Evaluation of Quantitative Precipitation Estimation from Model, Satellite and Radar

CHONGXING FAN

SCHOOL OF ATMOSPHERIC SCIENCES, NANJING UNIVERSITY

SUPERVISOR: YONGSHENG CHEN

Contents

01 Introduction

02 Data and Method

03 Result Analyses

04 Conclusions

05 References

Contents

01 Introduction

02 Data and Method

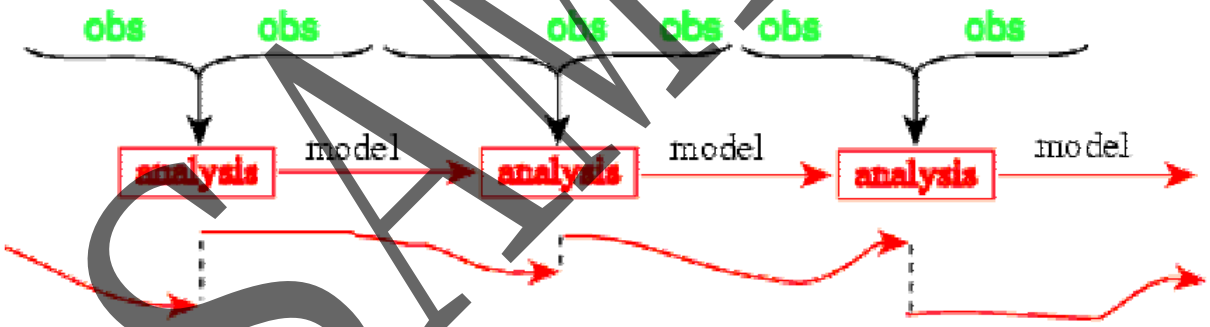
03 Result Analyses

04 Conclusions

05 References

Introduction

- Observation including satellite, radar and rain gauge data is combined with model to produce analysis field.
- Error structure of observations and forecasts have to be understood to improve data assimilation.



Contents

01 Introduction

02 Data and Method

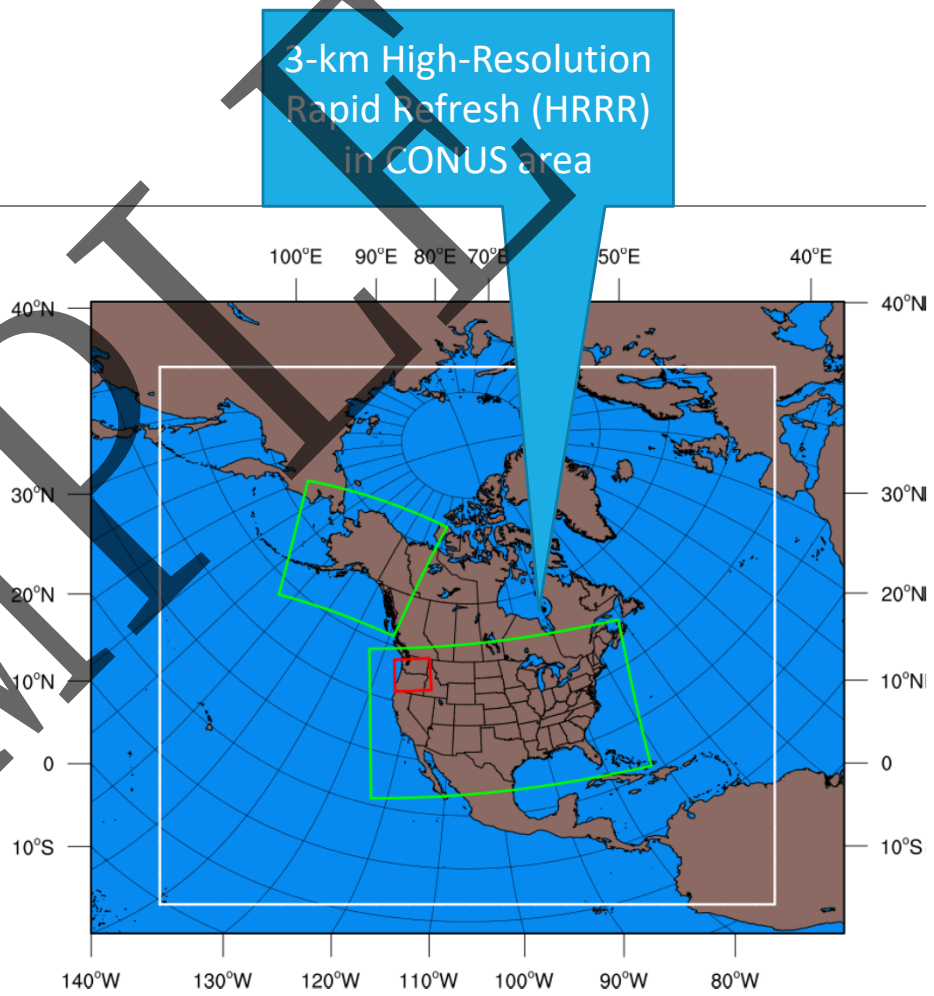
03 Result Analyses

04 Conclusions

05 References

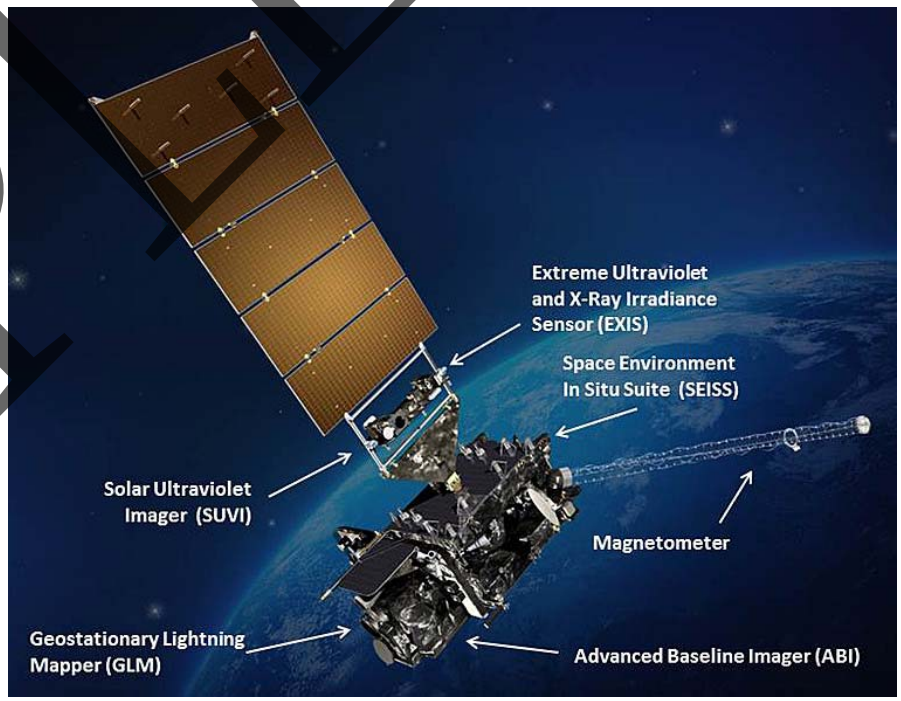
Data

- Model: High-Resolution Rapid Refresh(HRRR)
  - ✓ Spatial Resolution: 3km
  - ✓ Temporal Resolution: 1h
  - ✓ Domain: CONUS
- Real-time 3-km resolution, hourly updated, cloud-resolving, convection-allowing atmospheric model
- Radar assimilation included



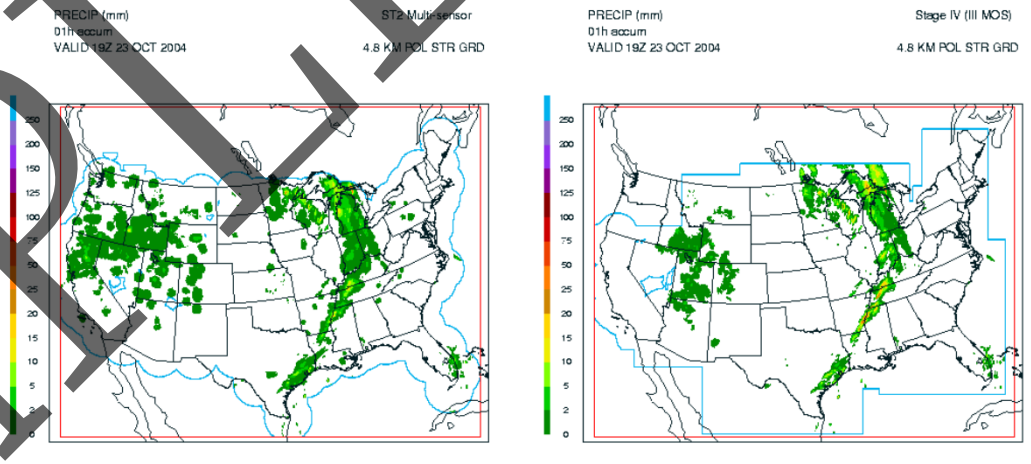
Data

- Satellite Estimates: GOES-16 ABI L2+ RRQPE
  - ✓ Spatial Resolution: 2km
  - ✓ Temporal Resolution: 15mins
  - ✓ Domain: Full Disk
- The ABI Rainfall Rate algorithm generates the baseline Rainfall Rate product from ABI IR brightness temperatures and is calibrated in real time against microwave-derived rain rates to enhance accuracy. The algorithm generates estimates of the instantaneous rainfall rate at each ABI IR pixel.



Data

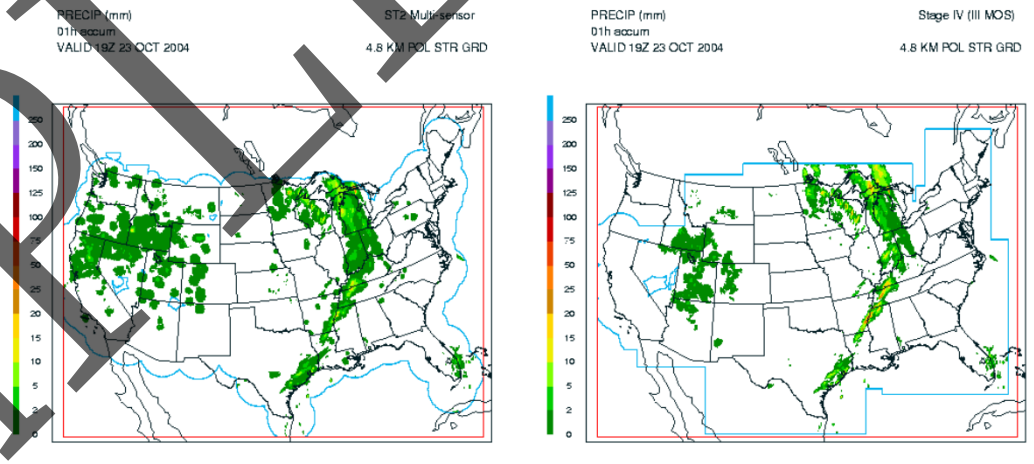
- Radar + Gauge Estimates: StageIV
  - ✓ Spatial Resolution: 4km
  - ✓ Temporal Resolution: 1h
  - ✓ Domain: CONUS
- Mosaicked into a national product at NCEP, from the regional hourly/6-hourly multi-sensor (radar+gauges) precipitation analyses (MPEs) produced by the 12 River Forecast Centers over CONUS.



Snapshot of a one-hour Stage II (left) and Stage IV (right) analysis.

Data

- Radar + Gauge Estimates: StageII
  - ✓ Spatial Resolution: 4km
  - ✓ Temporal Resolution: 1h
  - ✓ Domain: CONUS
- National multi-sensor hourly precipitation analysis, based on hourly radar precipitation estimates from the ~140 WSR-88D radars over CONUS, and the ~3,000 automated gauge reports transmitted via the GOES Data Collection Platform.

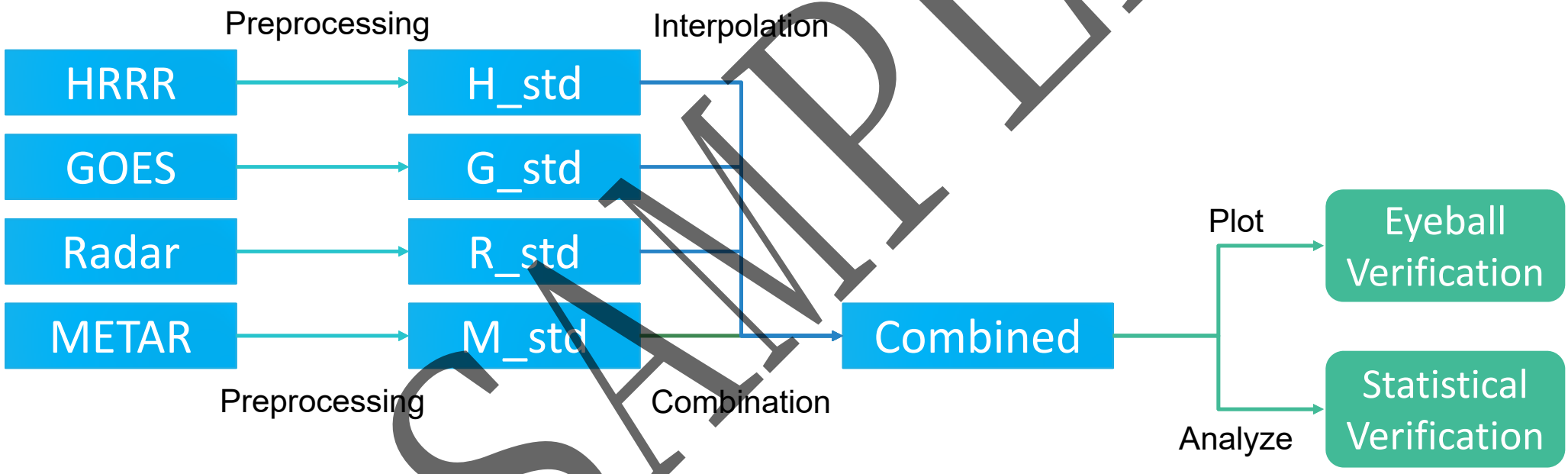


Snapshot of a one-hour Stage II (left) and Stage IV (right) analysis.

Data

- Observation: METAR
  - ✓ Spatial Resolution: 2388 stations
  - ✓ Temporal Resolution: ~5mins
  - ✓ Domain: CONUS
- Heated Tipping Bucket (HTB) Precipitation Gauge
- Precipitation Accumulation Algorithm

Method



Contents

01 Introduction

02 Data and Method

03 Result Analyses

04 Conclusions

05 References

Result Analyses

- We choose July 2018 for our analyses.
- Several verification methods are employed.
  - ✓ Average Rainfall Maps/Trends
  - ✓ Probability Distribution Function (PDF) Plots
  - ✓ Bias Maps/Trends
  - ✓ RMSE Maps/Trends
  - ✓ Average, Variance, Skewness and Kurtosis
  - ✓ Contingency Table
  - ✓ Correlation Analysis
  - ✓ Verification for Dichotomous Forecasts/Estimates