Hands-on Exercise
Quantitative Precipitation Estimation

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Purpose of this hands-on training

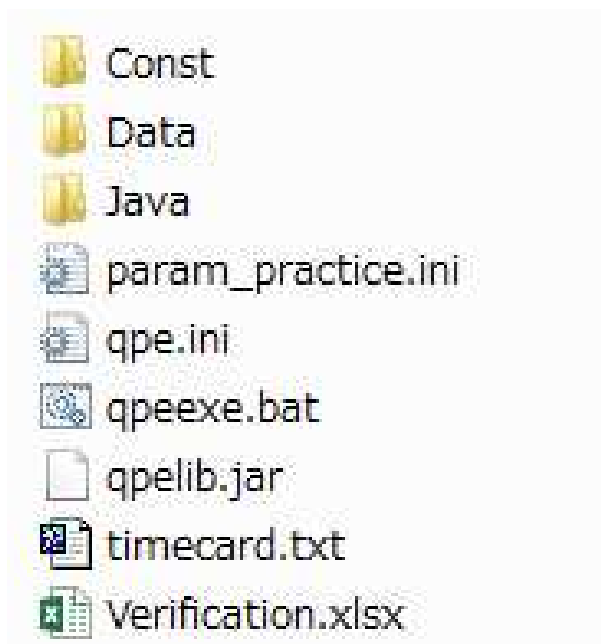- To understand the QPE algorithm, and the importance of observation data.

Contents

- Make QPE product using JMA observation data, and program for exercise.

Practice Tools

- ## QPE production tool
  - Constant parameters
    - Site list (radar, rain-gauge)
    - Tables
  - Execute program, script (windows batch)

  - Not R/A itself.
- ## Verification worksheet (Microsoft Excel)

Tool files

- **Setting files**
  - 'Const' folder
  - qpe.ini, param_practice.ini
  - 'timecard.txt'

- **Source, product data**
  - 'Data' folder

- **Execute program**
  - 'qpeexe.bat'

- **Verification tool**
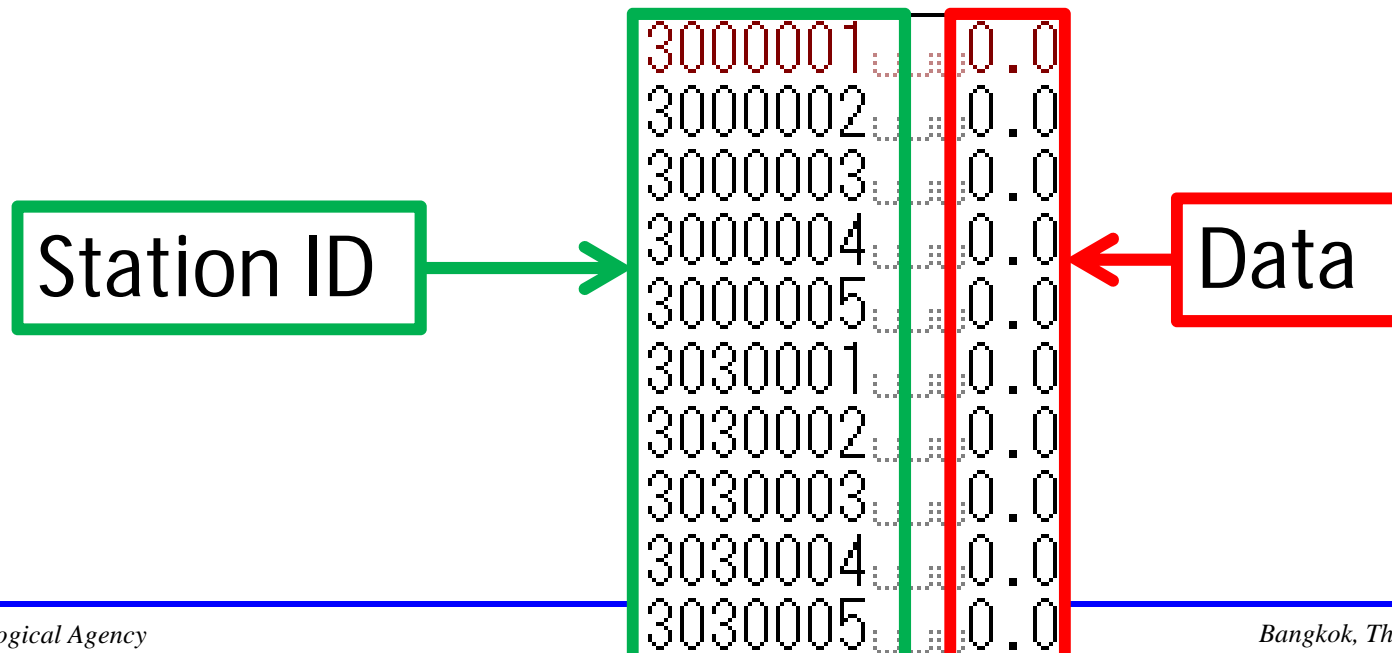 - Verification.xlsx

How to exercise

- Use
  - 'qpeexe.bat' to run QPE program

- Observation data source
  - './Data/Raingauge/' is for rain-gauge.
  - './Data/SiteRadarData/' is for radar.

- Output
  - './Data/Composite/' is for QPE
  - './Data/Verification/' is for CSV data to verify

Rain-gauge Data

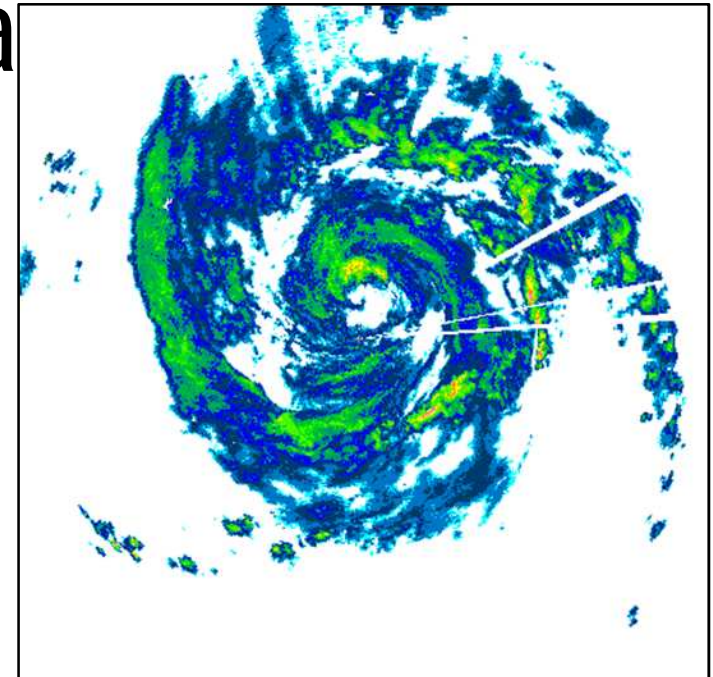- Please set rain-gauge data under the following directory.

  Filename is *YYYYMMDDHH*.txt

  Data format is …

Station ID →		← Data
3000001		0.0
3000002		0.0
3000003		0.0
3000004		0.0
3000005		0.0
3030001		0.0
3030002		0.0
3030003		0.0
3030004		0.0
3030005		0.0

Radar data

- Every 10 minutes radar data.

- JMA's operational format data
  - Not used elsewhere

Site Code (JMA Unique code) on file name
Tokyo radar A3
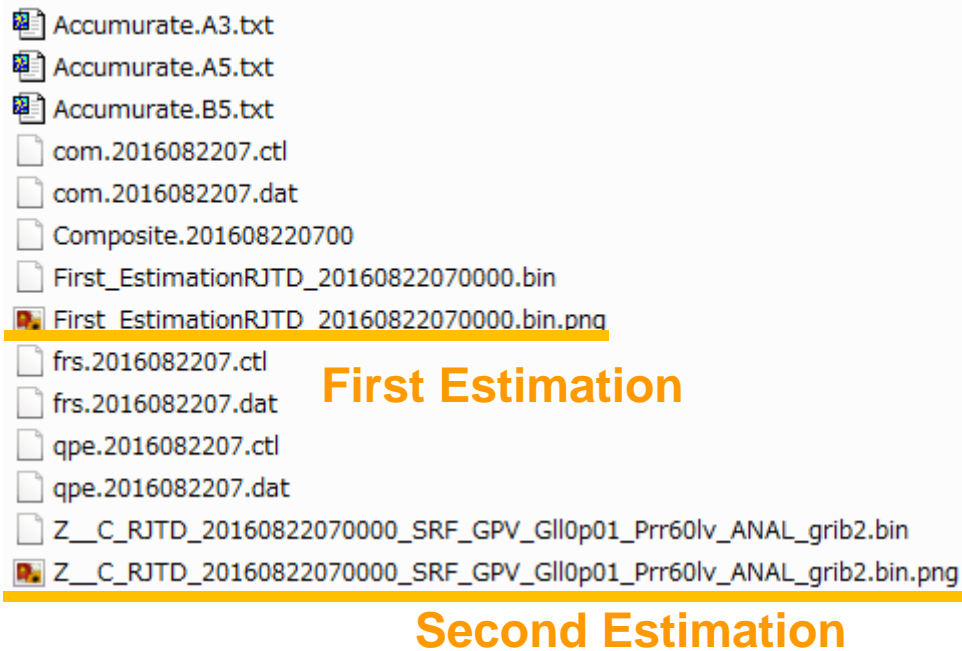   Ex. RCAPA320160822065000N302N.gz
Sendai radar A5
     Ex. RCAPA520160822065000N302N.gz
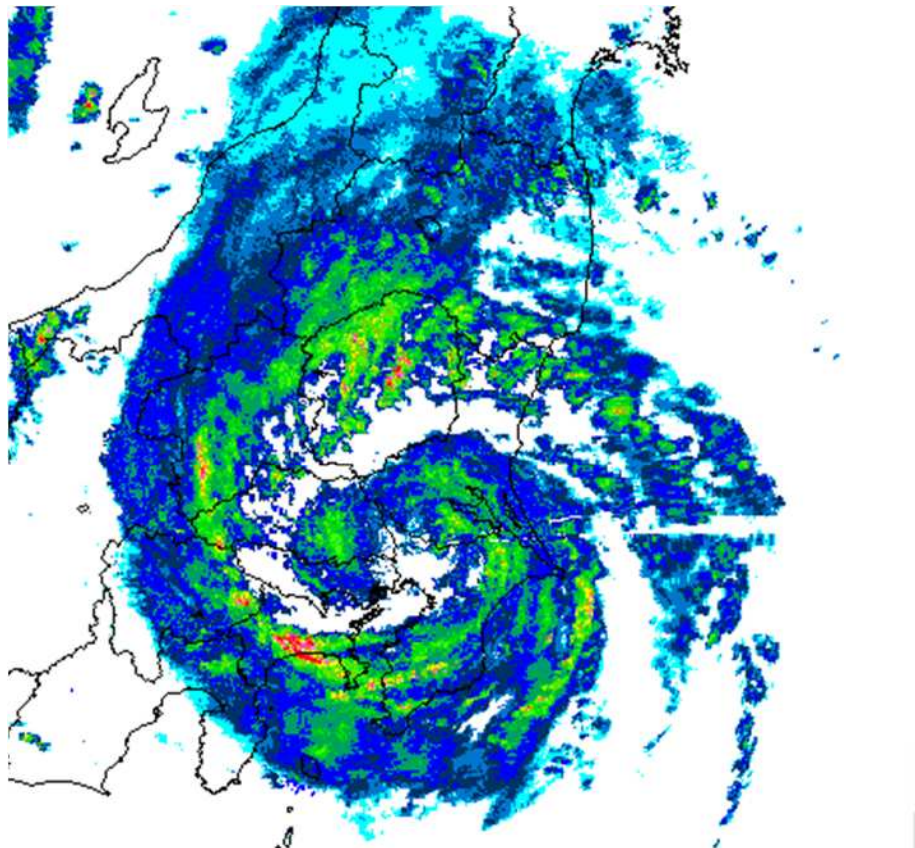Shizuoka radar B5
     Ex. RCAPB520160822065000N302N.gz

Output

- First Estimation and Second Estimation is at ./Data/Composite/ folder, and PNG is composite product.


```
Accumurate.A3.txt
Accumurate.A5.txt
Accumurate.B5.txt
com.2016082207.ctl
com.2016082207.dat
Composite.201608220700
First_EstimationRJTD_20160822070000.bin
First_EstimationRJTD_20160822070000.bin.png
frs.2016082207.ctl
frs.2016082207.dat
qpe.2016082207.ctl
qpe.2016082207.dat
Z__C_RJTD_20160822070000_SRF_GPV_Gll0p01_Prr60lv_ANAL_grib2.bin
Z__C_RJTD_20160822070000_SRF_GPV_Gll0p01_Prr60lv_ANAL_grib2.bin.png
```

First Estimation

Second Estimation

Case

- Typhoon case
  - 2016 /8 /22 16:00 UTC

2016/08/22 0555Z

Radar composite (all site)

Observation Data

- Radar data
  - Tokyo radar
  - Sendai radar
  - Shizuoka radar
- Rain-gauge

Sendai radar

Tokyo radar
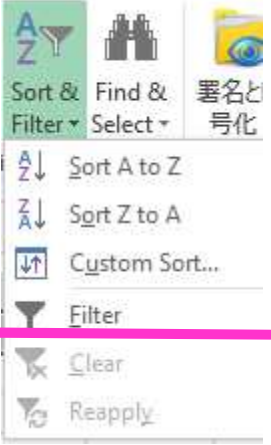
Shizuoka radar

2016/08/22 0700Z

Radar composite (all site)
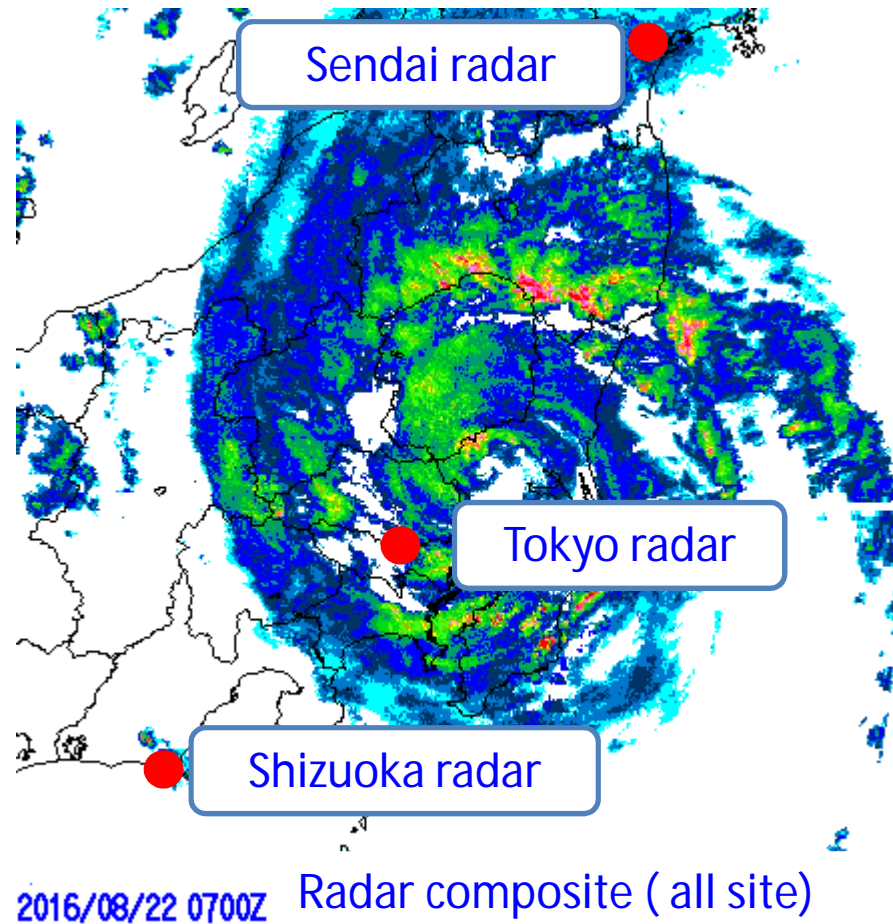
Data Source
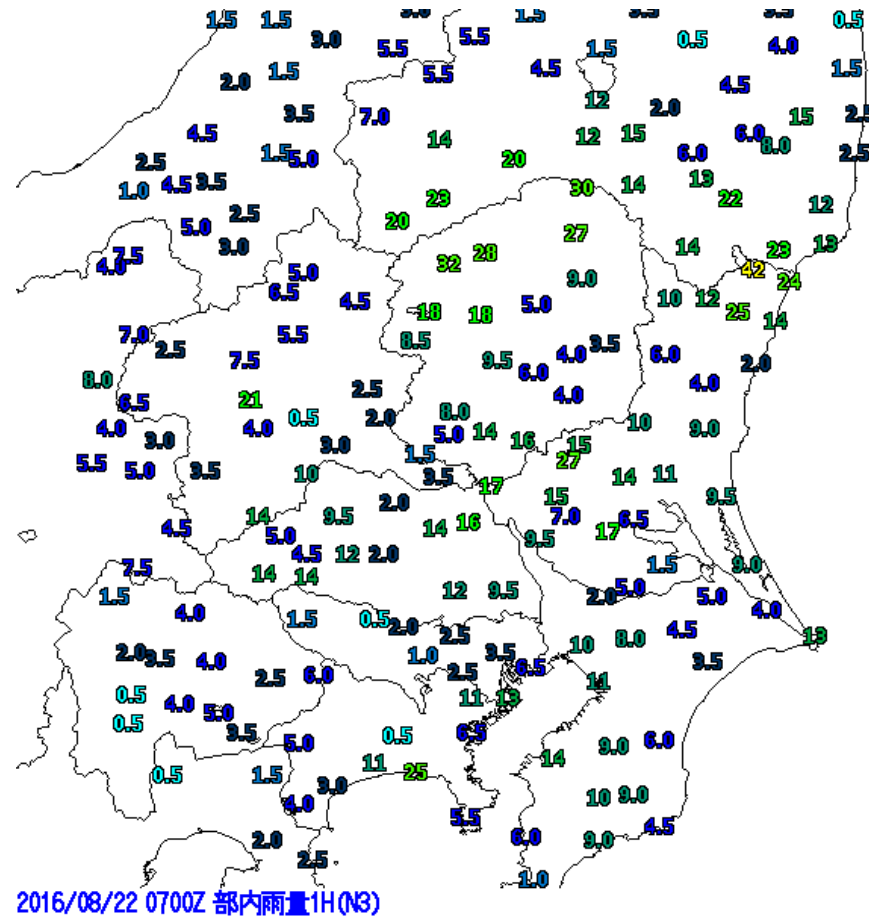
- Rain-gauge

As a truth

- Rain-gauge

2016/08/22 16:00 統合雨量1H(N3)
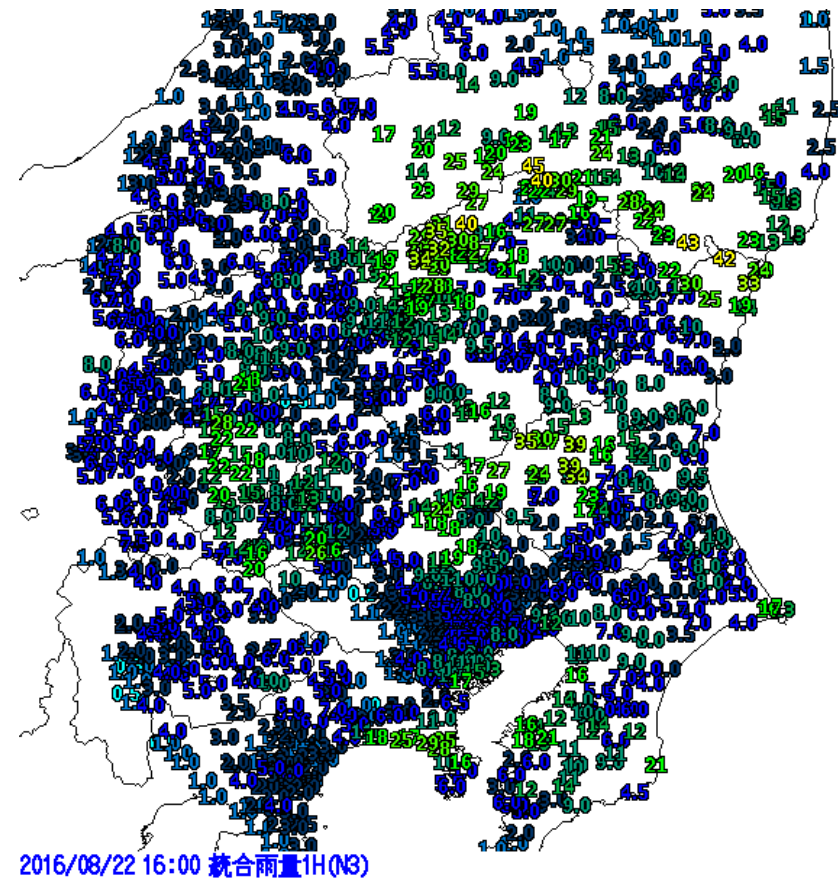
Verification

- Verification.xlsx

- ./Data/Verification/

    – Open Scatter.yyyyMMddHH.csv in Excel

    – Set 'Filter'

- Uncheck -1, and 0 of rain-gauge and radar
- Paste data to Verification.xlsx

radar

y = 0.2455x
R² = 0.0505

Radar

Rain-gauge

- See verification result in plot
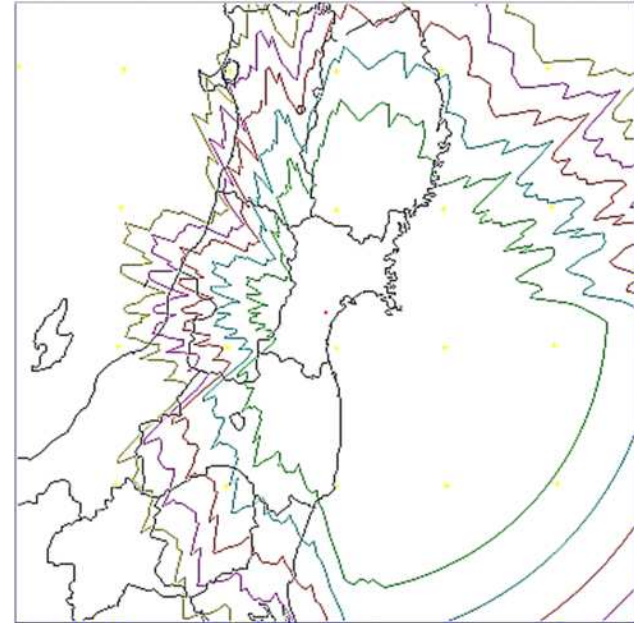 - Horizontal axis is rain-gauge
  - Vertical axis is radar

Appendix

Visibility

Sendai

- Altitude : 2km, 3km, 4km, ...

Shizuoka

Tokyo

Second Precipitation Estimation

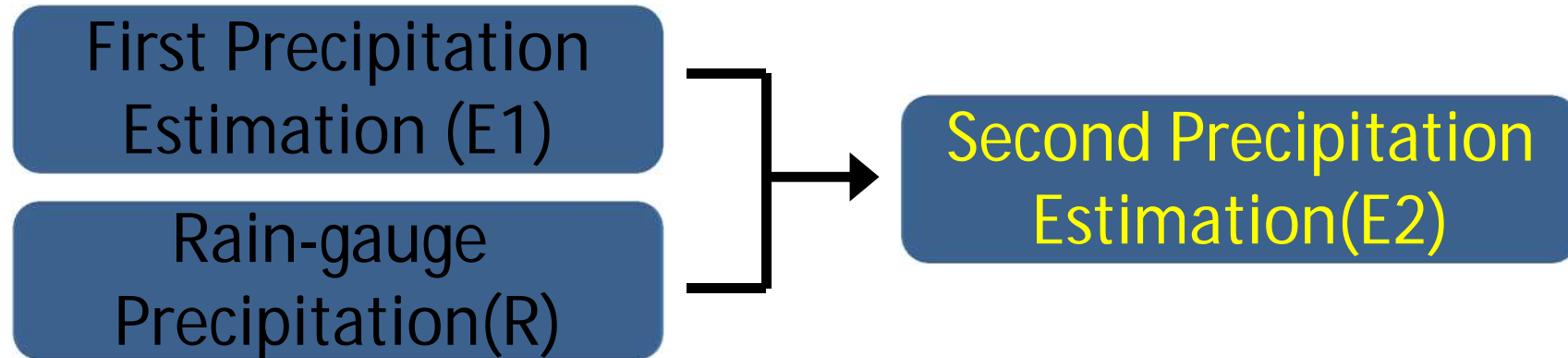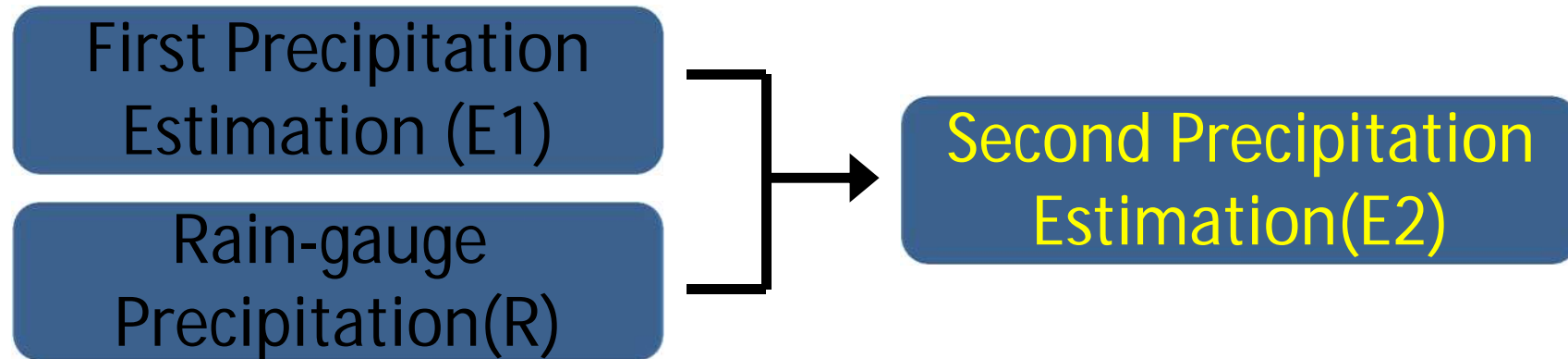First Precipitation Estimation (E1)

Rain-gauge Precipitation(R)
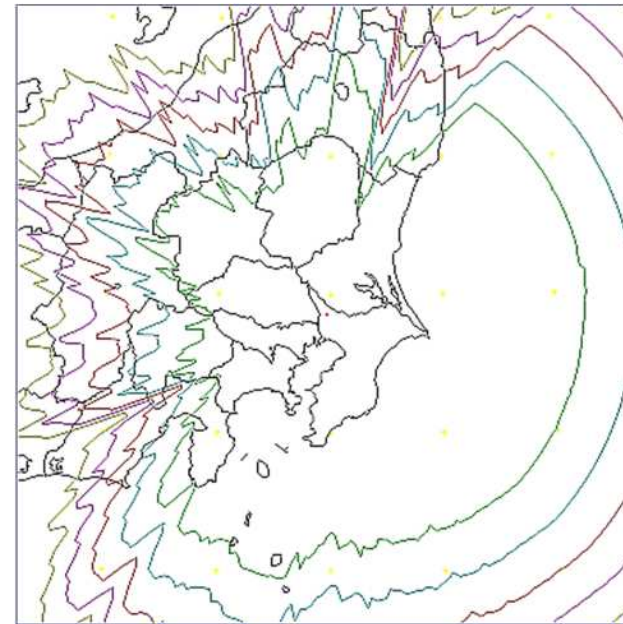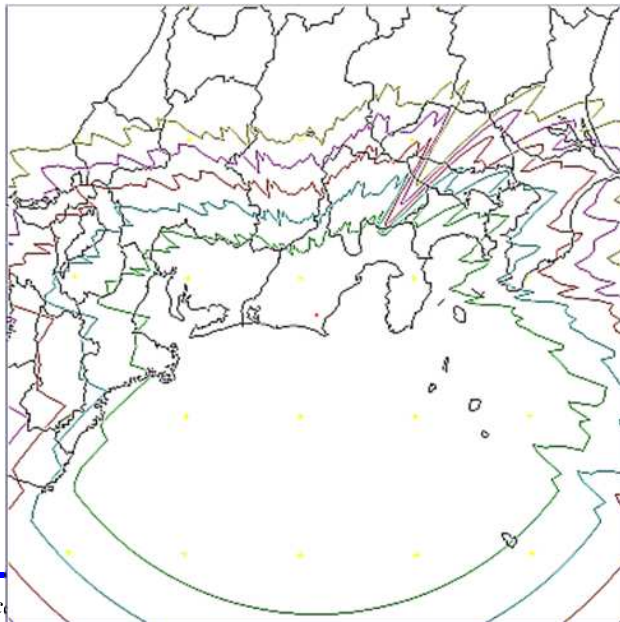
→ Second Precipitation Estimation(E2)

Calibrate again to express more smaller scale precipitation distribution.

1. Second Precipitation Estimation(E2) employ distribution of First Precipitation Estimation and rain-gauge observation.
   - Precipitation distribution around rain-gauge should be expressed more clearly.
2. For E2, Second Calibration Factor(F2) is calculated with correcting First Calibration Factor(F1) which contains overall observation.

Second Precipitation Estimation

First Precipitation Estimation (E1)

Rain-gauge Precipitation(R)

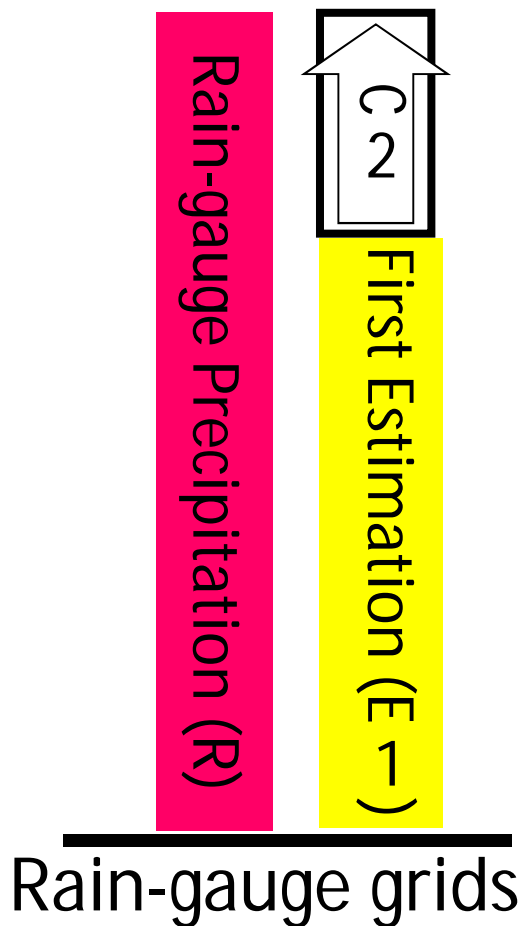Second Precipitation Estimation(E2)

Correction amount of First Calibration Factor
Correction factor calculation

1. For rain-gauge grids
   Compare First Precipitation Estimation with precipitation observation by rain-gauge.
2. For all grids
   Weighed interpolation method referencing neighbor rain-gauge grids.

Second Precipitation Estimation

Calculation of Correction Factor (C2) for rain-gauge grids

Rain-gauge Precipitation (R)

C2

First Estimation (E 1)

Rain-gauge grids

$$C2(i) = R(i)/E1(i)$$

R(i)   Precipitation observed by rain-gauge #i

E1(i)   First Estimation at the grid of rain-gauge #i

C2(i)   Correction Factor at the grid of rain-gauge #i

*To be determined for all rain-gauge grids