



INTERNATIONAL ROAD DYNAMICS INC.



USING CONTINUOUS CALIBRATION TO IMPROVE WIM ACCURACY IN COMMERCIAL VEHICLE OPERATIONS

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Improving WIM Accuracy with Continuous Calibration

Overview:

- Introduction
- Benefits to Commercial Vehicle Operations
- CCWIM Study
 - Site Requirements/Considerations
 - Graphs
 - Comparison Table
 - Conclusions
- Applications
- Q&A



Introduction

- CCWIM is a highly advanced automatic calibration algorithm that **optimizes WIM systems**
- Calibrates the WIM to **minimize the GVW error** by considering multiple factors
- Maintains **WIM accuracy** without any manual calibration over a long period of time (several years)



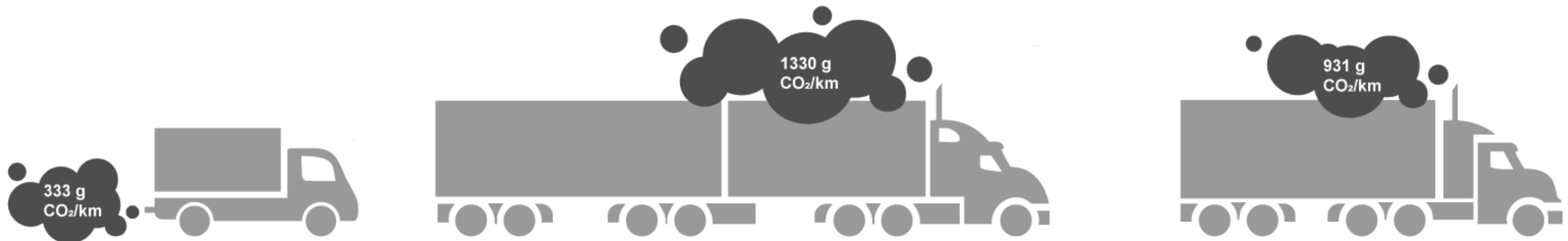
Benefits to Commercial Vehicle Operations

- CCWIM benefits commercial vehicle operations by improving **WIM accuracy and automating calibration**
 - **Eliminates drift** over time. Tighter tolerances reduce time and costs associated with inspecting compliant vehicles (**higher accuracy = higher confidence**).
 - Characteristics of the **traffic stream** at a particular location are better reflected in calibrating the WIM system
 - **Operates continuously**, resulting in WIM data of consistently high quality that opens the field to potential applications of WIM for **direct weight enforcement**
 - Supports **24/7 enforcement operations** which wasn't possible with traditional weigh stations enforcement in all situations (when closed)

Environmental Benefits

Reduces unnecessary inspections at weigh stations resulting in lower GHG emissions from trucking

- Each litre of diesel fuel produces **2.66 kg of CO₂e** (carbon dioxide equivalent).
- Vehicles produce other emissions, such as volatile organic compounds (VOCs), carbon monoxide (CO) and oxides of nitrogen (NOX), known to **contribute towards air pollution and smog.**
- **Highly accurate pre-selection** reduces the number of trucks unnecessarily kept idling, braking and accelerating at inspection stations.



Cost Benefits to Commercial Vehicle Operations

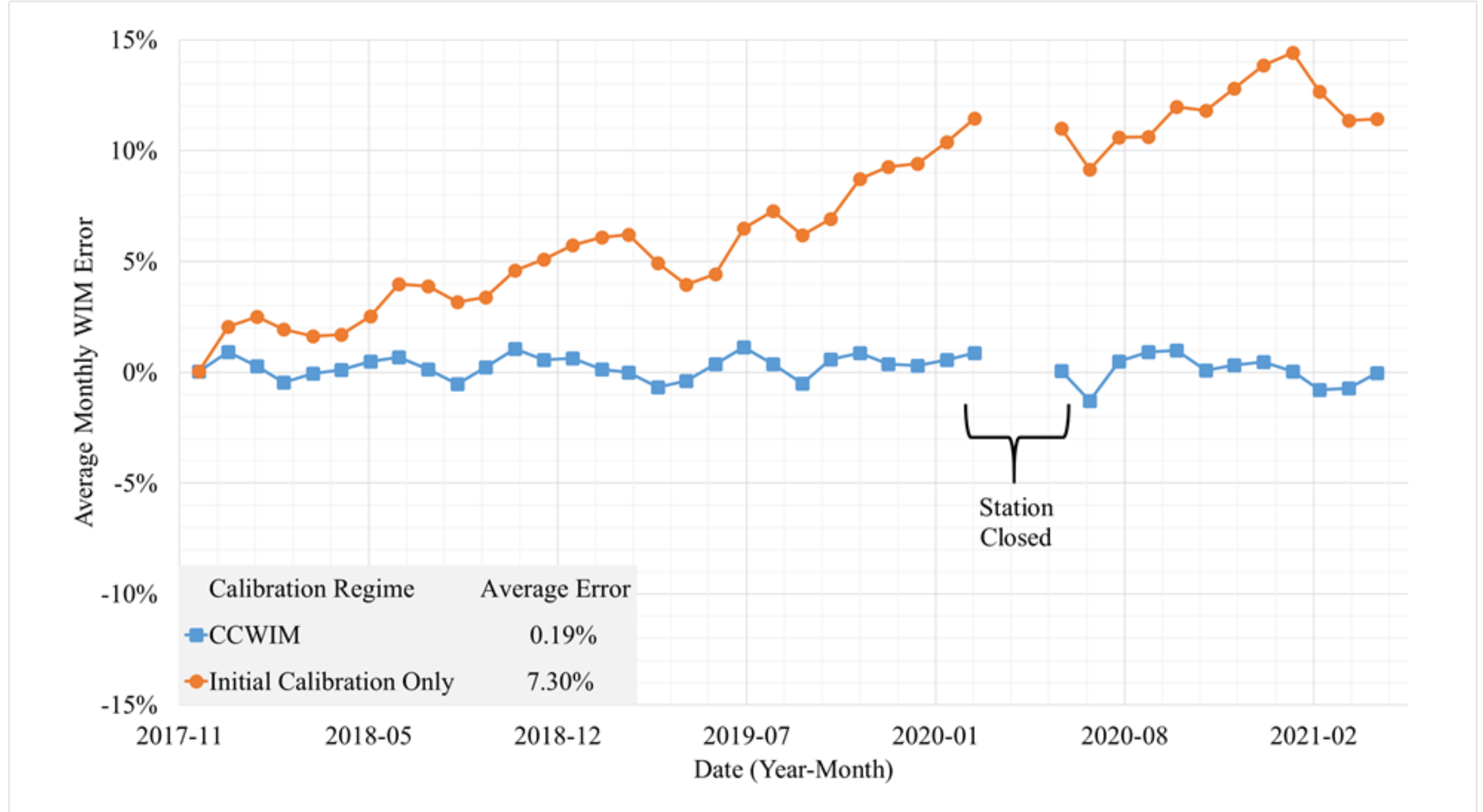
- Cost Benefits
 - **Reduced costs** relative to conventional calibration test trucks (between \$5,000 and \$20,000 depending on the location of the WIM site)
 - Not having to perform this type of calibration at regular intervals represents **recurring savings** to Ministries of Transportation.
 - Strongly supports **implementation of direct enforcement**, resulting in cost advantages versus traditional enforcement operations

CCWIM Study

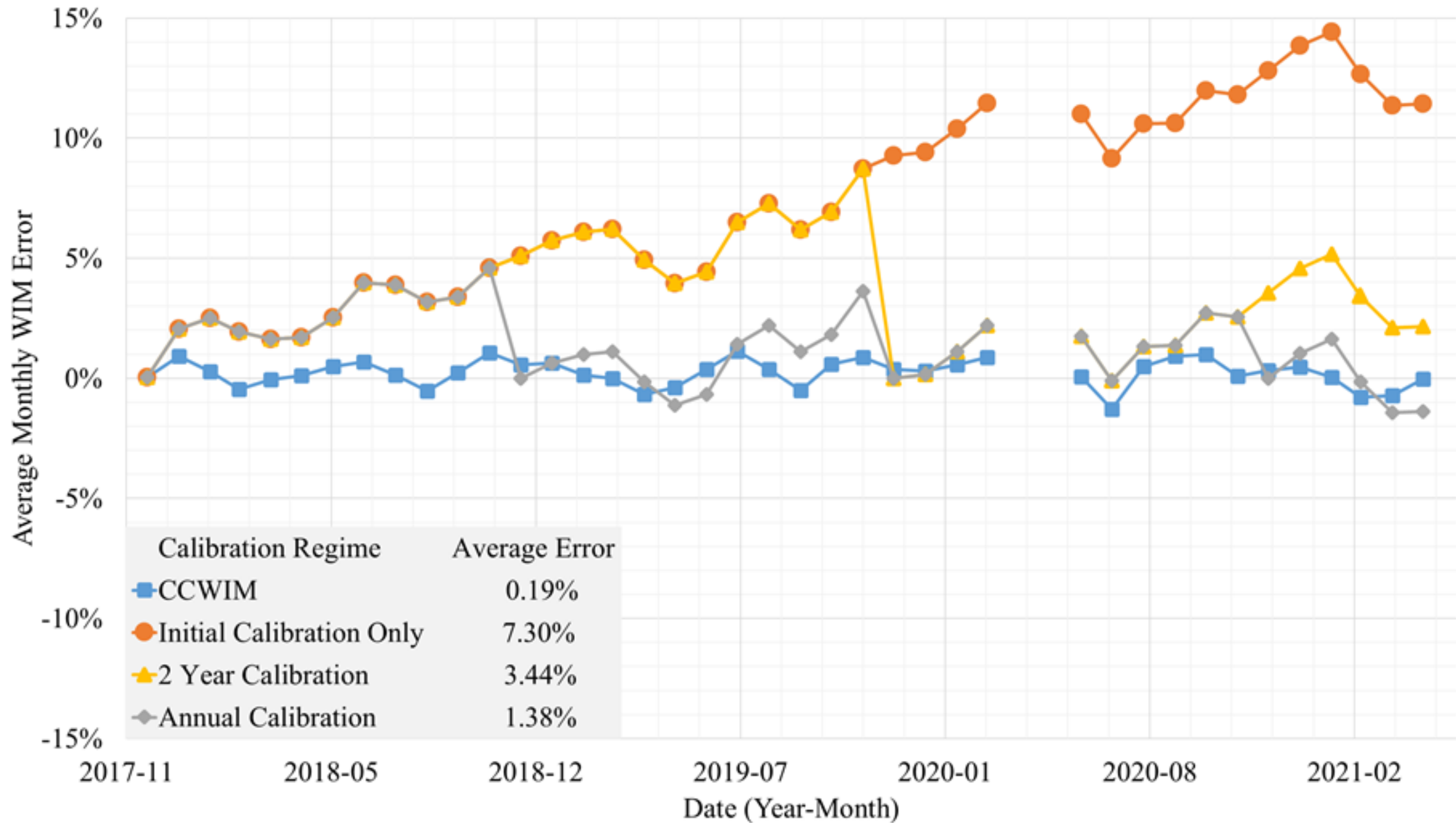
- Study results of CCWIM sites over a long period of time (several years)
- 2 Calibration Regimes
 1. Initial Calibration Only
 - Manual method using small set of test trucks with 10 to 50 samples
 2. Continuous Calibration of WIM



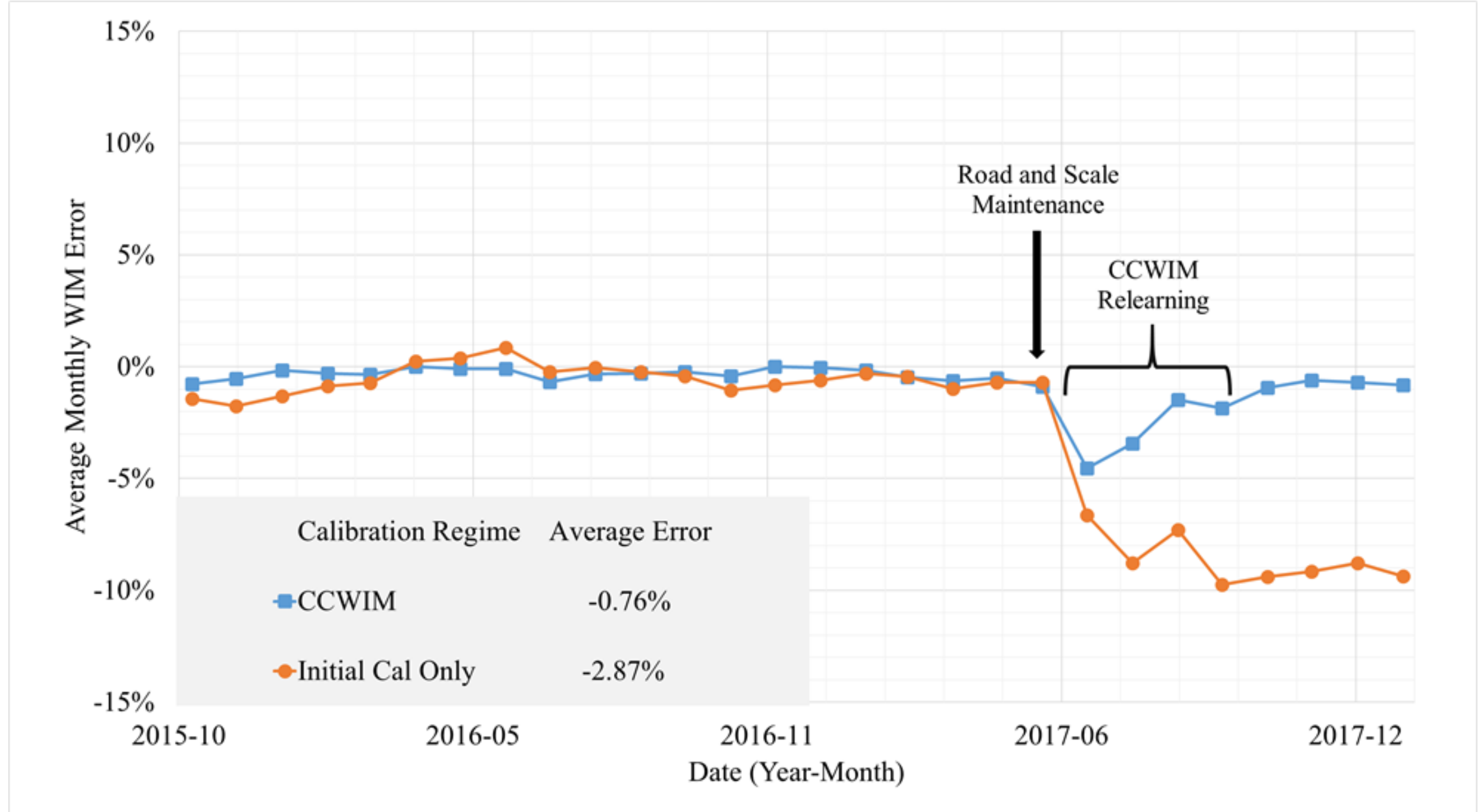
Monthly WIM Average Error - Site 1



Monthly WIM Average Error - Site 1



Monthly WIM Average Error - Site 2





Comparison Initial Calibration Only & Continuous Calibration

Site	Vehicle Count [number of vehicles]	Study Period [months]	GVW Error [%]		Improvement Ratio
			Initial Calibration Only	Continuous Calibration	
1	19,570	38	7.30	0.19	38.4
2	109,134	28	-2.87	-0.76	3.8

Study Conclusions

- WIM weight average error varies over time
 - Positive or Negative drift
 - Cyclical patterns – no predictable pattern
 - May change suddenly
 - **CCWIM reduces these impacts and adjusts to keep error close to zero**
- Confirms Conventional WIM Best Practices
 - **Annual WIM** calibration for non-CCWIM sites helps to reduce WIM error over time
 - **Calibration after maintenance** recommended
 - **Monitoring** of WIM weights
- Continuous calibration is very effective and keeps the WIM system **operating optimally**

Applications

- At Weight Inspection Station:
 - Tighter pre-screening tolerances
 - Eliminate the need for calibration trucks
 - Potential for **mobile** weight enforcement using WIM when the station is closed and/or direct (**free flow**) enforcement



Applications

- At Virtual Weigh Stations & Overload Enforcement Programs
 - Improve data collection accuracy for:
 - Traffic research
 - Roadway design
 - Maintenance planning
 - Improve confidence for **mobile** enforcement and **direct** enforcement





Questions?



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Thank You

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