SARIMA parameter selection Report - 西条

SARIMA$(p, d, q)(P, D, Q)_s$:

$$(1 - \sum_{i=1}^{p} \phi_i L^i)(1 - \sum_{I=1}^{P} \Phi_I L^{sI})(1 - L)^d (1 - L^s)^D y_t =$$

$$c + (1 + \sum_{i=1}^{q} \theta_i L^i)(1 + \sum_{I=1}^{Q} \Theta_I L^{sI})\varepsilon_t$$

$$\hat{y}_t = c + \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{I=1}^{P} \Phi_I y_{t-sI} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} + \sum_{J=1}^{Q} \Theta_J \varepsilon_{t-sJ}$$

y_t: observed value at time t

$\hat{y}_t$: predicted value at time t

ϕ_i, Φ_I: non-seasonal and seasonal AR coefficients

θ_j, Θ_J: non-seasonal and seasonal MA coefficients

d, D: differencing orders (non-seasonal and seasonal)

s: seasonal period (here 24 for hourly data)

L: lag operator ($L y_t = y_{t-1}$)

ε_t: white noise (random error term)

Objective = minimize residual variance σ_ε^2 to fit observed series.

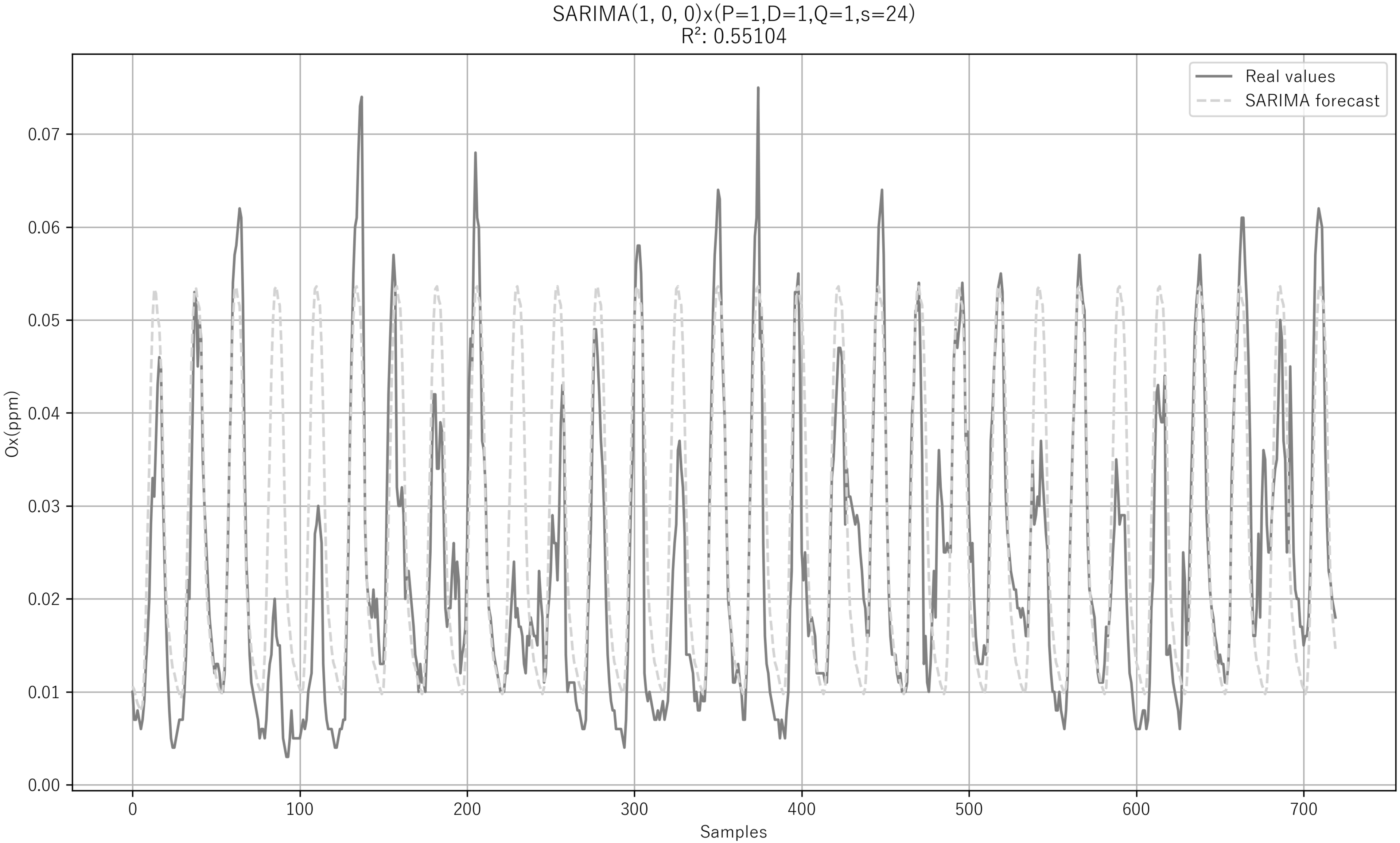
Prefecture code	38
Station code	38206050
Station name	西条
Target item	Ox(ppm)
Number of training samples	8760
Number of testing samples	720
Model	SARIMA
SARIMA order	(1, 0, 0)
Seasonal order	(P=1,D=1,Q=1,s=24)
Parameter Grid (tested) p	[0, 1, 2]
Parameter Grid (tested) d	[0]
Parameter Grid (tested) q	[0, 1, 2]
Predictions mean	0.02786350224569117
Predictions std	0.016375568473218666
Real mean	0.02472777777777778
Real std	0.016101356242239538
Ljung-Box residuals autocorrelation, Prob(Q)	1.4888833755275349e-127
Residuals skew	-0.6341733430378361
Residuals kurtosis	4.189088844263242

Features used for prediction

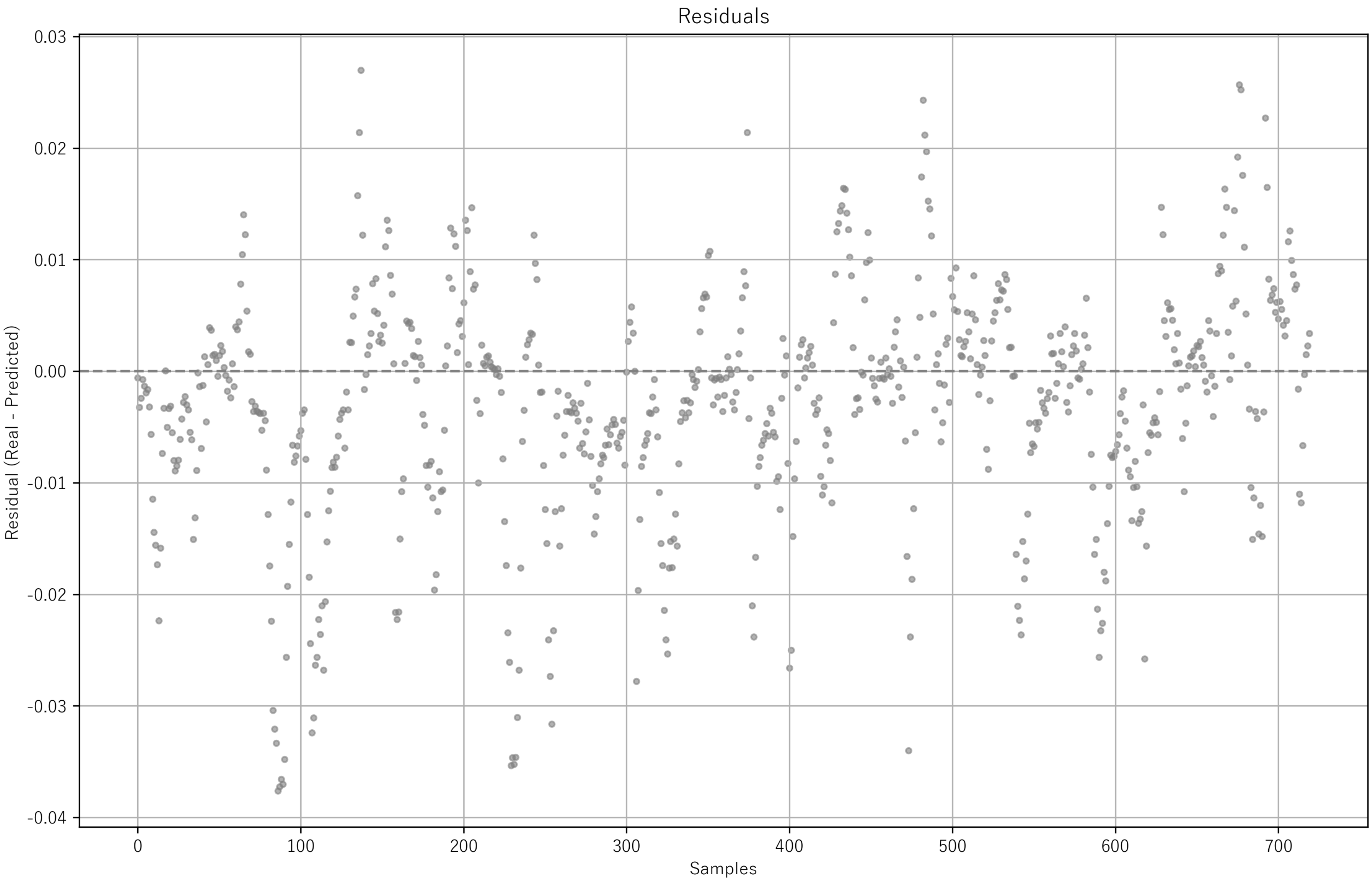
Ox(ppm)

Model accuracy

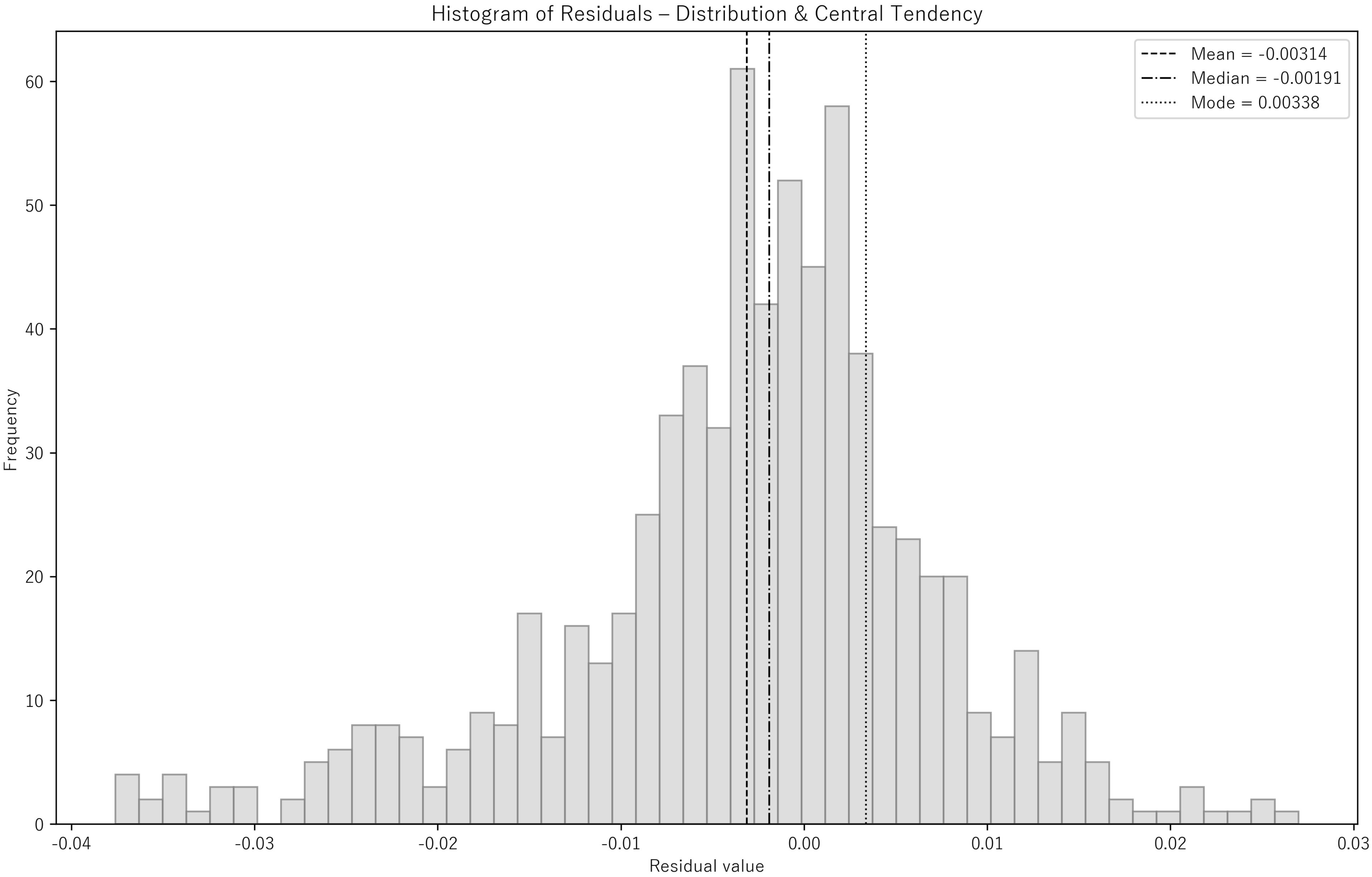
Target	R^2	MAE	RMSE
Ox(ppm)	0.5510	0.0077	0.0108



SARIMA(1, 0, 0)x(P=1,D=1,Q=1,s=24)
R²: 0.55104
Real values
SARIMA forecast
Ox(ppm)
Samples
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0
100
200
300
400
500
600
700



Residuals
Residual (Real - Predicted)
Samples
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
0
100
200
300
400
500
600
700



Histogram of Residuals – Distribution & Central Tendency
Mean = -0.00314
Median = -0.00191
Mode = 0.00338
Frequency
0
10
20
30
40
50
60
-0.04
-0.03
-0.02
-0.01
0.00
0.01
0.02
0.03
Residual value