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Atmospheric Measurement Techniques Discussions

Interactive comment on "Real-world measurement and mechanical-analysis-based-verification of NO_x and CO_2 emissions from in-use heavy-duty vehicle" *by* Hiroo Hata et al.

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The authors have tested a heavy-duty vehicle in Japan on a dynamometer and using a PEMS to evaluate how driving force and season influences emissions of CO2 and NOx.

The literature review is not sufficient to show why this work is novel, especially as the authors measure one vehicle only.

The methodology is not transparent sufficiently to allow key outputs to be replicated, namely the transient emissions maps. There are issues with the figures in the SI which

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need to be addressed, including the transient emissions maps and the correlation analysis.

Line 20: Define long-term and short-term Line 23: What year is the NASA reference? Line 23: Better to use ‘climate change’ instead of ‘global warming’ Line 25: This reference is 10 years old – can you find a newer source to support your point? Line 25: Is ‘photochemical oxidant’ a single species? It seems this would be a group of chemicals Line 41: I don’t believe this to be the case – lab tests are set to standard conditions to allow repeatability over all tests. The narrow test conditions means the results may not align with what we see in more varied real-world conditions Line 44: What is the EPA reference year? Catalytic converters operate based on stoichiometric combustion in a spark ignition engine, and are (I believe) relatively independent of the ambient temperature Line 45: Might be better to say proportional to fuel burn, since exhaust treatment technology mitigates the effect of driving conditions on tailpipe emissions Line 70: What are the 2016 Japanese regulations? Line 81: How were the lab test conditions modified to reflect different seasons? Line 90: Why was EGR measured only in spring and summer? Line 91: I assume the route was the same across all days and seasons? Line 96: What is the justification for a 5 second smooth? Line 99: Worth explaining the central difference method and justifying its use here Line 120: Rolling resistance and aerodynamic drag should be derived from coast down tests – was this done in your 2012 work referenced? Line 121: You have switched from km/s2 to m/s2 units for acceleration. How is the 0.139 m/s2 threshold determined? Line 122: How was the test mass determined? Line 132: What is the justification for smoothing the altitudes? Altitudes are already smoothed to be a constant value within each mesh. Line 133: Similarly, what is the justification for the 7m smoothing to determine road slope? Line 150: I disagree - exhaust temperature varies more than coolant temperature Line 184: Should define the torque and speed ranges Line 204: There is no method to recreate the transient emissions table Line 206: Engine out emissions are related to driving force (and fuel used), but tailpipe NOx is decoupled from engine out emissions due to active management by the SCR Line 213: Earlier, you said ambient

temperature had an important role to play in emissions Line 218: Some evidence is needed for this. The air conditioner will manifest as some additional load, in the same way as a heater during the winter. Fig 1: There are two trips per day in each of the seasons – does this graph show the average of those two trips? Were all of these cold starts, with engine coolant temperature from the same starting point Fig 2: How is this graph determined? We don't know what the ambient temperatures were in each of the eight tests (two tests per day, four seasons) Fig 3: How many dyno tests were done? Were the ambient conditions of the PEMS test replicated here? Fig 4: Why is the area of the EGR + SCR plots (third column) larger than the No EGR + SCR and EGR only plots? They should all occupy the same area because vehicle speed and driving force doesn't change across the three columns Fig 5: As Fig 4 Fig 6: The R2 value for these graphs might be high, but there is large variation about the 1:1 line

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