Verification of High-resolution Regional Model (HRM) over Thiruvanathapuram: A case study

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Outline of the Presentation:

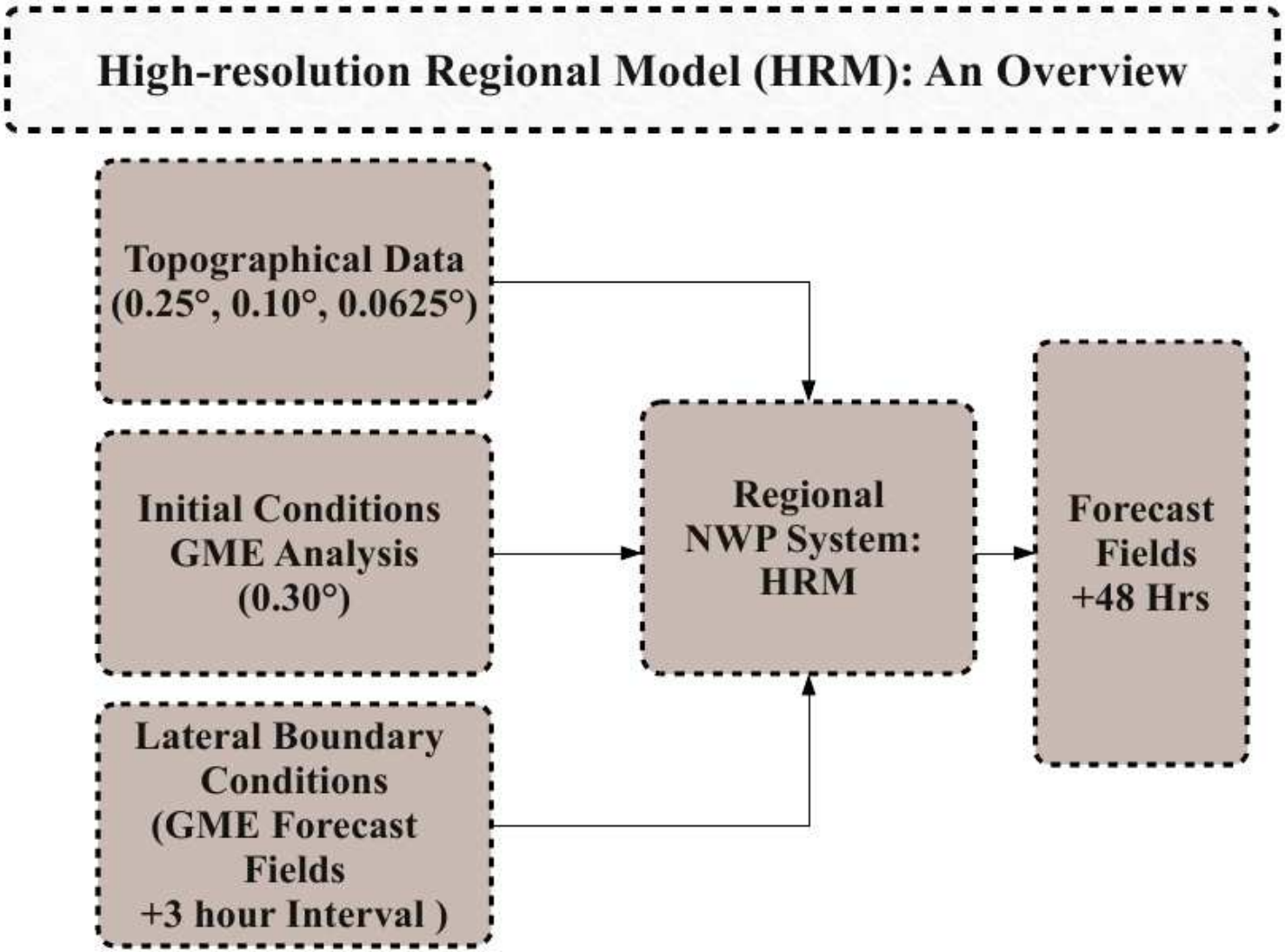
About the Research Work

Verification study of a regional atmospheric model, HRM, over a coastal station - Thiruvananthapuram by comparison of model-simulated vertical profiles of meteorological parameters with concurrent observations.

Salient features of HRM

- A hydrostatic model developed by DWD, Germany
- Specifically developed for mesoscale processes
- Indian domain (0° to 30° N; 65° E to 95° E)
- Hybrid coordinate with vertical (60 layers) stretch option

Prognostic variables	Diagnostic variables
Surface pressure	Vertical velocity
Temperature	Geopotential
Water vapour	Cloud cover
Cloud water	Diffusion coefficients
Cloud ice	
Horizontal wind	
Ozone (optional)	
Several surface/soil parameters	


High-resolution Regional Model (HRM): An Overview
Topographical Data (0.25°, 0.10°, 0.0625°)
Initial Conditions GME Analysis (0.30°)
Lateral Boundary Conditions (GME Forecast Fields +3 hour Interval)
Regional NWP System: HRM
Forecast Fields +48 Hrs

Objective of the Study

- Assessment of HRM simulations in the vertical direction
- Temporal Evolution in Model Bias with respect to Forecast Hours

Database Details

Study Domain: Thiruvananthapuram (8.5°N, 76.9°E)

Period of Study: November 11 - 17, 2010

Database

- Upper-air Meteorological Observations (00 and 12 GMT)
- HRM Simulated Forecast Fields for +48 Hrs at +1 Hrs interval

Methodology

HRM simulated forecast fields are compared with the observations and the errors are quantified by estimation of **Bias** and **Root Mean Square Error (RMSE)** using the following equations:

$$Bias = M_i - O_i \tag{1}$$

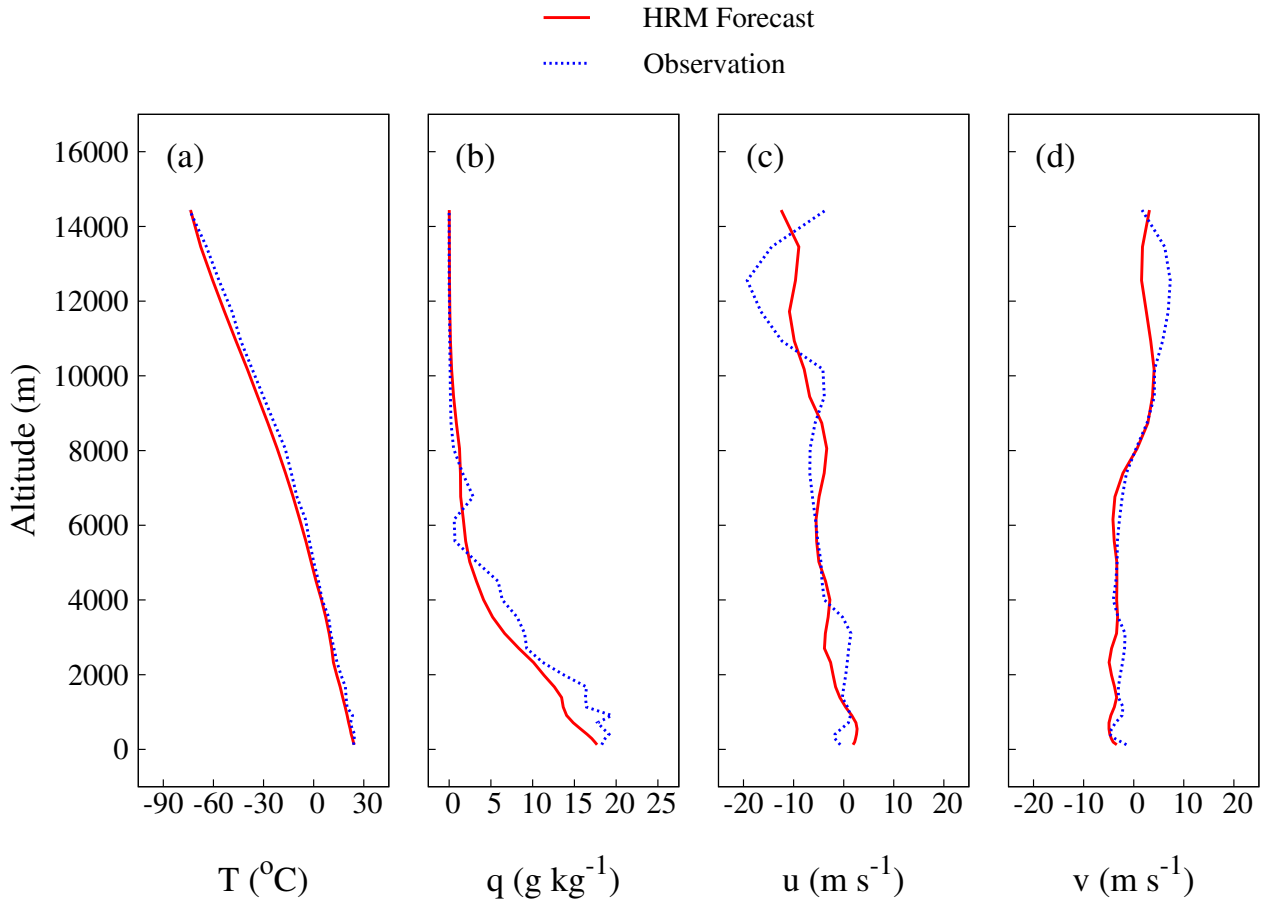
$$RMSE = \sqrt{\frac{\Sigma(M_i - O_i)^2}{n}} \tag{2}$$

O_i = Observation at a particular height

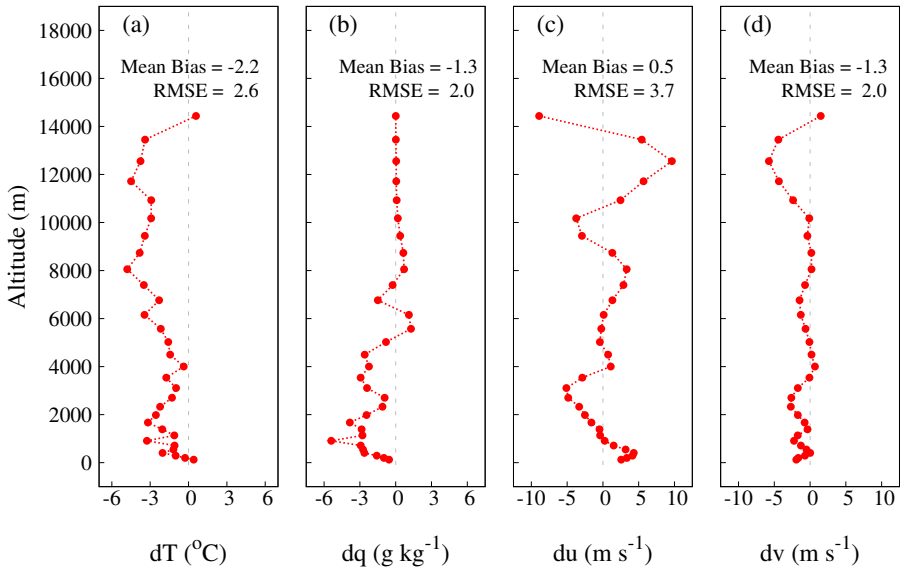
M_i = Corresponding forecast at that height

n = No. of Observations/forecasts

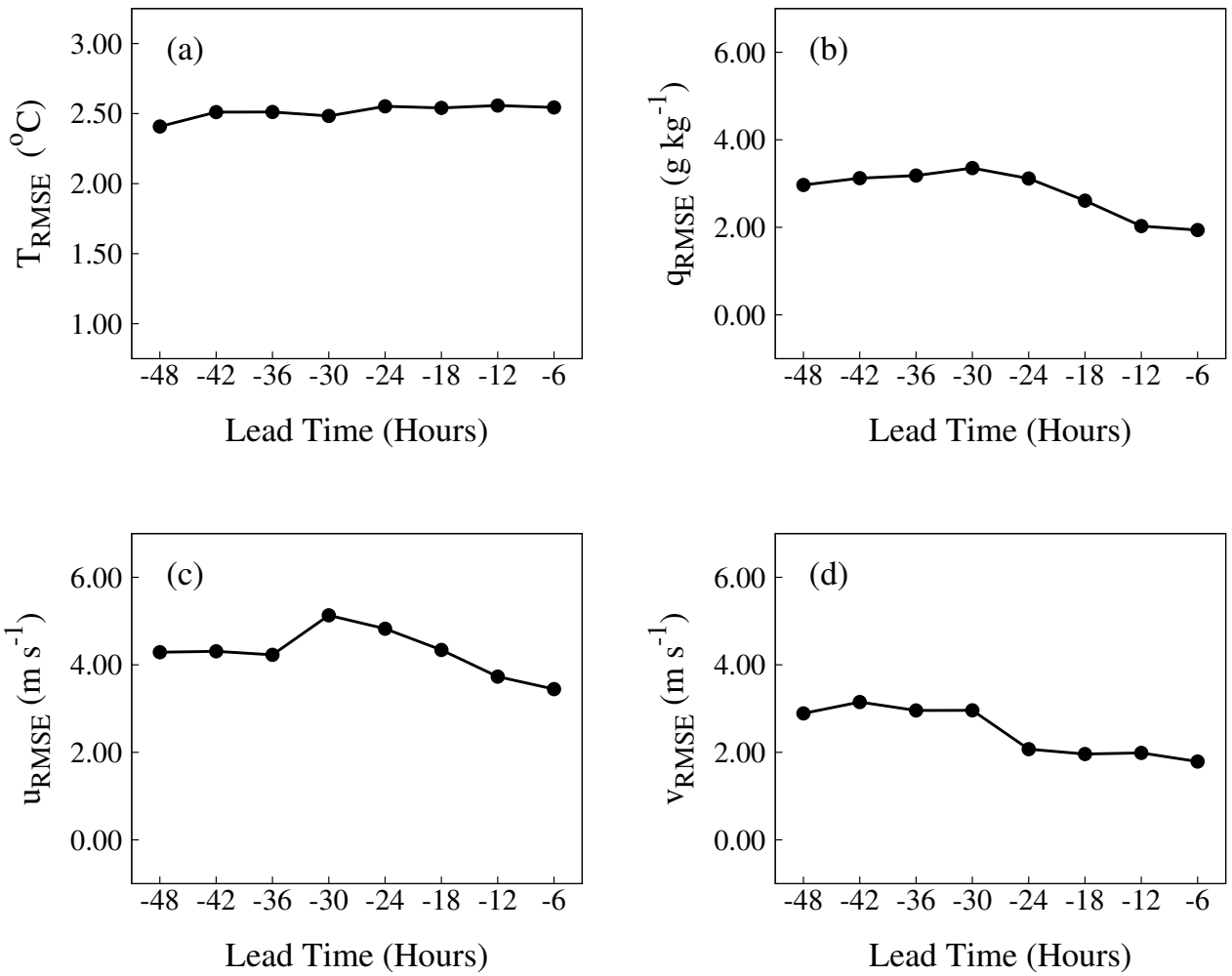
Comparisons of HRM simulated (+12 Hrs) meteorological parameters with Observations on November 16, 2010 (00 GMT)



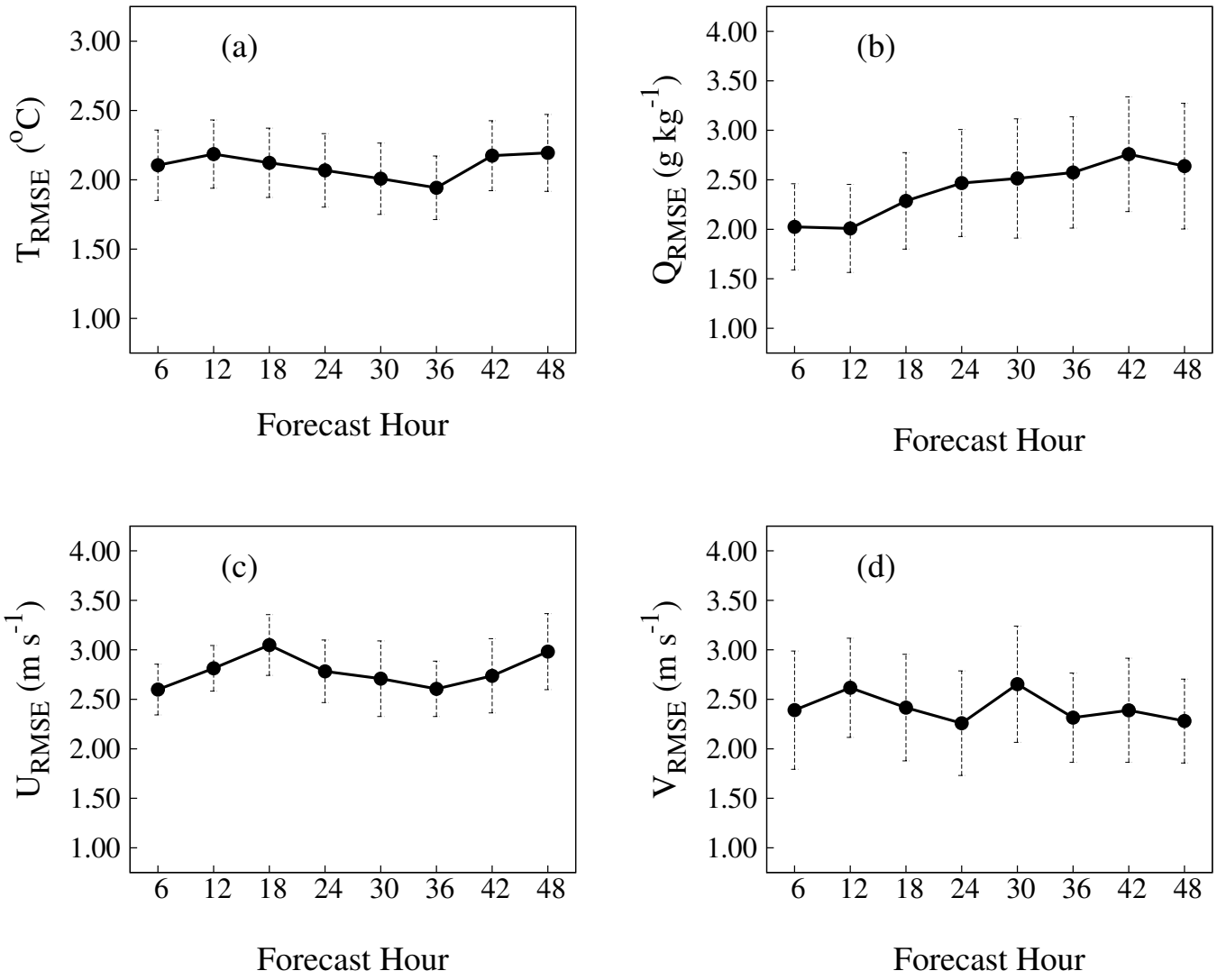
Model Bias (= Difference between HRM simulations and Observation) for November 16, 2010 (00 GMT)



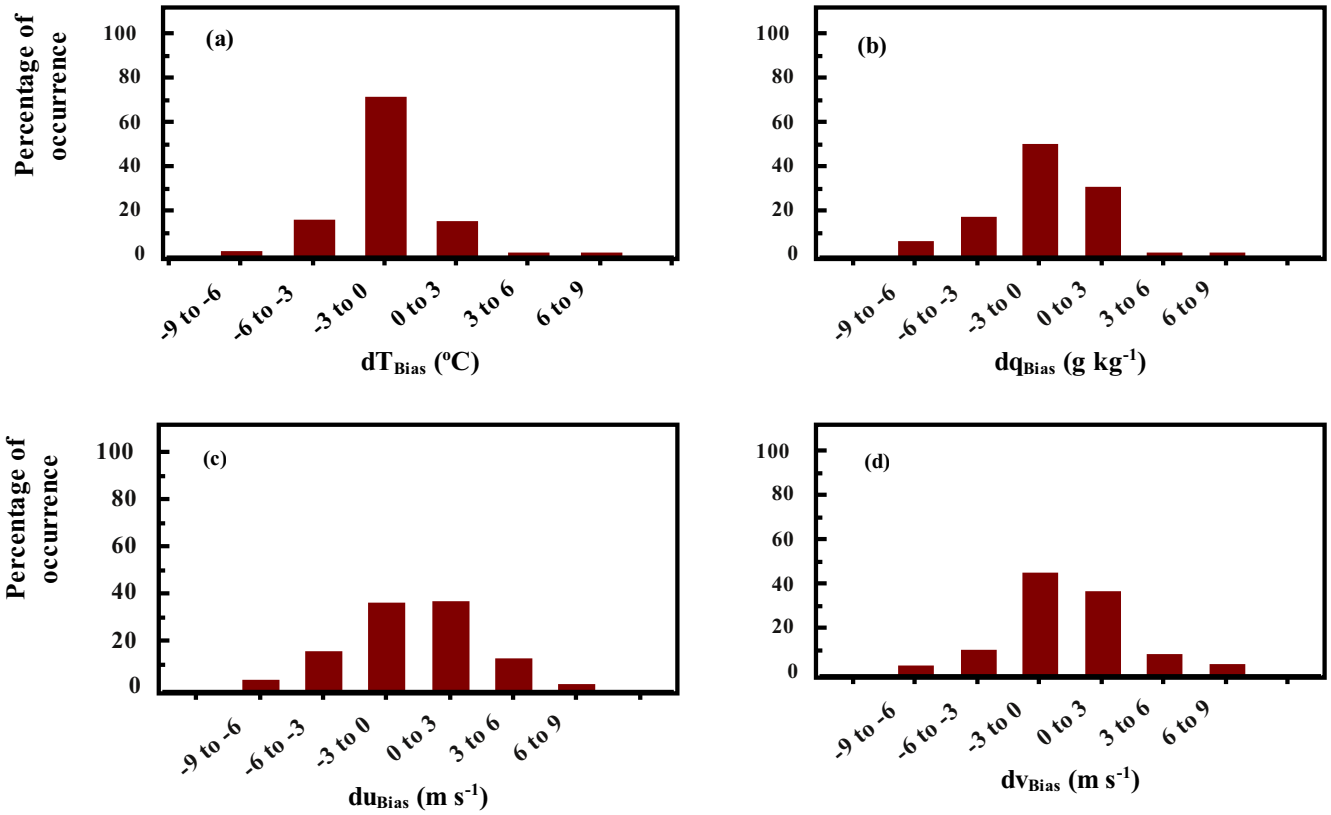
- consistent negative bias in temperature and moisture simulations



RMSE of HRM simulated vertical profiles for 16 November 2010 (00 GMT)



Average RMSE of HRM simulated vertical profiles based on almost 14 forecasts



Percentage of occurrence of model bias for temperature, humidity and winds corresponding to all forecasts

Concluding Remarks

- In most of the cases, temperature and moisture are seen to be under-estimated by HRM
- HRM simulated temperature showed a consistent bias and RMSE with forecast time
- HRM simulated moisture fields are seen to deviate largely with forecast time
- HRM simulated winds do not show any clear signature with forecast time

Thankyou for your attention