A43R-3008: A Remote Sensing-Based Method for Generating a Global Continuous Carbon Dioxide Concentration Dataset
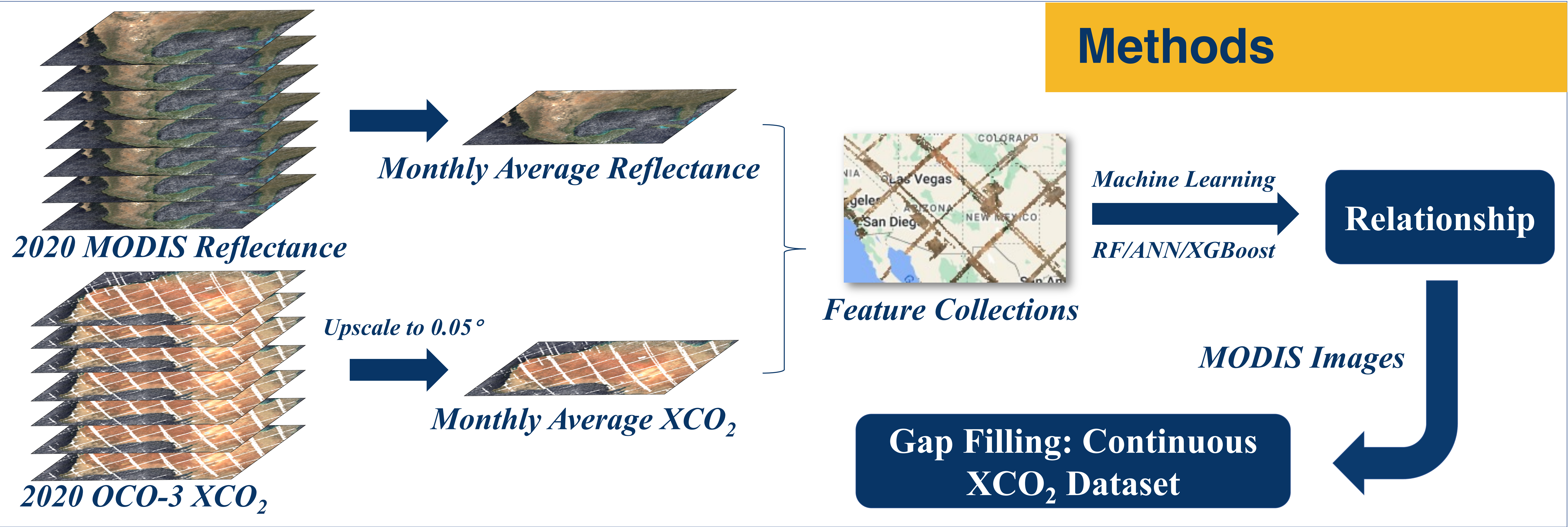
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Introduction

➤ CO_2 concentration has consistently increased over the years, creating an urgent need for accurately quantifying CO_2 to assist policymakers in making decisions.

➤ MODIS provides high-precision surface reflectance data over a wide spatial and temporal range. And OCO-3 is an emerging high-precision carbon satellite capable of providing XCO_2 data.

➤ A novel method is presented by utilizing machine learning to explore the correlation between MODIS surface reflectance and XCO_2.

➤ TCCON is used to verify the effectiveness of the proposed method.

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Methods

2020 MODIS Reflectance → *Monthly Average Reflectance*

2020 OCO-3 XCO_2 → *Upscale to 0.05°* → *Monthly Average XCO_2*

Feature Collections → *Machine Learning RF/ANN/XGBoost* → **Relationship**

MODIS Images → **Gap Filling: Continuous XCO_2 Dataset**

Results and Conclusions

Validation Results

	Jan	Feb	March	April	May	June	July	Aug	Sep	Nov	Dec
R^2	0.48	0.49	0.58	0.54	0.61	0.42	0.32	0.34	0.45	0.22	0.36
RMSE	1.37	1.50	1.72	1.76	1.62	1.51	1.41	1.37	1.12	1.19	1.32

There is a computing error in the models for October, this error will be addressed in subsequent work.

Monthly Relative Error per TCCON Site