



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

Const
 Data
 Java
 param_practice.ini
 qpe.ini
 qpeexe.bat
 qpelib.jar
 timecard.txt
 Verification.xlsx

- 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 ...



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. RCAP<mark>B5</mark>20160822065000N302N.gz



Output

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





Case

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



Observation Data

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





Data Source

• Rain-gauge





As a truth

• Rain-gauge



Verification

- Verification.xlsx
- ./Data/Verification/
 - Open Scatter.yyyyMMddHH.csv in Excel

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14	-1	0	0	0					
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A Sort Smallest to Largest

Sort by Color

- Sort Largest to Smallest
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- Uncheck -1, and 0 of rain-gauge and radar
- te data to Verification.xlsx

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1	rain-ga	*	radar	*	first es 💌	second	٠	timation	
2	5		0.47526		1.099552	3.4072	23	-	
3		6	0.792	761	1.834118	4.0127	22		
4		5	1.032	916	2.389737	4.4511	55		
5	4	1.5	1.067	186	2.469023	4.3556	81		
6	1	1.5	0.782	565	1.810761	2.5971	27	-	
7	3	3.5	1.1519	923	2.66507	4.4848	78		
8	2	2.5	0.320	323	0.74225	2.5032	71		
9	1	1.5	0.47	528	1.101913	2.1916	69		
10	3	8.5	0.4960	066	1.14769	2.601	87		
11	5	5.5	0.163	789	0.37894	2.523	01		
12	1	1.5	0.2393	368	0.553798	1.5878	03		
13	0).5	0.3394	411	0.785255	2.3759	47		
14	5	5.5	1.140	337	2.639421	6.2207	91		
15	4	1.5	0.8	528	1.99616	4.2402	83		
16		7	0.6104	437	1.412295	3.3734	42		
17	11	1.5	1.1490	001	2.658309	6.9697	74		
18		2	1.1510	086	2.663133	5.3055	03		
19		15	0.346	517	0.800893	5.2704	69		
20	2	2.5	0.2318	371	0.536452	2.2681	15		
21	13	3.5	1.8018	342	4.16871	14.7	16		
22	12	2.5	1.914	706	4.429832	12.257	48		
23		15	1.9594	166	4.533386	10.173	28		
24		6	0.64	595	1.496771	6.4834	59		
25		6	0.363	074	0.840001	6.1666	32		
26		8	0.657	528	1.521245	8.3094	34		

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



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Appendix



Visibility

Sendai

• Altitude : 2km, 3km, 4km, ...







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.



Correction amount of First Calibration Factor

Correction factor calculation

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

Calculation of Correction Factor (C2) for 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

*<u>To be determined for all rain-gauge grids</u>