

# Linear Regression 24-hour Forecast Report - 西条

$$\hat{y}_t = \beta_0 + \sum_{i=1}^n \beta_i x_{t,i}$$
$$\mathcal{L} = \frac{1}{N} \sum_{t=1}^N (y_t - \hat{y}_t)^2$$

$x_{t,i}$ : i-th feature value at time t

$\beta_i$ : regression coefficient learned from training data

$\beta_0$ : intercept term (bias)

$\hat{y}_t$ : predicted target value

$\mathcal{L}$ : mean squared error minimized during training

The Linear Regression model establishes a direct linear relationship between the input features and the target variable(s).

Each forecasted value is computed as a weighted sum of the input features plus a bias term. The model coefficients (weights) are estimated by minimizing the Mean Squared Error between predicted and actual values.

This method is fast, interpretable, and effective when the relationship between predictors and target is approximately linear.

Prefecture code	38
Station code	38206050
Station name	西条
Target item	Ox(ppm)
Number of data points in the train set	15747
Number of data points in the test set	6749
Forecast horizon (hours)	24
Model	Linear Regression
Elapsed time	0 min 3 sec
Number of features used	25
Residuals mean	0.002013
Residuals median	0.00059
Residuals mode	-0.001307

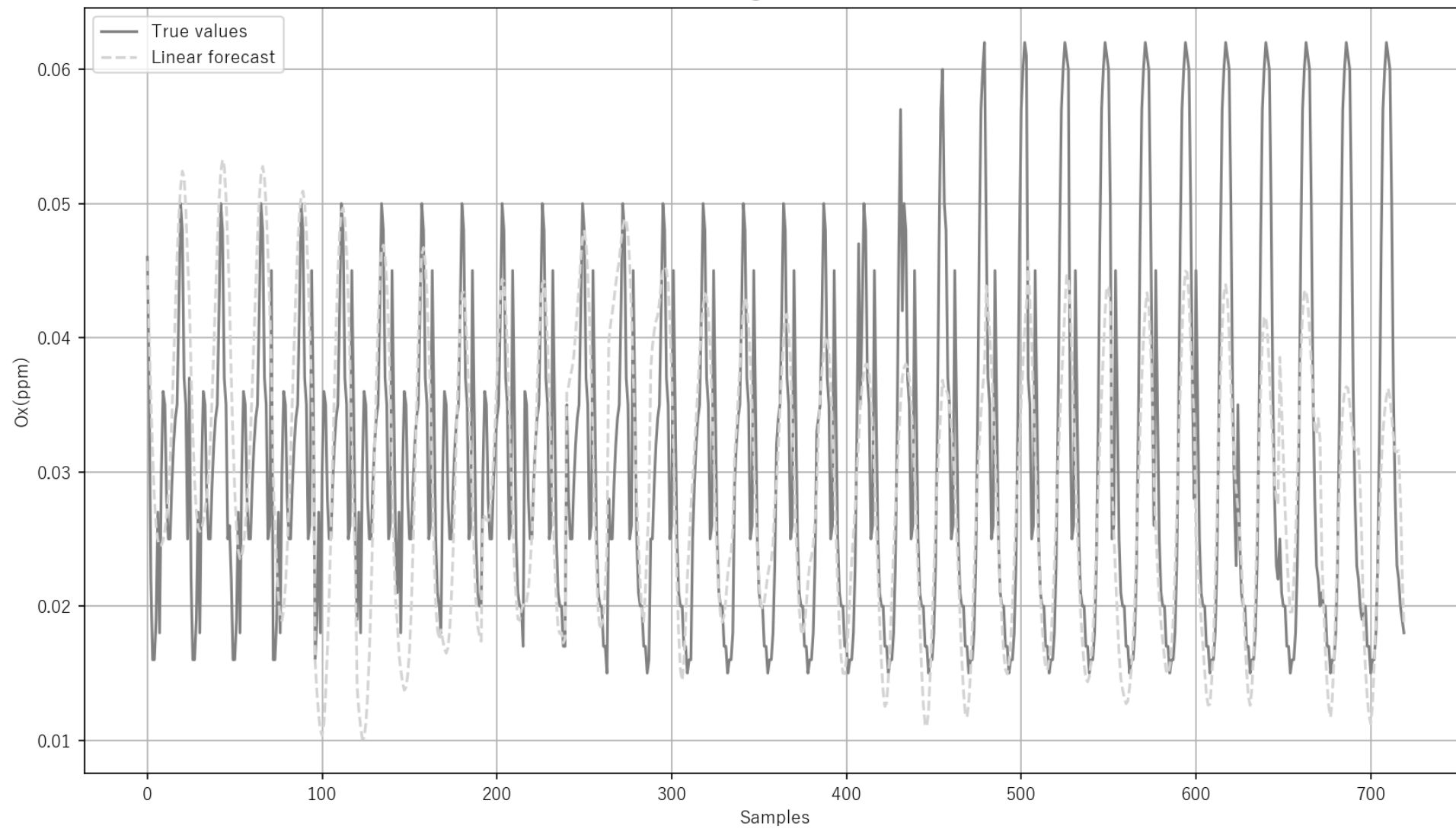
## Features used for prediction

NO(ppm)	NO2(ppm)	U	V	Ox(ppm)_roll_mean_3
Ox(ppm)_roll_std_6	NO(ppm)_roll_mean_3	NO(ppm)_roll_std_6	NO2(ppm)_roll_mean_3	NO2(ppm)_roll_std_6
U_roll_mean_3	U_roll_std_6	V_roll_mean_3	V_roll_std_6	Ox(ppm)_diff_1
Ox(ppm)_diff_2	Ox(ppm)_diff_3	NO(ppm)_diff_3	NO2(ppm)_diff_3	U_diff_3
V_diff_3	hour_sin	hour_cos	dayofweek	is_weekend

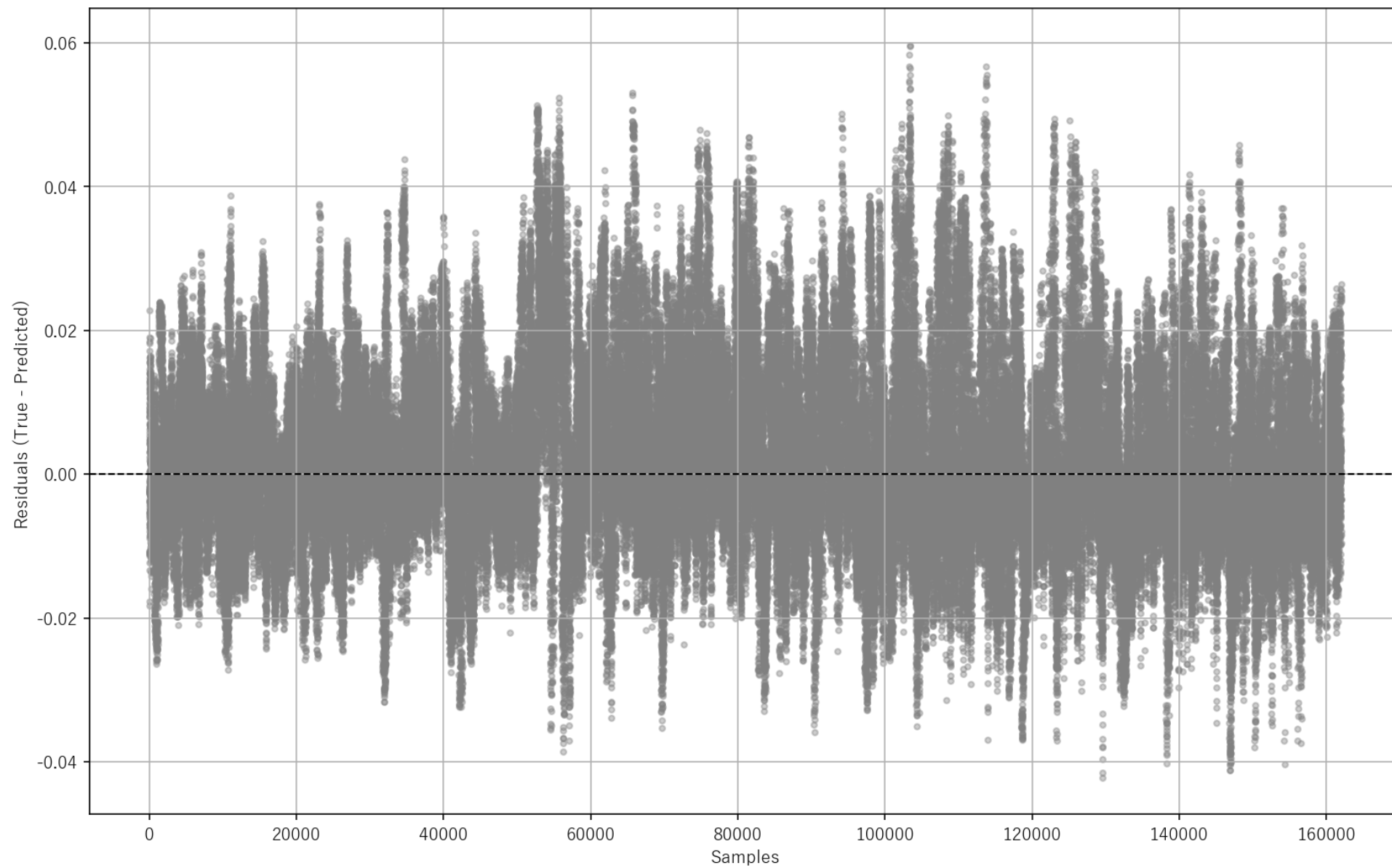
## Model accuracy

Target	R <sup>2</sup>	MAE	RMSE
Ox(ppm)_t+01	0.8568	0.0051	0.0069
Ox(ppm)_t+02	0.7705	0.0066	0.0087
Ox(ppm)_t+03	0.6924	0.0077	0.0101
Ox(ppm)_t+04	0.6264	0.0086	0.0111
Ox(ppm)_t+05	0.5764	0.0092	0.0119
Ox(ppm)_t+06	0.5383	0.0096	0.0124
Ox(ppm)_t+07	0.5107	0.0099	0.0128
Ox(ppm)_t+08	0.4893	0.0101	0.0130
Ox(ppm)_t+09	0.4711	0.0103	0.0133
Ox(ppm)_t+10	0.4542	0.0105	0.0135
Ox(ppm)_t+11	0.4429	0.0106	0.0136
Ox(ppm)_t+12	0.4410	0.0106	0.0136
Ox(ppm)_t+13	0.4476	0.0105	0.0136
Ox(ppm)_t+14	0.4608	0.0103	0.0134
Ox(ppm)_t+15	0.4772	0.0102	0.0132
Ox(ppm)_t+16	0.4937	0.0100	0.0130
Ox(ppm)_t+17	0.5093	0.0098	0.0128
Ox(ppm)_t+18	0.5231	0.0096	0.0126
Ox(ppm)_t+19	0.5322	0.0094	0.0125
Ox(ppm)_t+20	0.5347	0.0094	0.0125
Ox(ppm)_t+21	0.5322	0.0094	0.0125
Ox(ppm)_t+22	0.5269	0.0095	0.0126
Ox(ppm)_t+23	0.5180	0.0096	0.0127
Ox(ppm)_t+24	0.5018	0.0098	0.0129

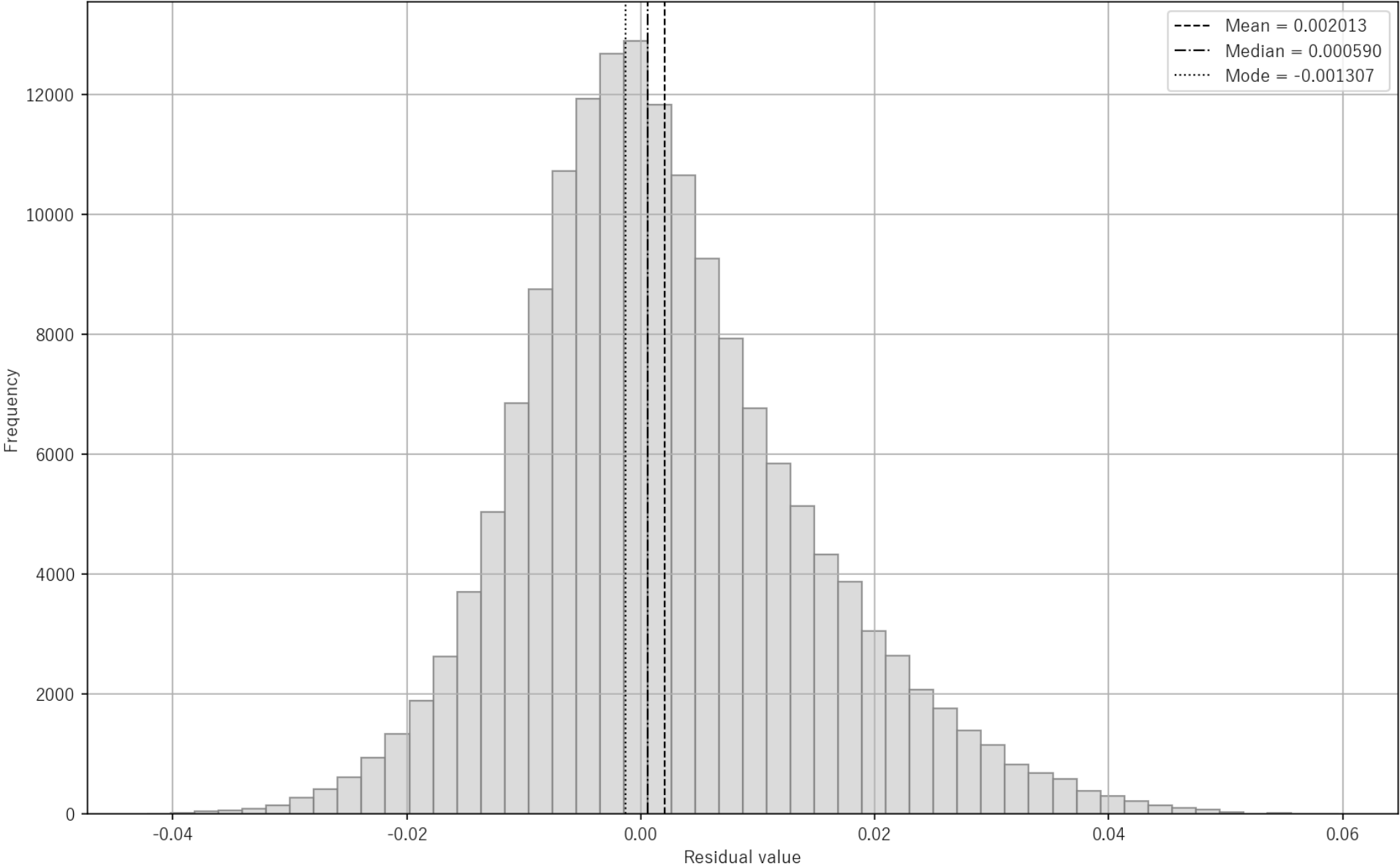
Linear Regression Multi-step Forecast (24h)  
 $R^2$  (avg): 0.53865



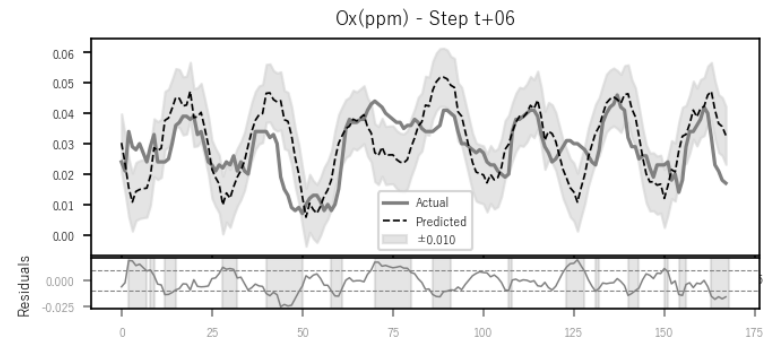
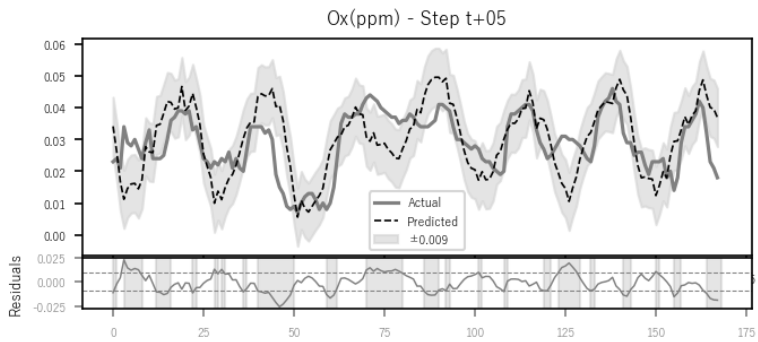
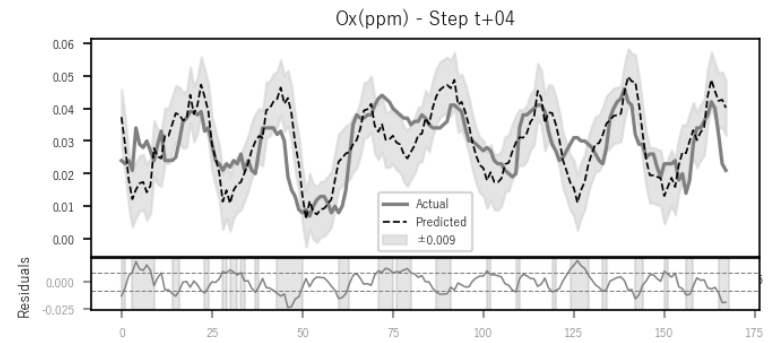
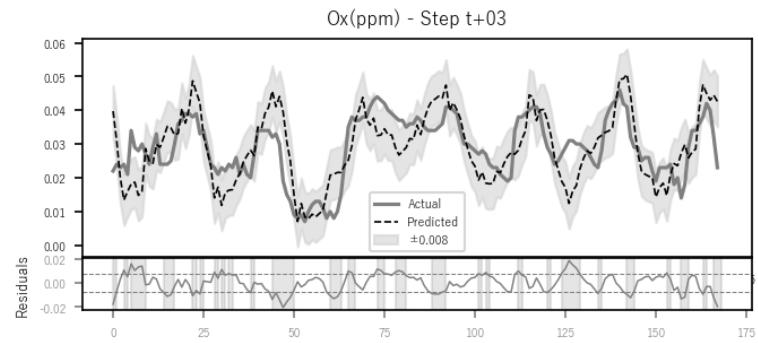
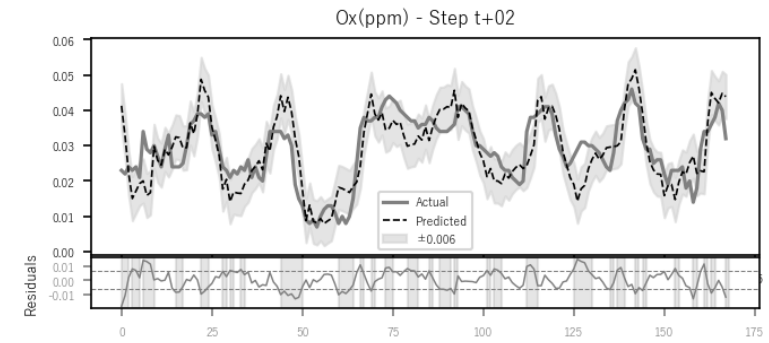
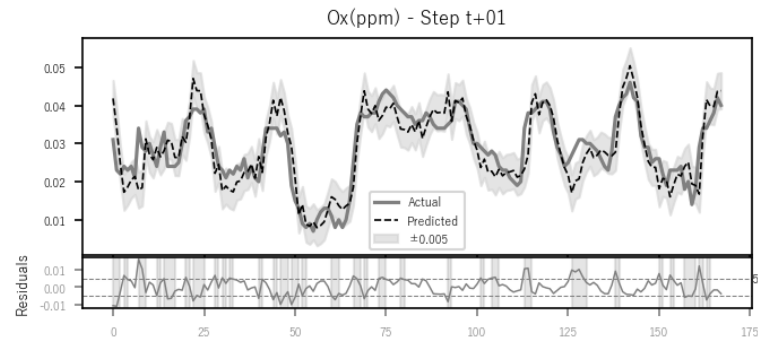
Distribution of Residual Errors



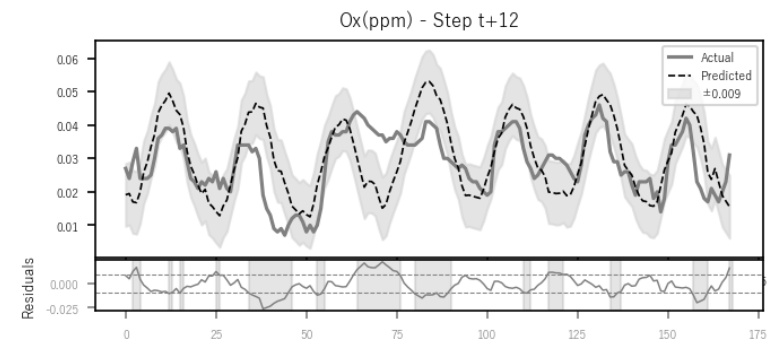
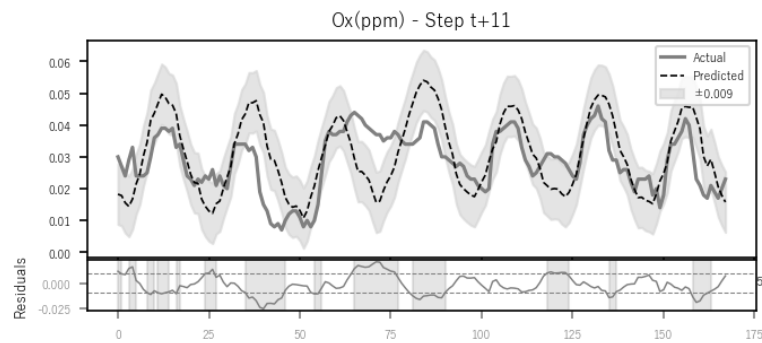
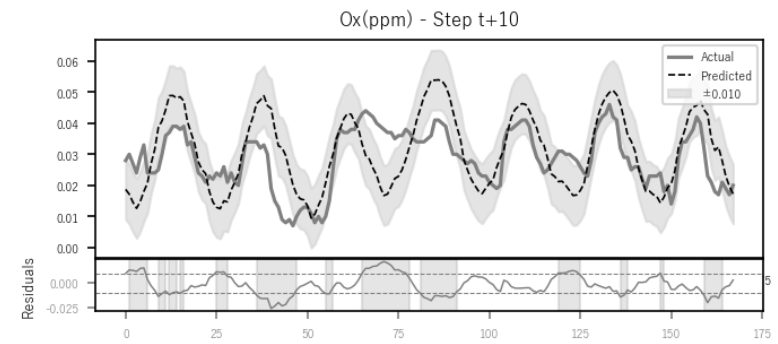
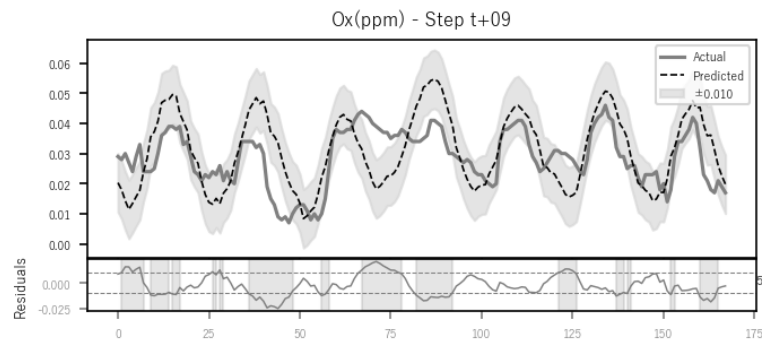
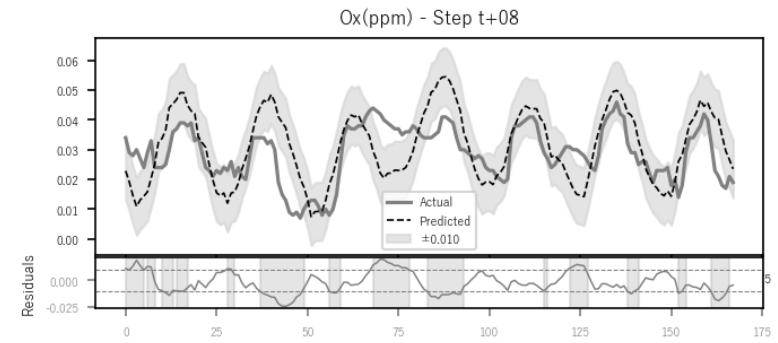
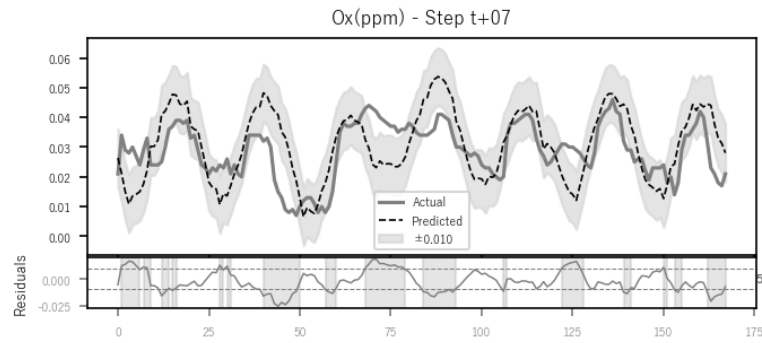
Histogram of Residuals – Distribution & Central Tendency



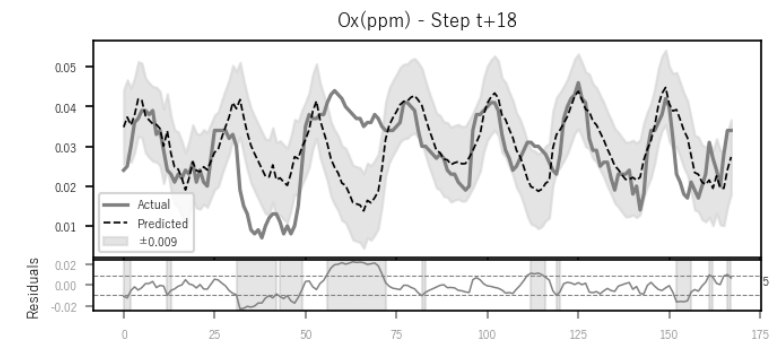
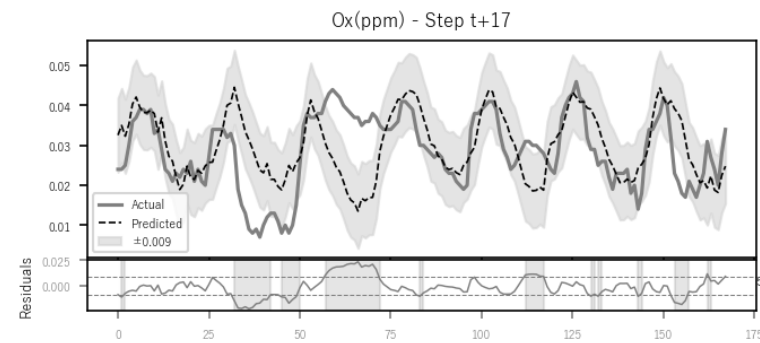
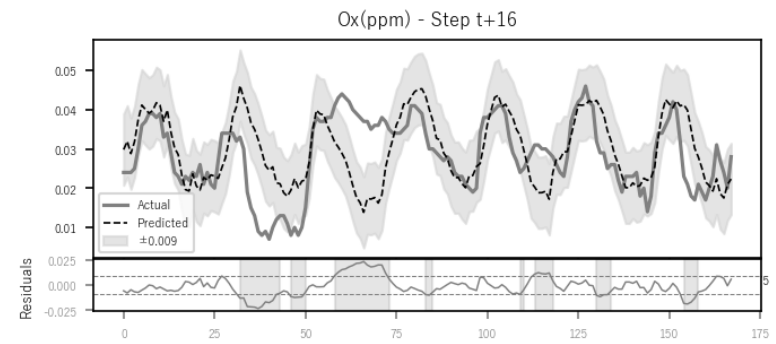
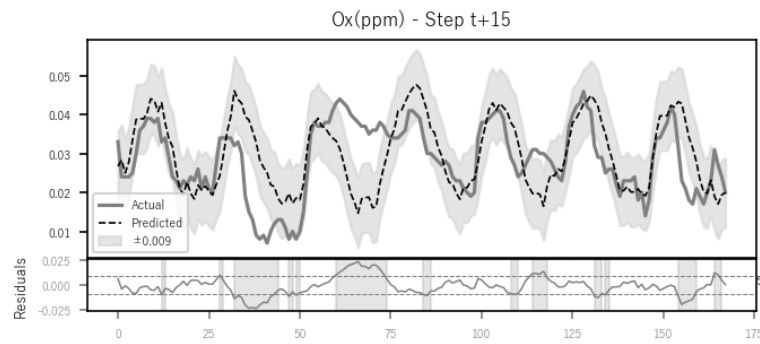
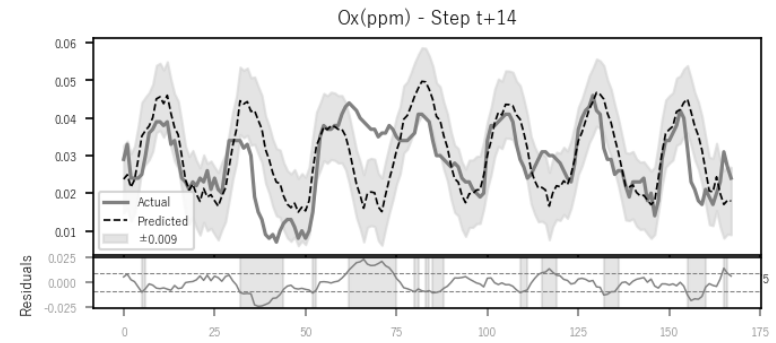
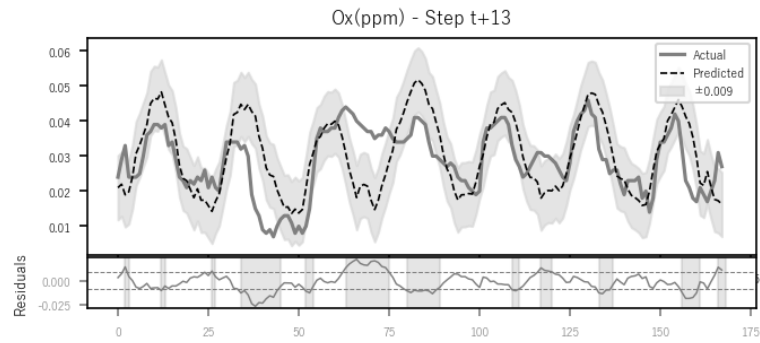
Comparison between actual and predicted values  
with  $\pm$  Standard Deviation Bands



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with  $\pm$  Standard Deviation Bands



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with  $\pm$  Standard Deviation Bands

