



Universidade de São Paulo



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# ***Advances in RDE Brazil: FTP-75, ethanol biofuel and others***

**PEMS 10<sup>th</sup> Annual Conference**

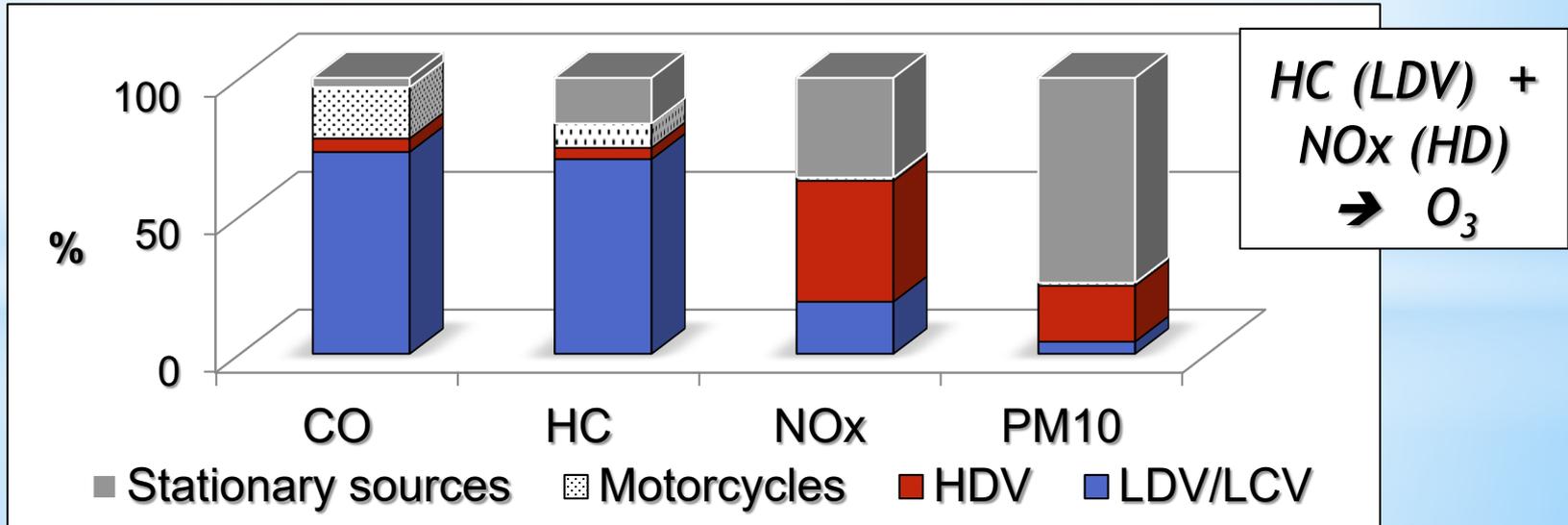
**A. Forcetto**

# Introduction

- RDE Brazil: effective after Jan./2022
- Importance: homologation (aft/2025) and fraud detection
- RDE Brazil: adapted from RDE Europe
- Objective: share the RDE Brazilian advances and concerns

# Typical Brazilian profile

- Main pollutants:  $O_3$  and  $PM_{2.5}$ 
  - Precursors:  $\left\{ \begin{array}{l} \text{HC (from LDV)} \\ \text{NOx (from HDV)} \end{array} \right.$



# Typical Brazilian profile

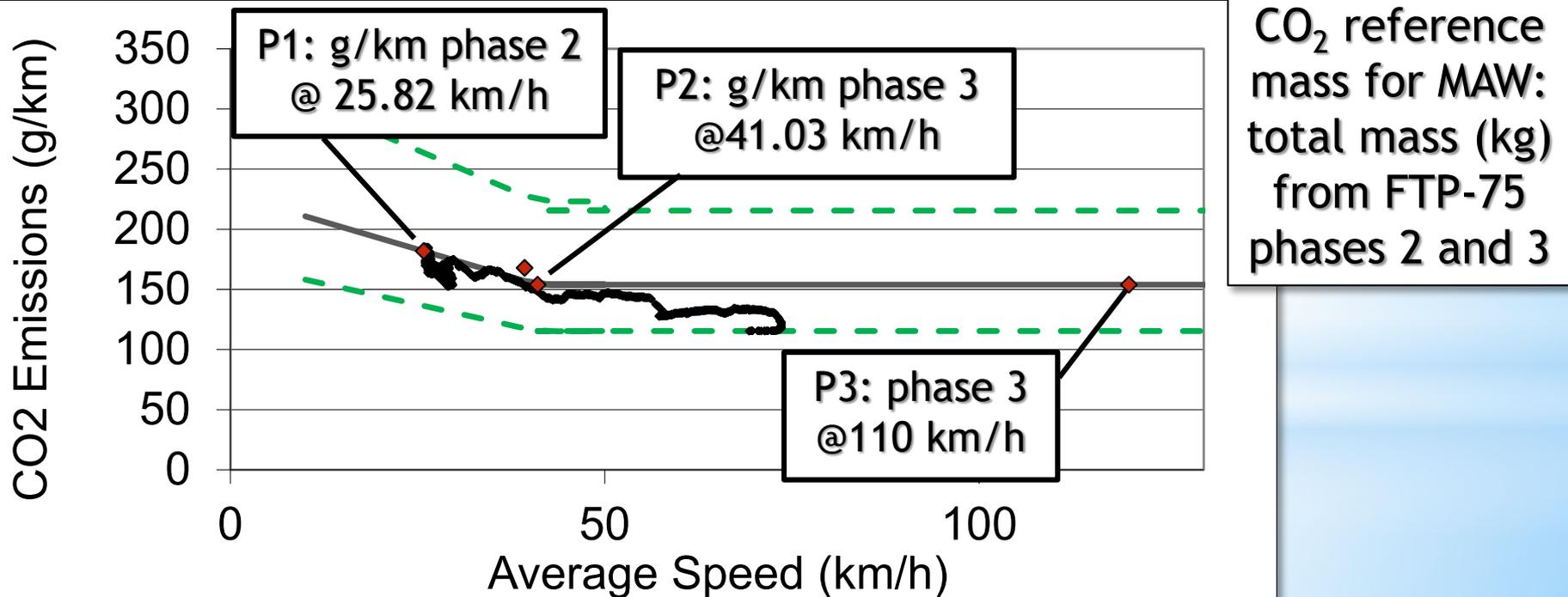
- Fuels: Gasoline (w/25% ethanol) and Ethanol 100%
  - Diesel: not allowed for cars
- Flexfuel cars & motorcycles
- Big cities close to 1,000 m, high slopes
- Laboratory procedure: FTP-75 (instead of WLTC)

# RDE Brazil development

- Based on RDE Europe
- Priority to metropolitan pollution control
  - Trips: only Urban (65%) and Rural (35%), no motorway
- Altitude gain: 600 to 1,200 m/100 km
- Temperature: 20-35° C (moderate)  
10-20° C and 35-40° C (extended)

# RDE Brazil development

- **CO<sub>2</sub> reference:** From FTP-75 phases 2 and 3



# RDE Brazil development

- **Pollutants:**

- PM / PN: only in laboratory
- RDE Regulated: CO / HC (NMOG) / NO<sub>x</sub>
- CO<sub>2</sub> for efficiency
- **$\text{NMOG}_{\text{RDE}} = \text{THC}_{\text{RDE}} \times (\text{NMOG}_{\text{LAB}} / \text{THC}_{\text{LAB}})$**

# Concerns

All of them: not clear yet

- Cold start ethanol emission ( $< 20^{\circ}\text{C}$ )
  - Up to 30,000 ppm in the first minutes
- High NMOG due ethanol blend (E22 - E100)
- THC and CO emission in high altitude gain and high temperature

# Conclusions

- ✓ RDE Brazil: on the way
- ✓ FTP-75 as reference cycle: possible
- ✓ Flexfuel technology / Ethanol biofuel: the present
- ✓ Other important improvements: ORVR, 48h shed

*That's is just the beginning!*

# Thanks for your attention

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