

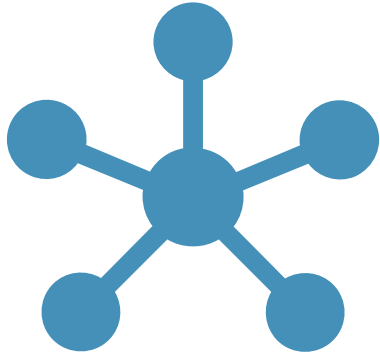


NO2 PREDICTION BY USING MACHINE LEARNING REGRESSION ANALYSES IN GOOGLE EE

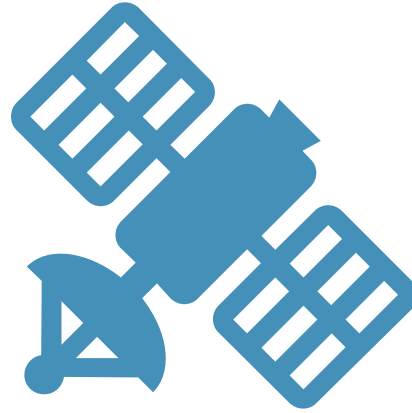
ANNA PAVLENKO

JULY 1, 2020

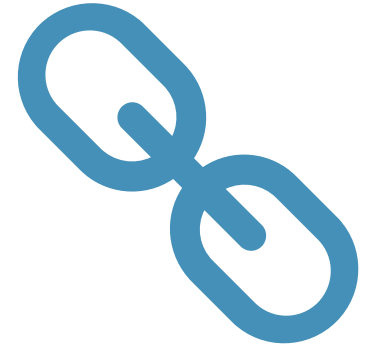
GOOGLE EARTH ENGINE:



Network



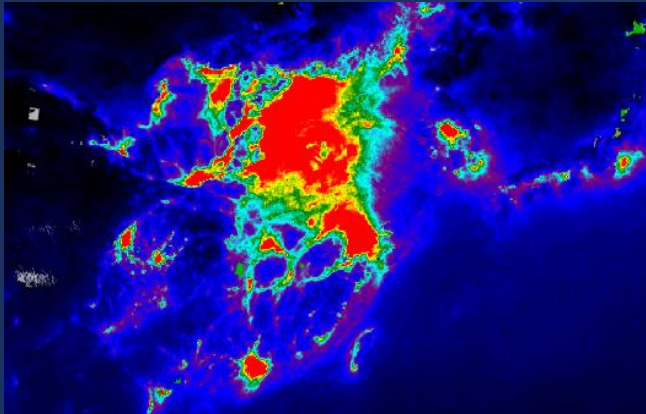
Satellite



Link

TECH REQUIREMENTS: CONNECTION TO INTERNET

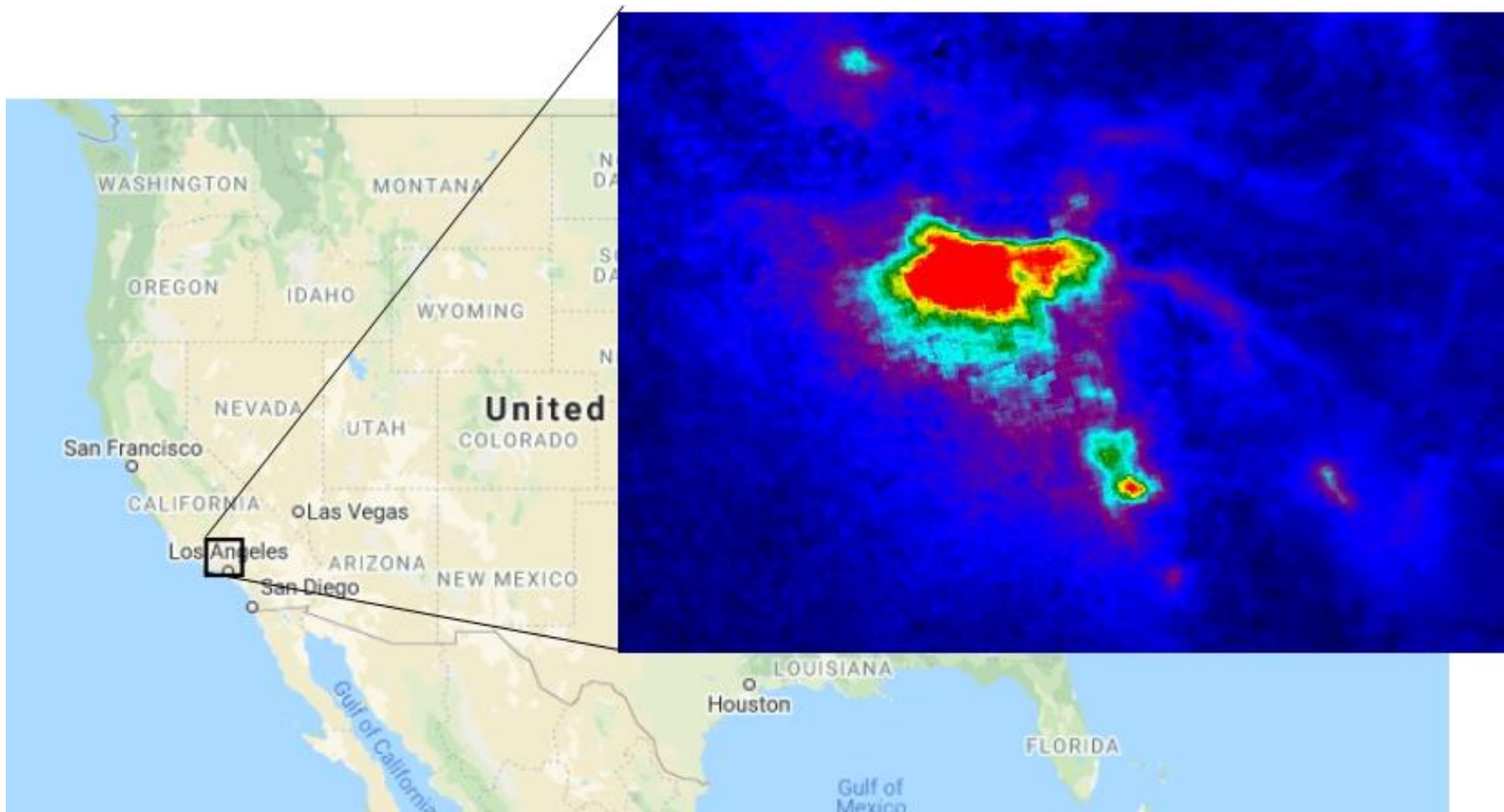
NITROGEN DIOXIDE (NO₂) AIR POLLUTION



- TROPOMI instrument:
- October 13, 2017
- High spectral resolution: (7x3.5 km²)



STUDY AREA: LOS ANGELES, US

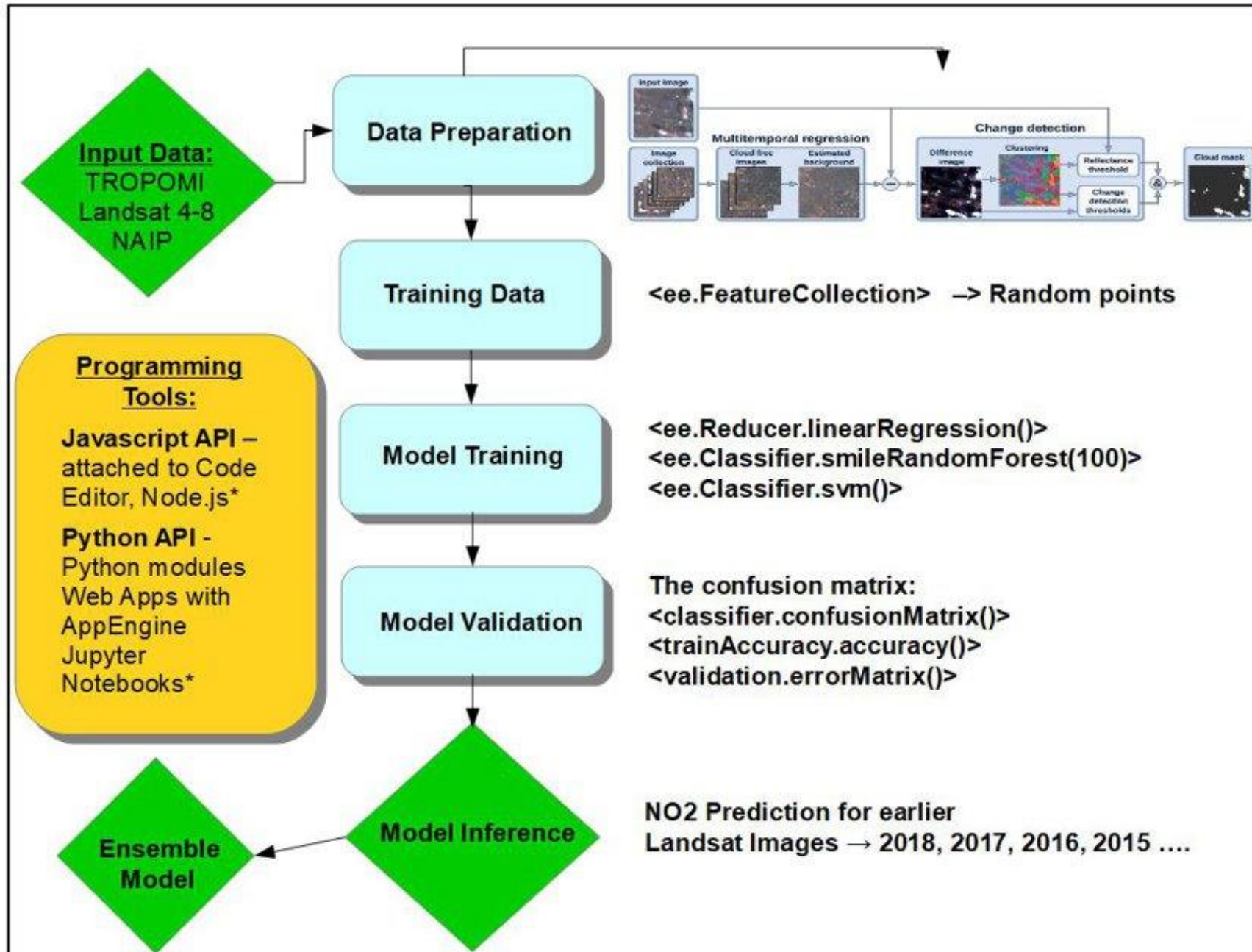


Data:

Sentinel-5P
TROPOMI
2018 – now

Landsat 4-8
1978 - now

WORKFLOW



REGRESSION WORKFLOW:

- `var training = image.sample(region, scale)`
- `var classifier = ee.Classifier.randomForest().train(training)`
- `var result = image.classify(classifier)`
- `var predictor = classifier.setOutputMode(Regression)`
- `var confusionMatrix = classifier.confusionMatrix()`
- `var accuracy = confusionMatrix.accuracy()`

RANDOM FOREST REGRESSION:

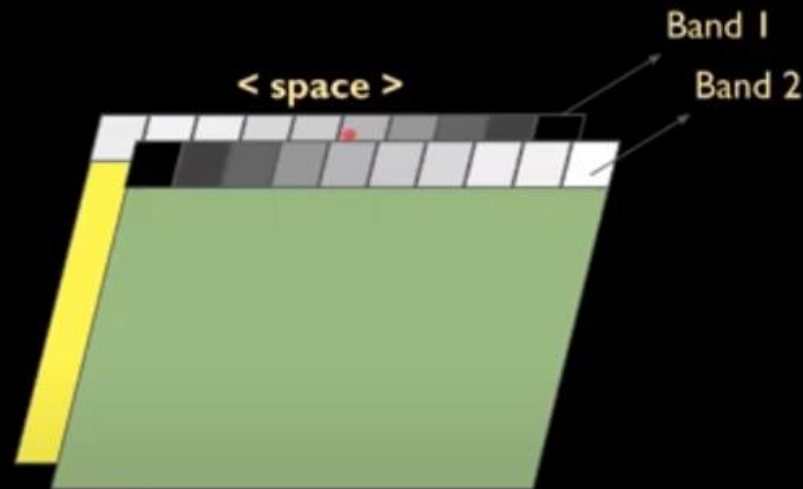
I. ACROSS SPACE

Contexts of linear regression in GEE

Linear Regression
across Space

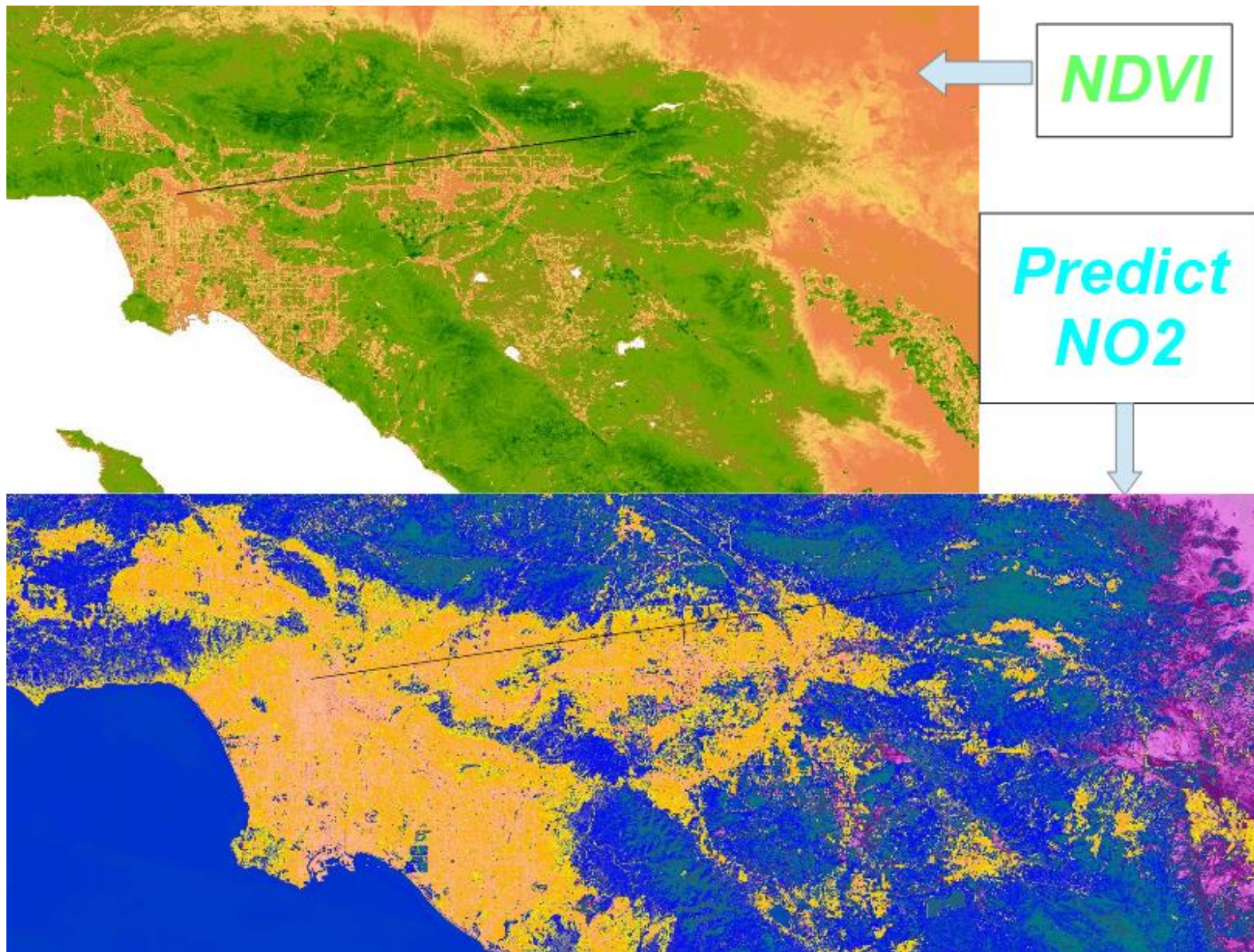
Input: `ee.Image()`

Output: A single dictionary of
regression outputs (i.e., intercept, slope,
residual)



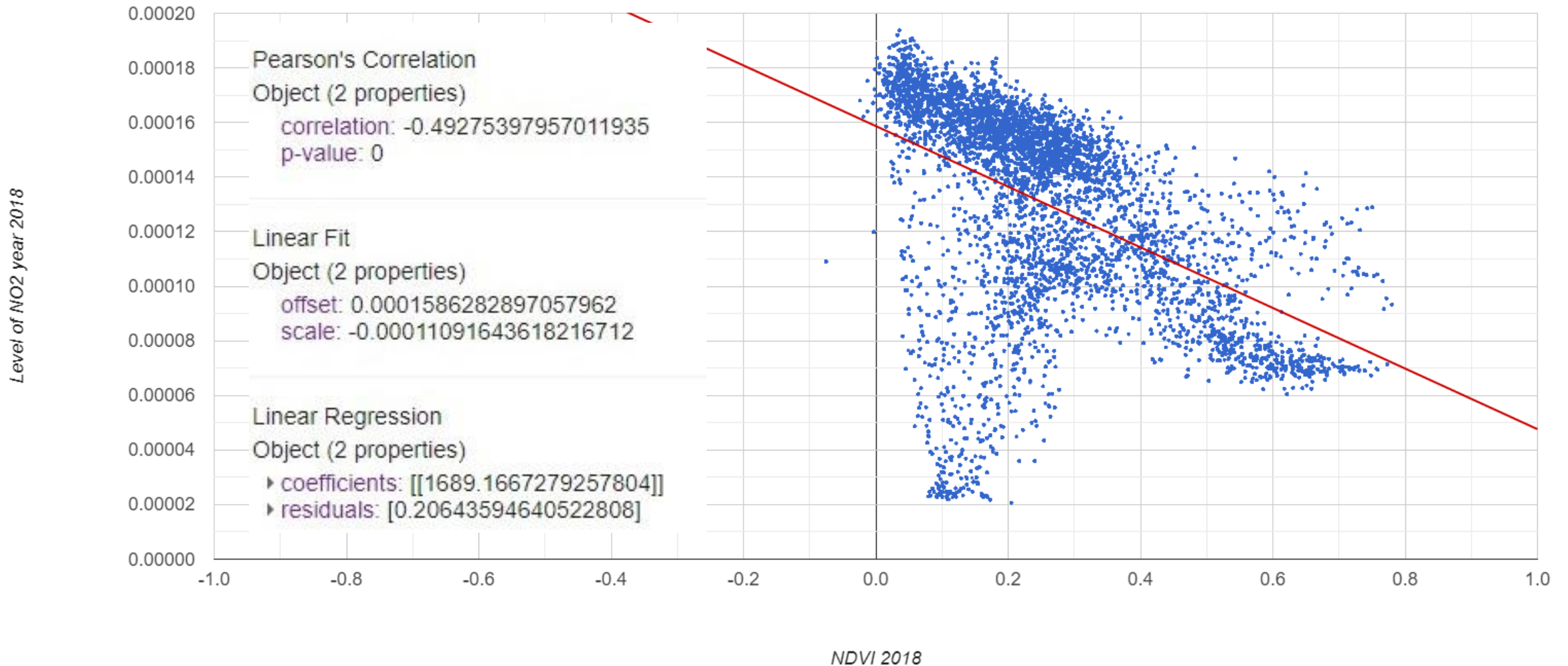
```
// PREDICTION FOR 2018 YEAR:  
var predict_2018 =  
landsat8_2018.select(bands).classify(pr  
edictor_all_data);
```

```
// NDVI_2018  
var ndvi_2018 =  
landsat8_2018.normalizedDifference(['  
B5', 'B4']);
```

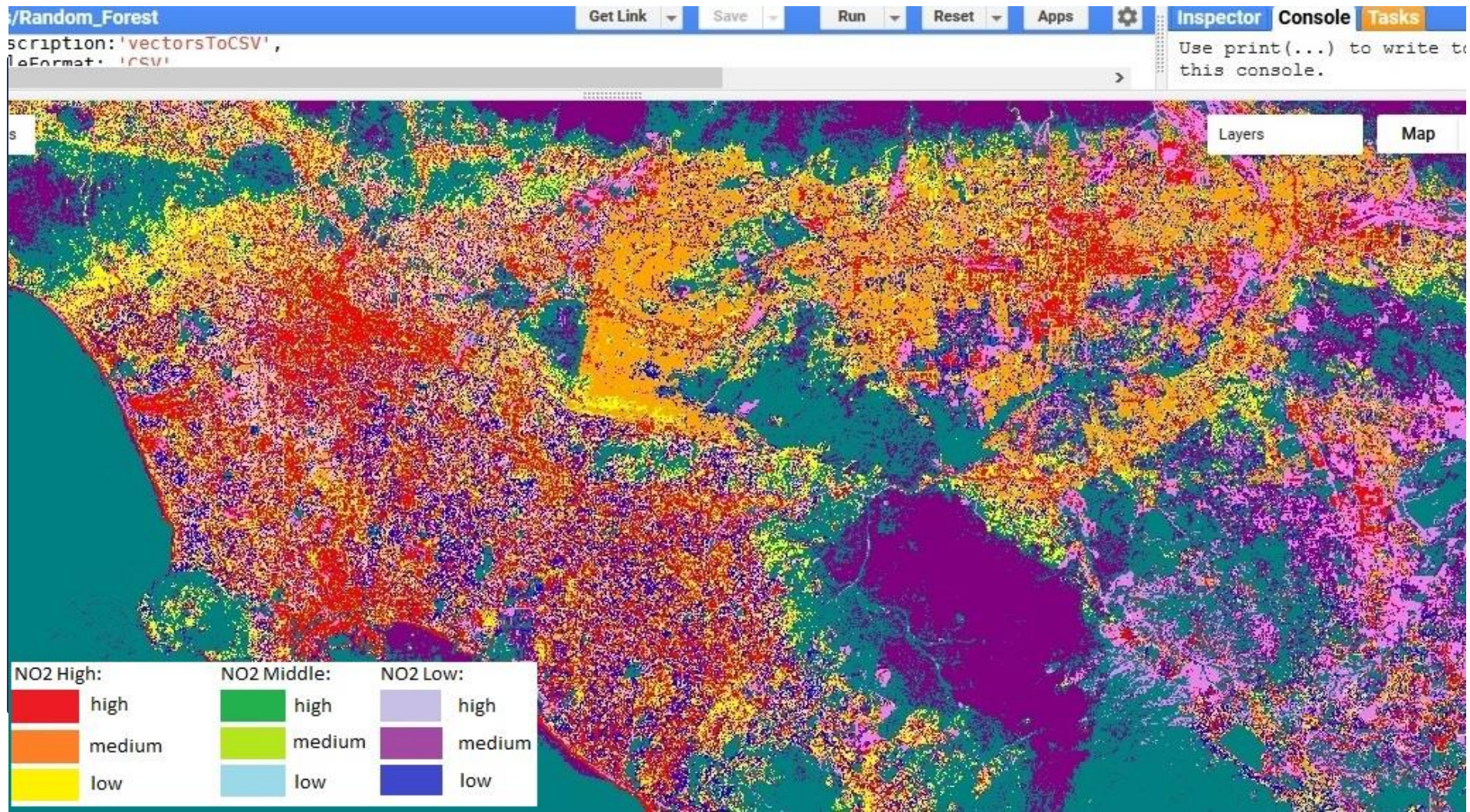



**PREDICTED NO2
2018
& NDVI 2018**

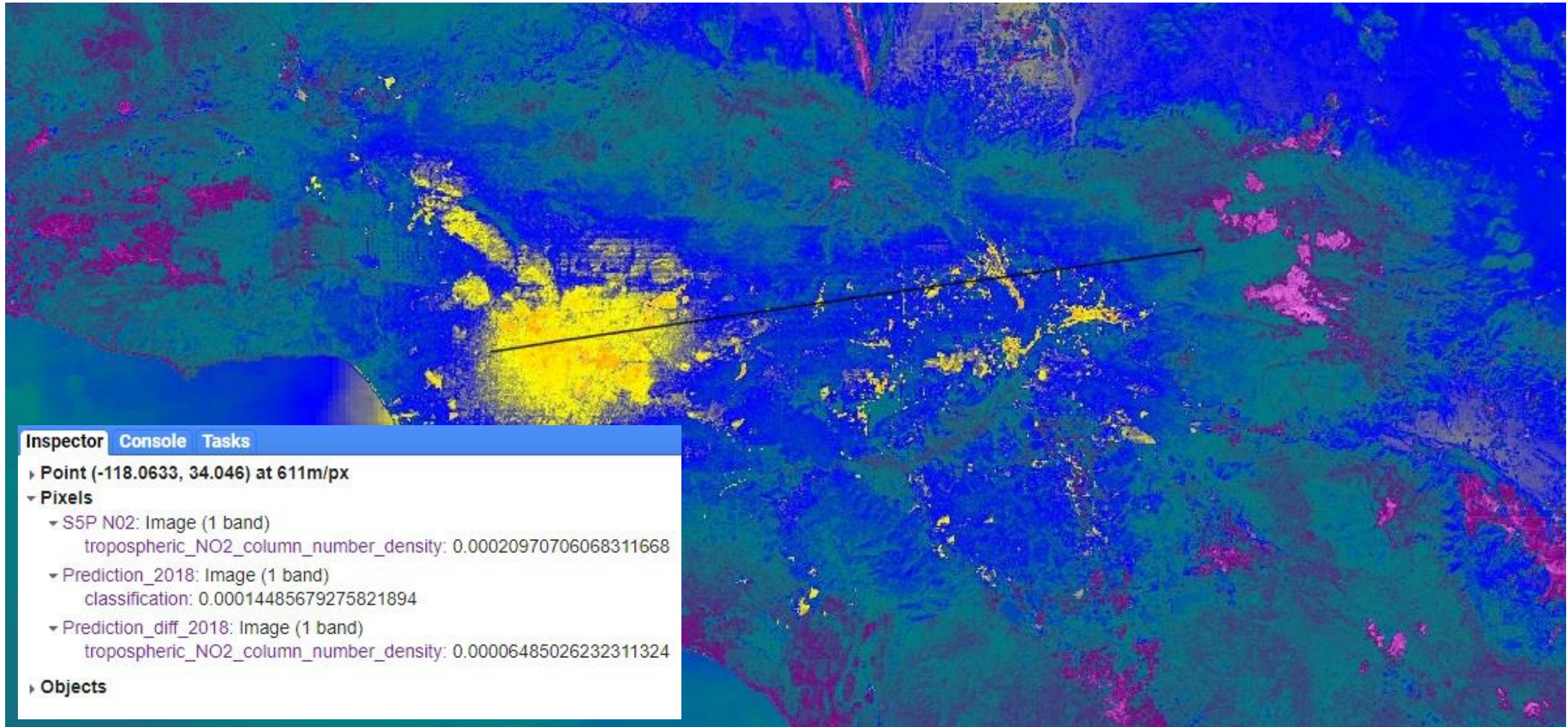
PREDICTION 2018



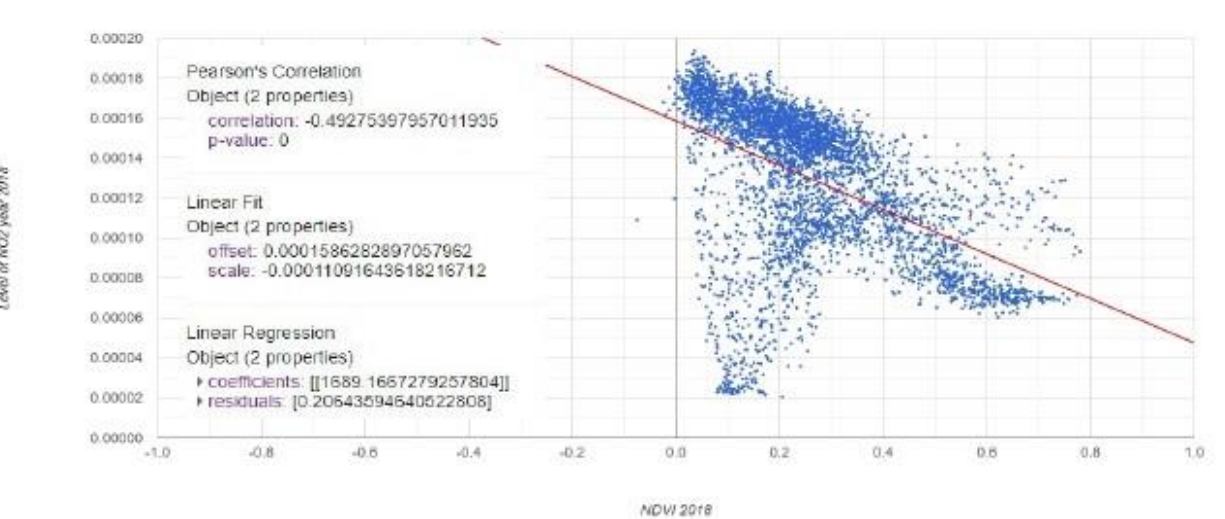
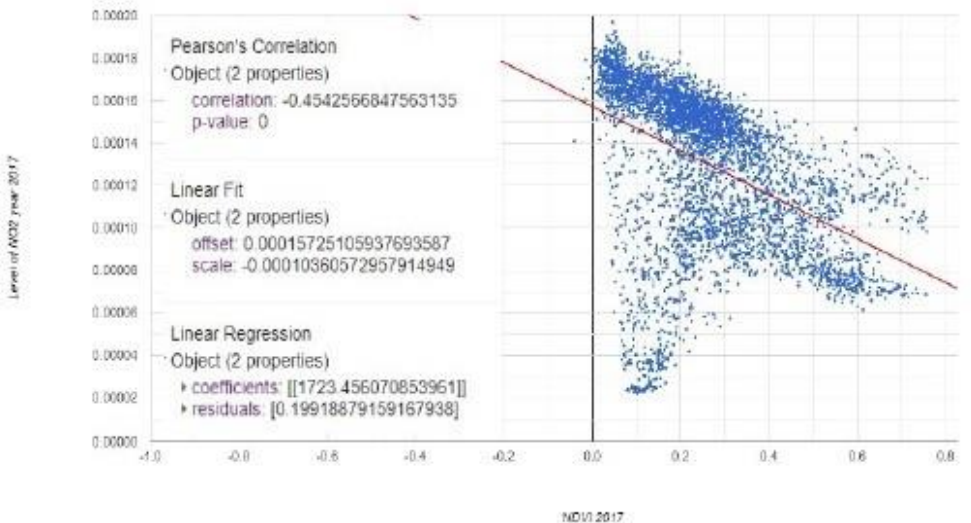
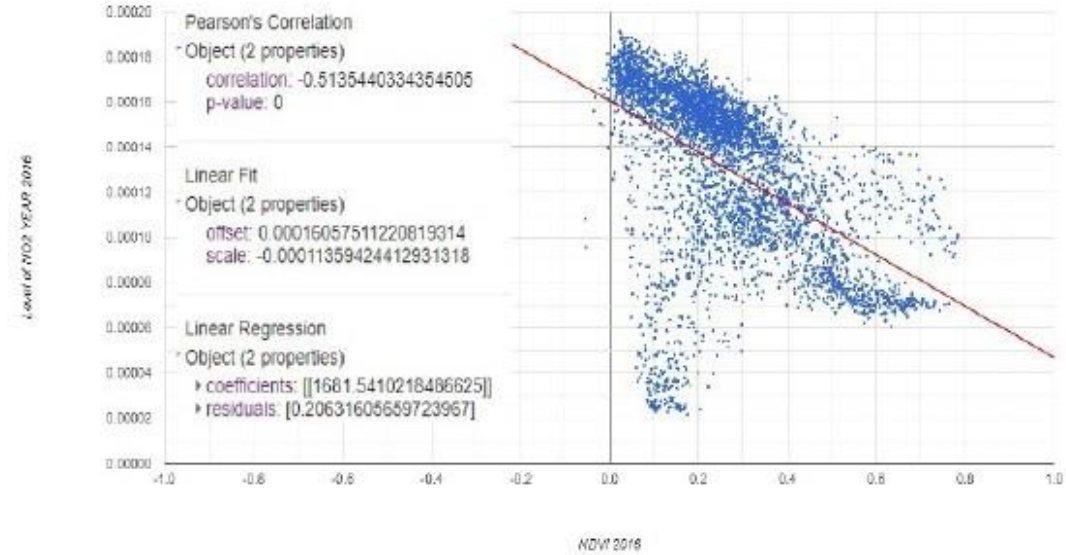
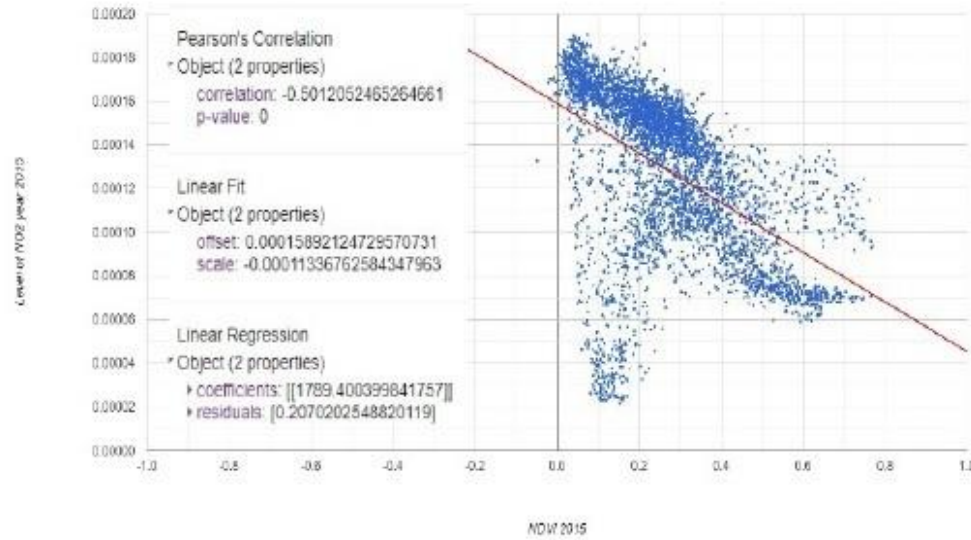
NO2 PREDICTION 2018



MODEL ACCURACY:

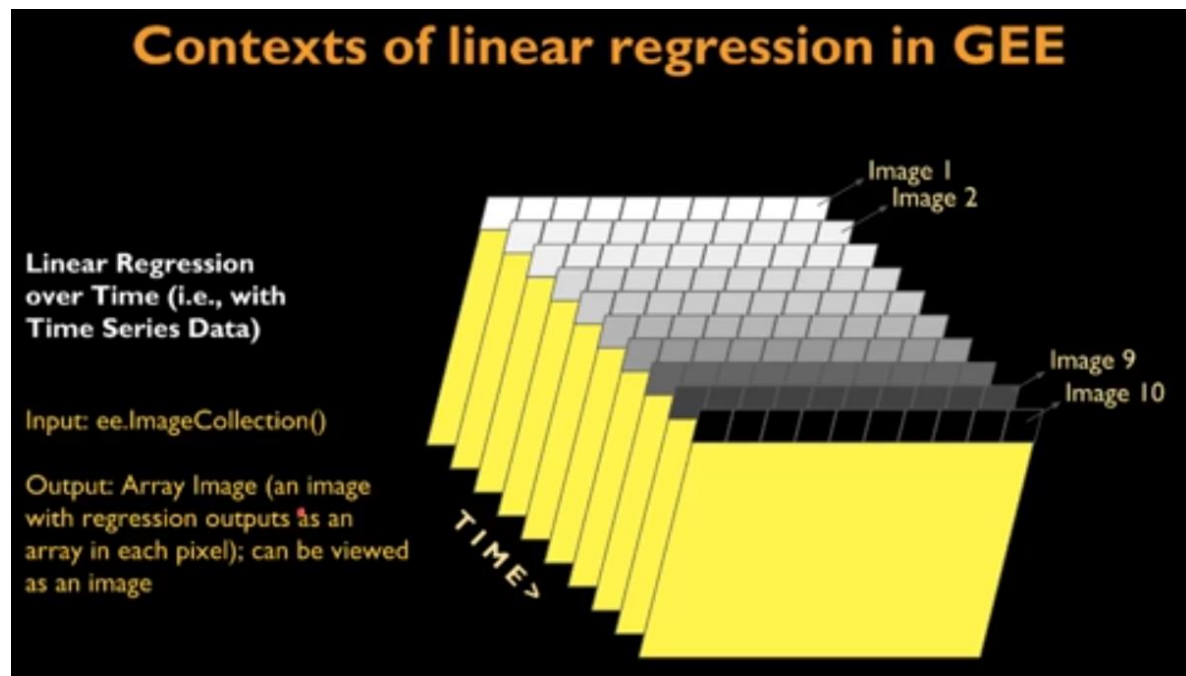


PREDICTION 2018 - 2015



RANDOM FOREST REGRESSION:

II. ACROSS TIME

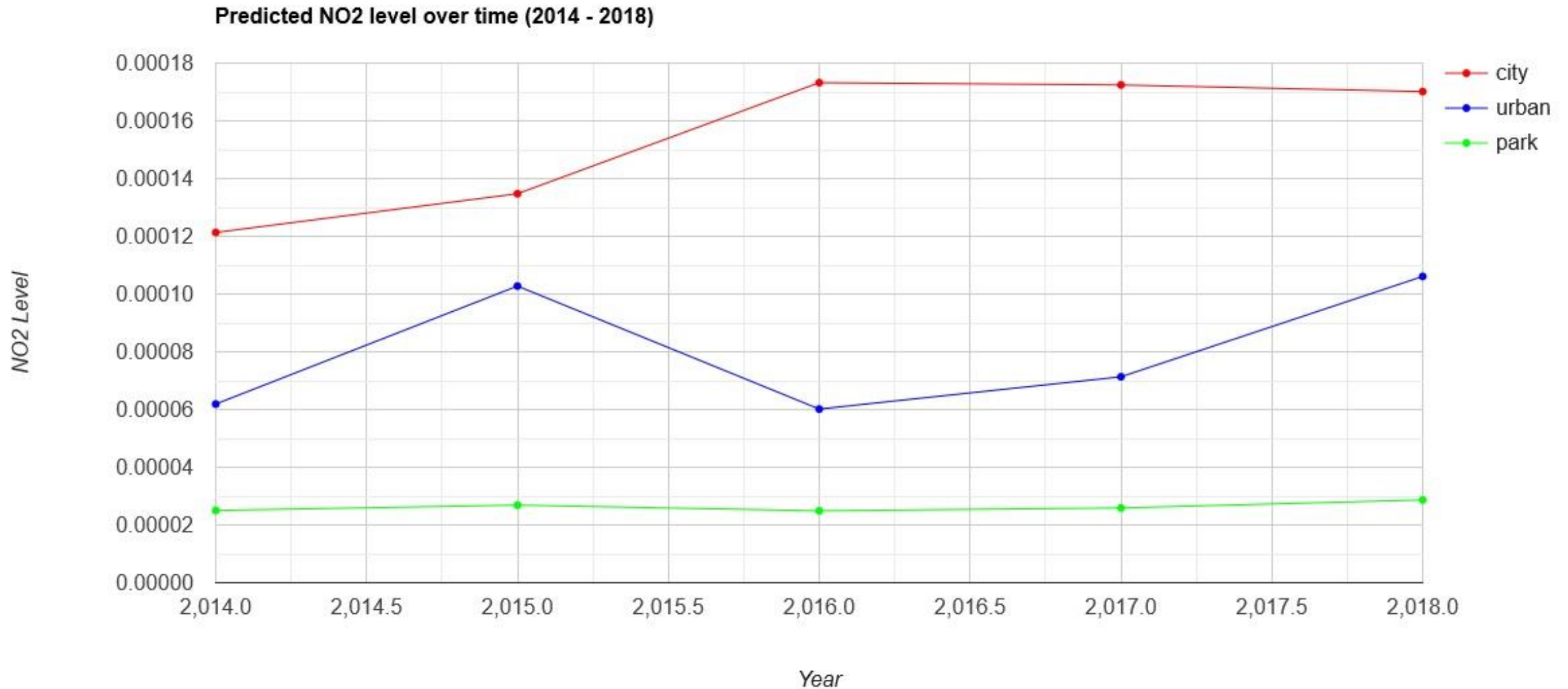


NO2 PREDICTIONS for 2014 - 2018 years:

// Landsat 2018:

```
var predict_2018 =  
landsat8_2018.select(bands).classify(predictor_all_data);  
var predict_2017 =  
landsat8_2017.select(bands).classify(predictor_all_data);  
var predict_2016 =  
landsat8_2016.select(bands).classify(predictor_all_data);  
var predict_2015 =  
landsat8_2015.select(bands).classify(predictor_all_data);  
var predict_2014 =  
landsat8_2014.select(bands).classify(predictor_all_data);
```

PREDICTION OVER TIME

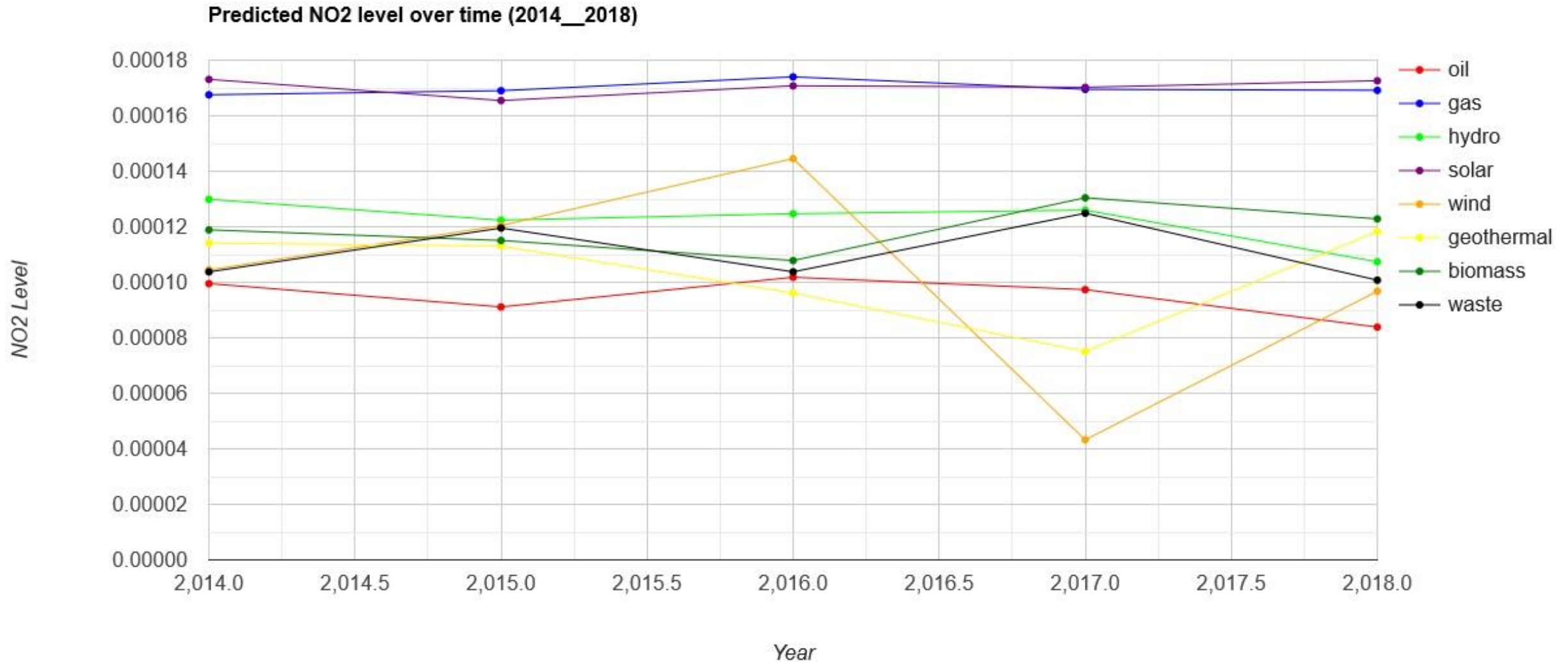




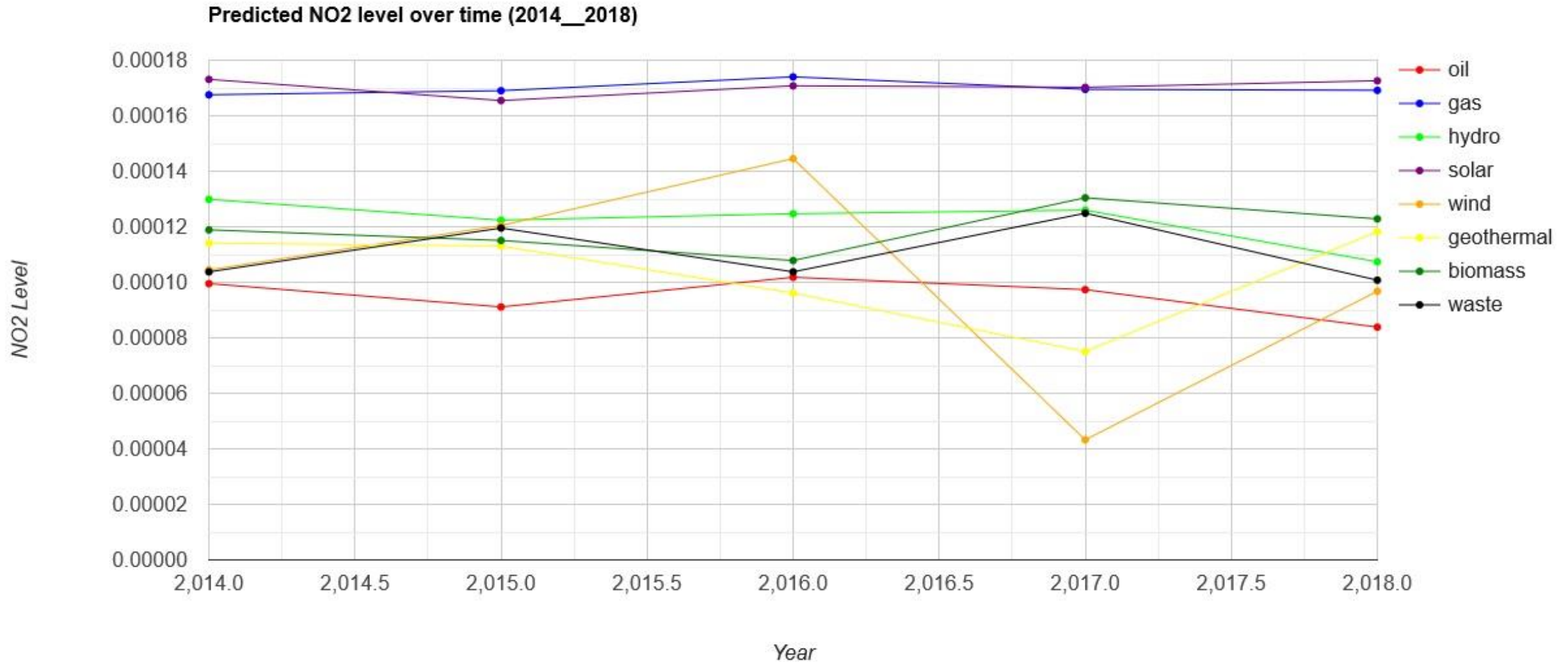
TIME SERIES 2018 – 2014

SPECIFIC POWER PLANTS
LOCATIONS

PREDICTION - POWER PLANTS



PREDICTION - POWER PLANTS



DEVELOPMENT:



Multiple Predictions several times / the same Algorithm

Multiple Machine Learning Algorithm (SVM, Decision Tree, Random Forest)

Ensemble Model



THANK YOU

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