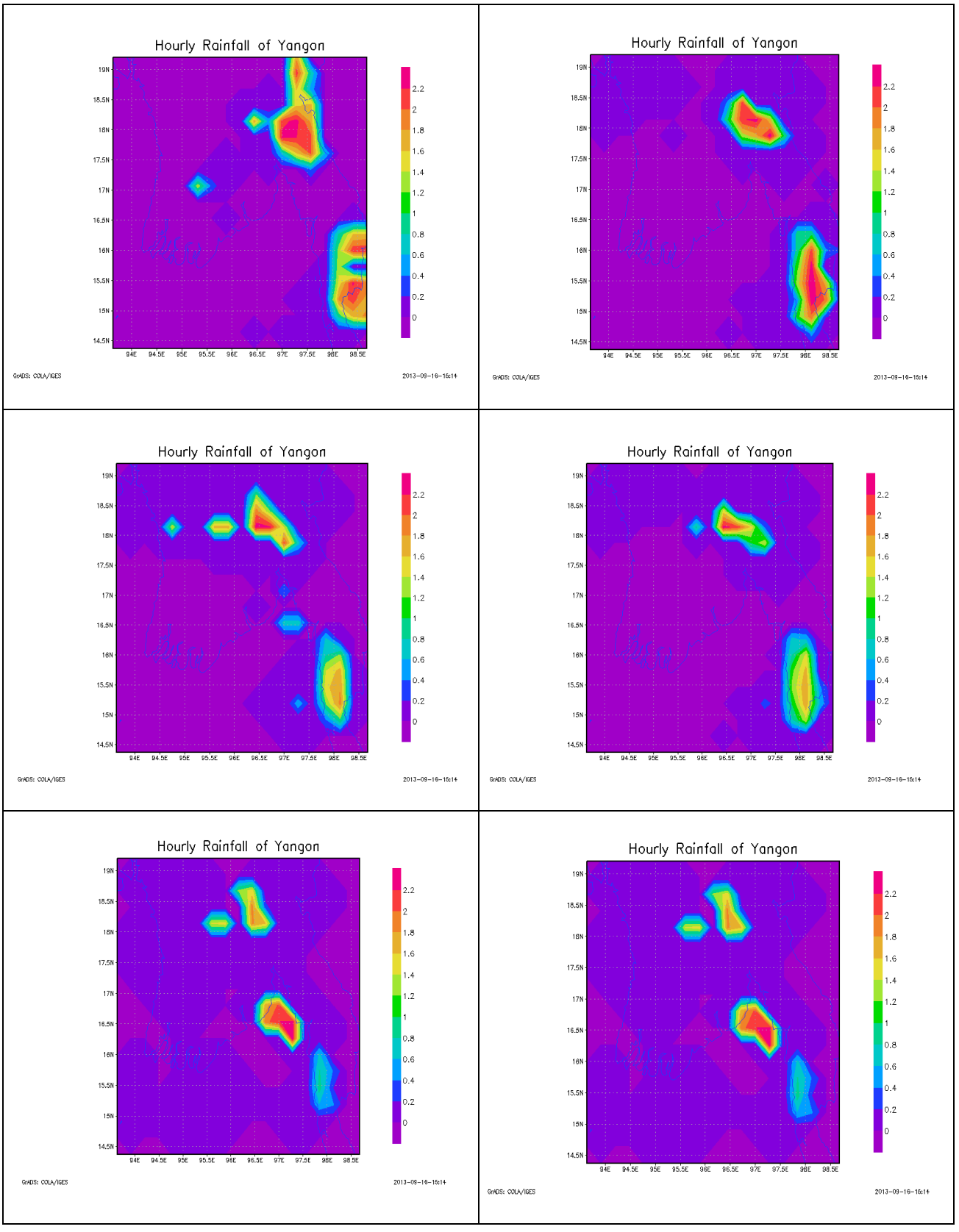
Group 2 was assigned to run the model, and estimate the rainfall for the next 24 hours in Nay Pyi Taw and surrounding area.



5.3. Group 3

Group 3 was assigned to run the model for Yangon and surrounding area, and generate hourly rainfall forecast.




Hourly Rainfall of Yangon
19N
18.5N
18N
17.5N
17N
16.5N
16N
15.5N
15N
14.5N
94E 94.5E 95E 95.5E 96E 96.5E 97E 97.5E 98E 98.5E
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
GrADS: COLA/IGES
2013-09-16-16:14

6. Outcomes and Recommendations

Feedback from participants confirmed their improved understanding of the processes behind WRF modeling, from the model environment to model installation and model runs. The outputs show skills gained in WRF modeling. All participants completed the tasks assigned to them.

All participants felt that the training process needs to be continued, to address the following:

a) Forecast interpretation
b) Model troubleshooting
c) Model automation and integration into DMH operations

RIMES shall schedule another technical visit to meet the above demands. In the meantime, skill built during the training in understanding any modeling error and identifying possible solutions would help. RIMES could also provide remote assistance, as may be needed. RIMES shall also continue to provide back-up support to DMH's daily forecasting operations.

ANNEX 1

PARTICIPANTS LIST

	Participant Name	Position at DMH
1	U Kyaw Lwin OO	Deputy Director
2	Daw Thet Htar Su Hlaing	Assistant Director
3	Daw Sein Sein Yi	Assistant Director
4	Dr. Than Naing	Staff Officer
5	U Lwin Oo Maung	Staff Officer
6	Daw Han Swe	Staff Officer
7	Dr. Tin Mar Htay	Assistant Forecaster
8	Daw Khin Win Maw	Assistant Forecaster
9	Daw Theigi Tun	Assistant Forecaster
10	Daw Chaw Su Hlaing	Assistant Forecaster
11	Daw Witt Yi Soe	Assistant Forecaster
12	Daw Aye Aye Soe	Assistant Forecaster
13	Daw War War Thein	Assistant Forecaster
14	Daw Sandar Wai	Senior Observer
15	Daw Khaing Soe Oo	Senior Observer
16	Daw Myintzu Hmwe	Senior Observer
17	Daw Thazin Phu	Senior Observer

ANNEX 2

TRAINING PROGRAM

9 September 2013

Session 1: System Setup and Accessibility Check

- Remote server access
- Working in a multi-user environment
- Practical exercises

10 September 2013

Session 2: Basics of Linux Operating System

- Using Linux
- Familiarization with the command prompt
- Learning basic commands
- Using the vi editor
- Practical exercises

11 September 2013

Session 3: WRF Libraries and Library Installation

- Searching for libraries
- Installing libraries
- Practical exercises

Session 4: WRF Model Installation

- WRF source code
- Introduction to the WRF model
- WRF installation: practical

12 September 2013

Session 5: WRF Modeling

- Pre-processing
- Model interpolation
- Model run
- Post-processing

13 September 2013

Session 5: WRF Modeling (continued)

- Practical Exercise
  - Model run for selected domain
  - Results interpretation
  - Presentation of outputs

Closing Session

Regional Facility, Regional integrated Multi-Hazard
Early Warning System for Africa & Asia,
Asian Institute of Technology Campus, PO Box 4
Klong Luang, Pathumthani 12120, Thailand
(t) +662 516 5900 – 01 **(f)** +662 516 5902 **(e)** rimes@rimes.int
(w) www.rimes.int