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Telematics Data to Estimate the impacts of Calendar and Meteorological Events on Transport Emissions at High Spatial-Temporal Resolutions

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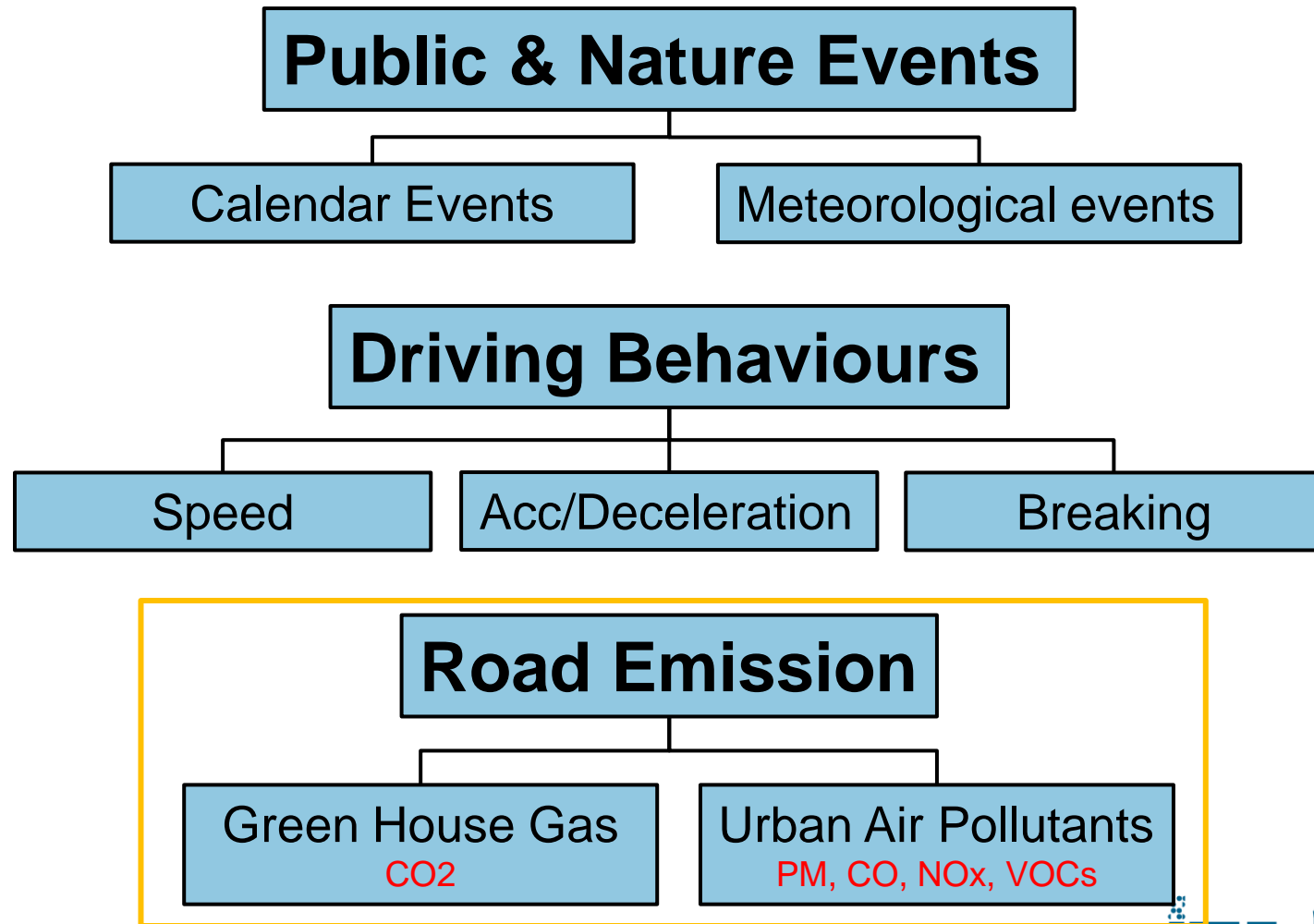
Presenter : Junjun Xiang



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- 1. Background & Introduction**
- 2. Research Objects & Methodology**
- 3. Impacts on Urban Transport**
- 4. Impacts on Road Emission**
- 5. Conclusion**



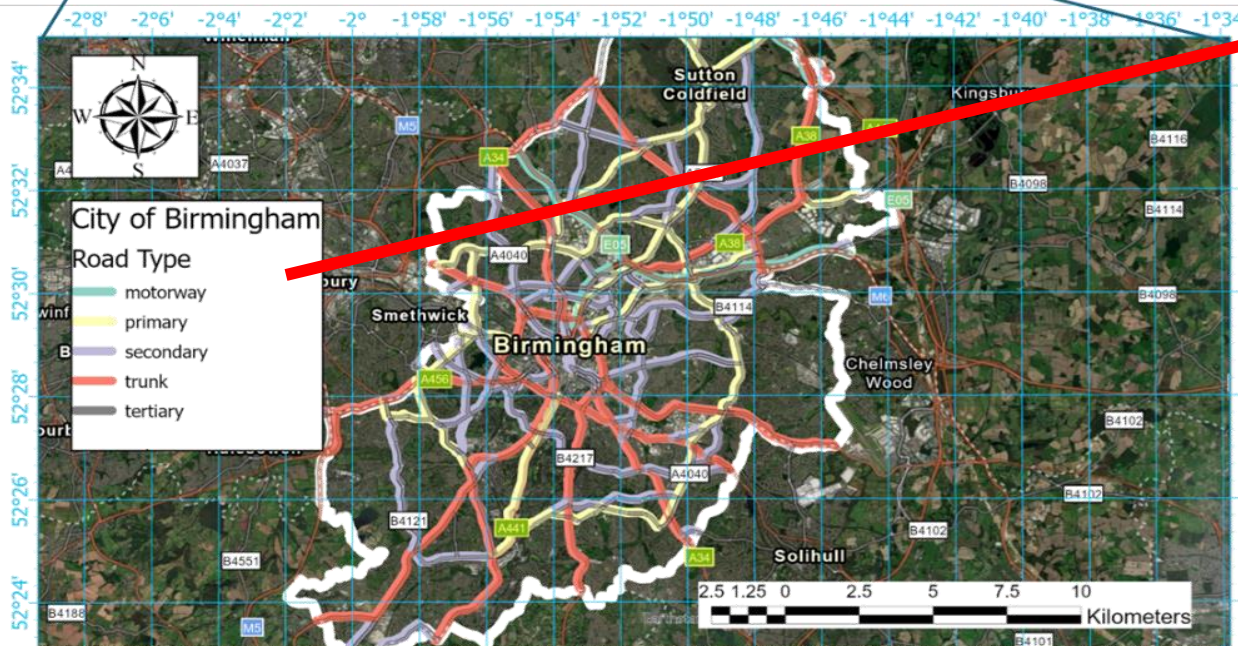
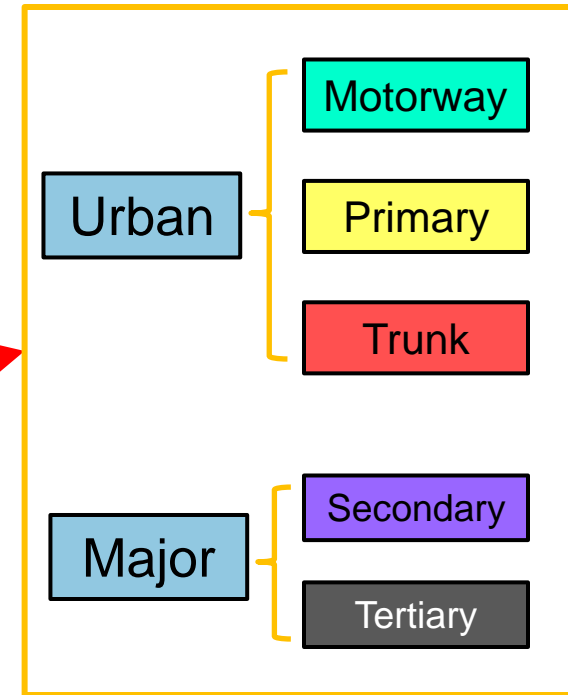
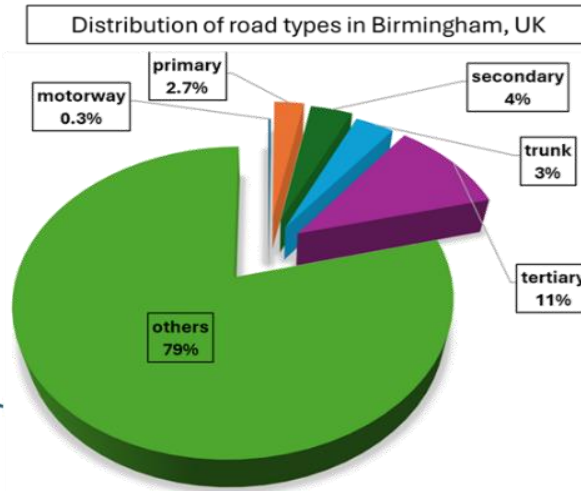


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Research Objects and Methodology



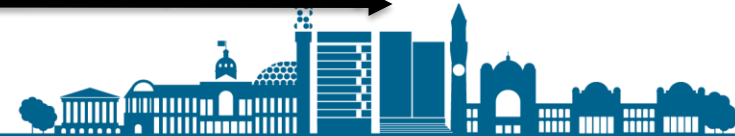
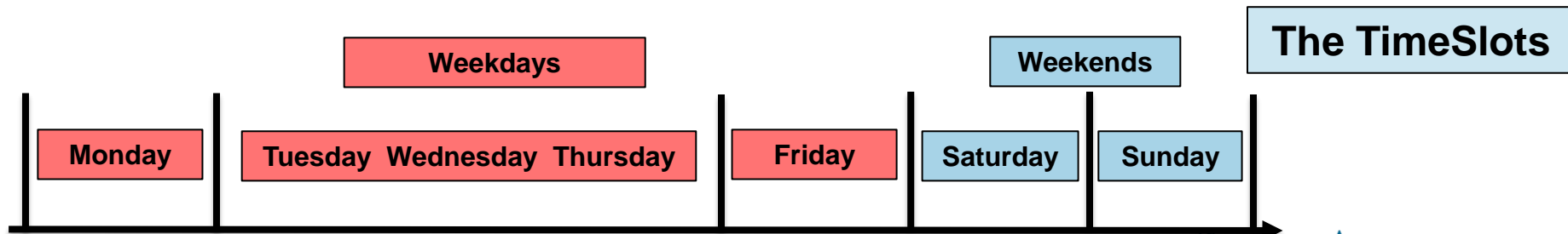
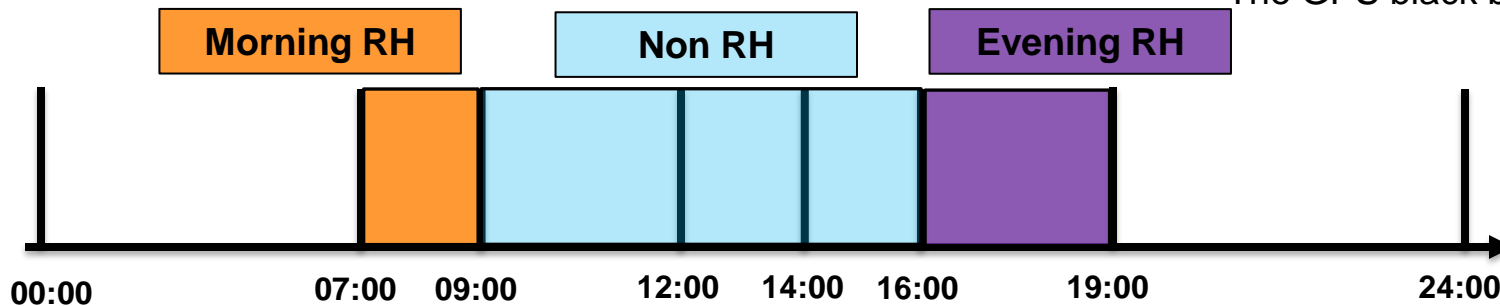
Telematics Data

The Geo-Spatial-Temporal Road Segments

- Spatial (longitude and latitude)
- Temporal (Different time slots)



The GPS black box



Research Objects and Methodology

Vehicle Characteristics

Speed

Acceleration

VSP

Emission Factors

CO₂ EF

NO_x EF

Intervention (Event Periods)

VS.

Non-Intervention (Annual Average Level)



Research Objects and Methodology

Vehicle Characteristics

Speed

Acceleration

VSP

Emission Factors

CO₂ EF

NO_x EF

Intervention (Event Periods)

Calendar

- Easter Holiday
- Summer School Holiday

Meteorological

- Heatwave
- Coldwave
- Flooding

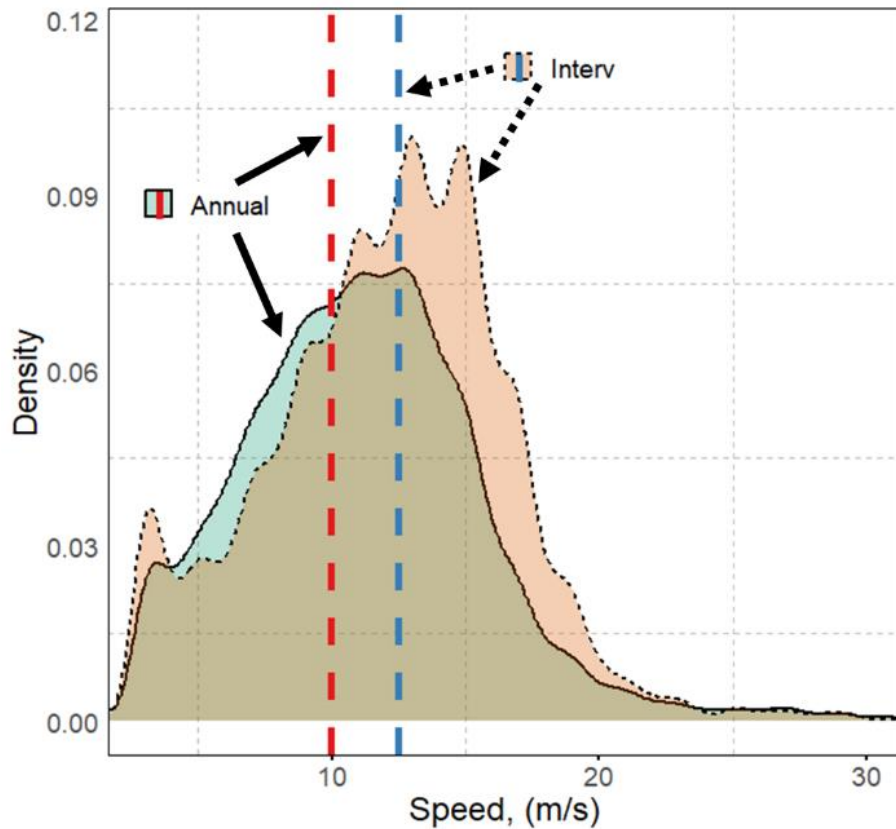


Vehicle Characteristics

Speed

Acceleration

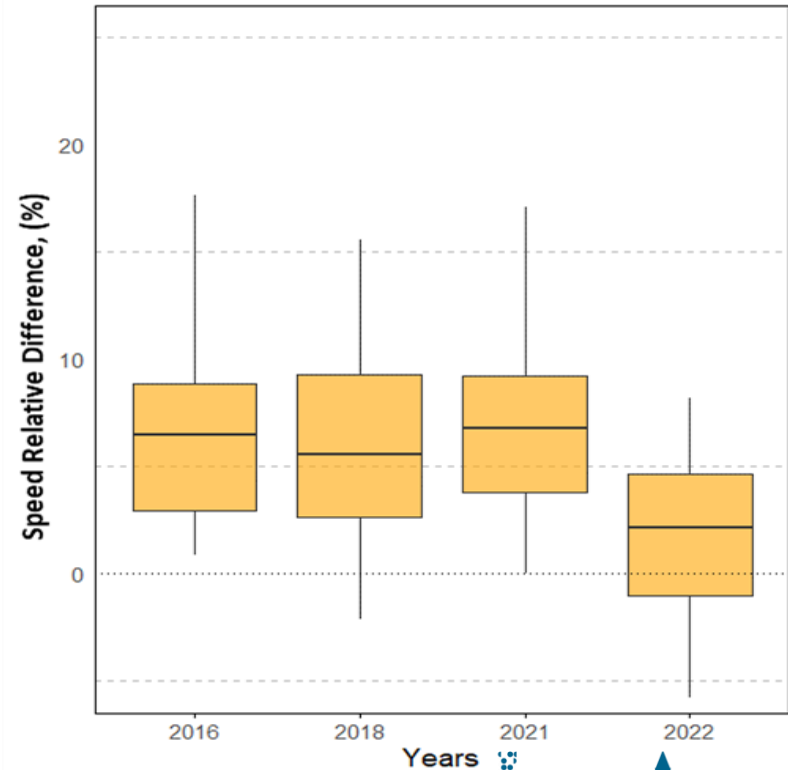
VSP



Emission Factors

CO₂ EF

NO_x EF



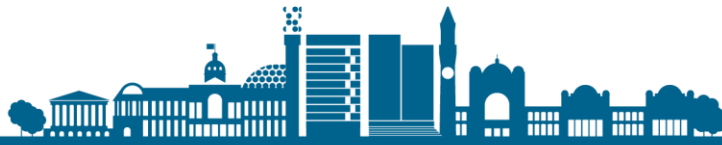
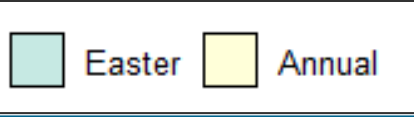
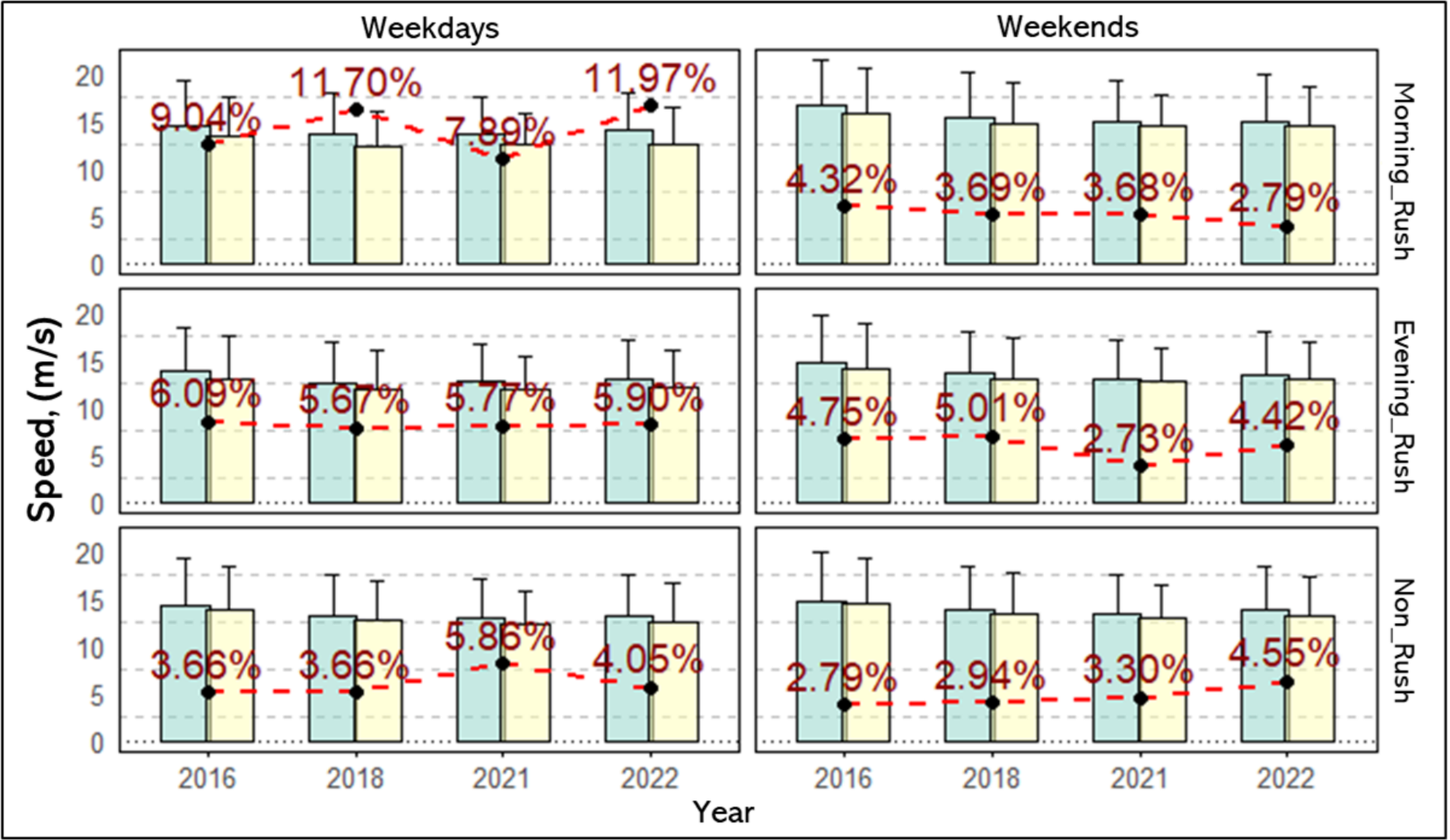
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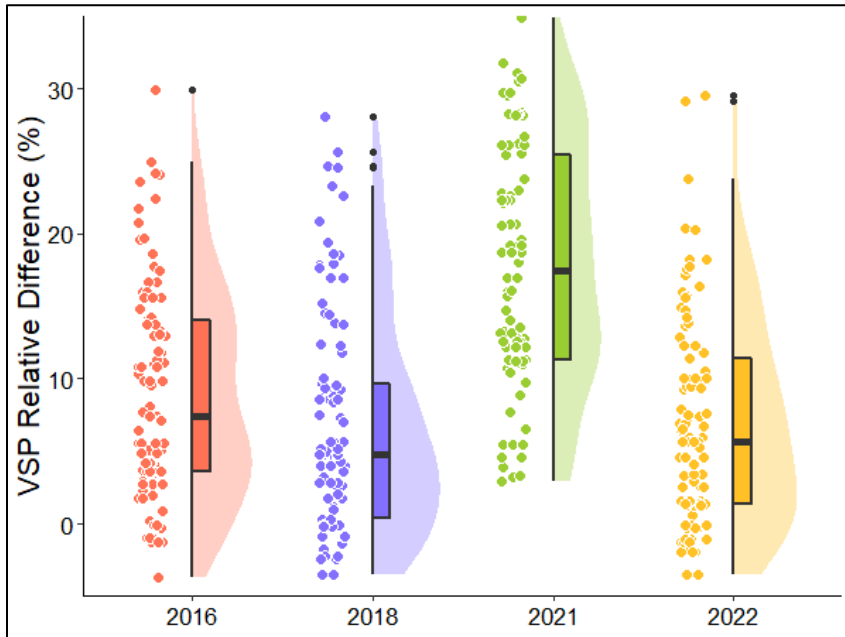
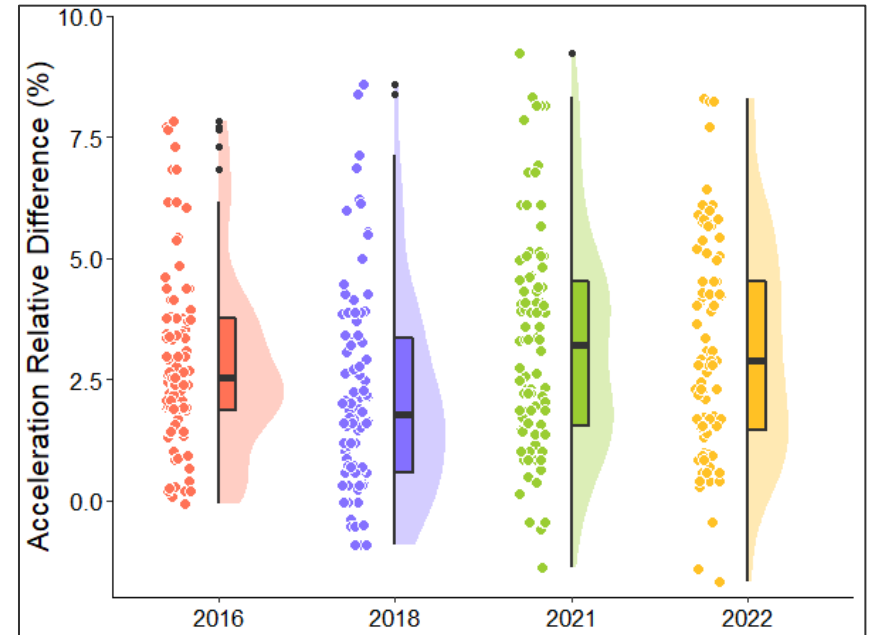
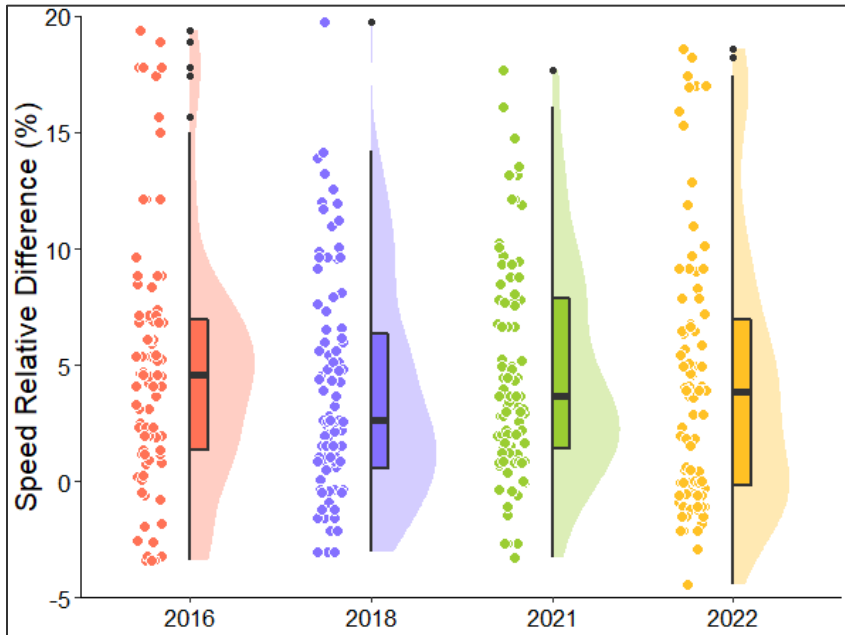
Impacts on Urban Transport

(e.g.)Easter Holiday



Impacts on Urban Transport

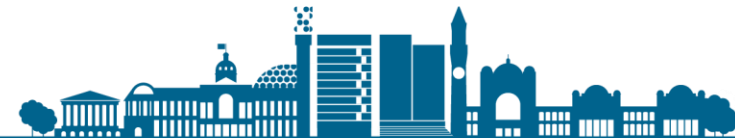
(e.g.)Easter Holiday



- **5%** increase on vehicle speeds
- **2-3%** on vehicle acceleration
- **6-8%** on VSP

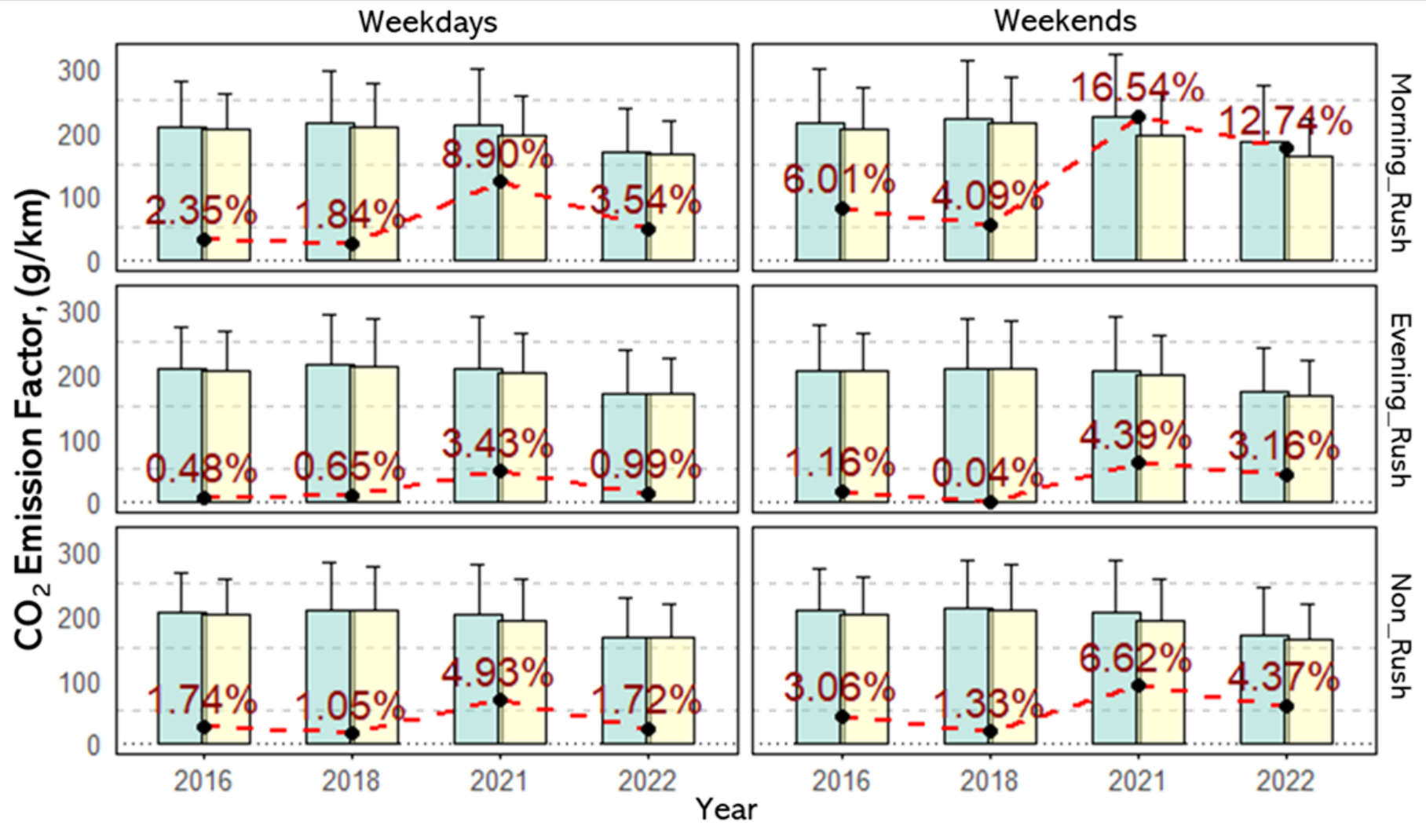
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Impacts on Urban Transport

(e.g.)Easter Holidays

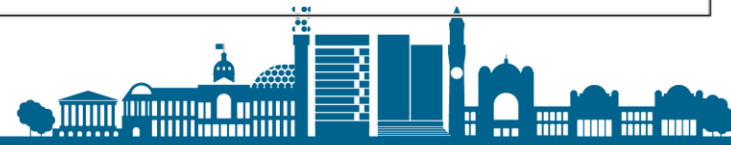
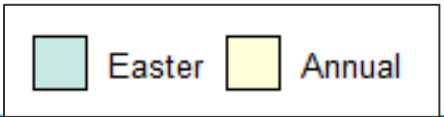
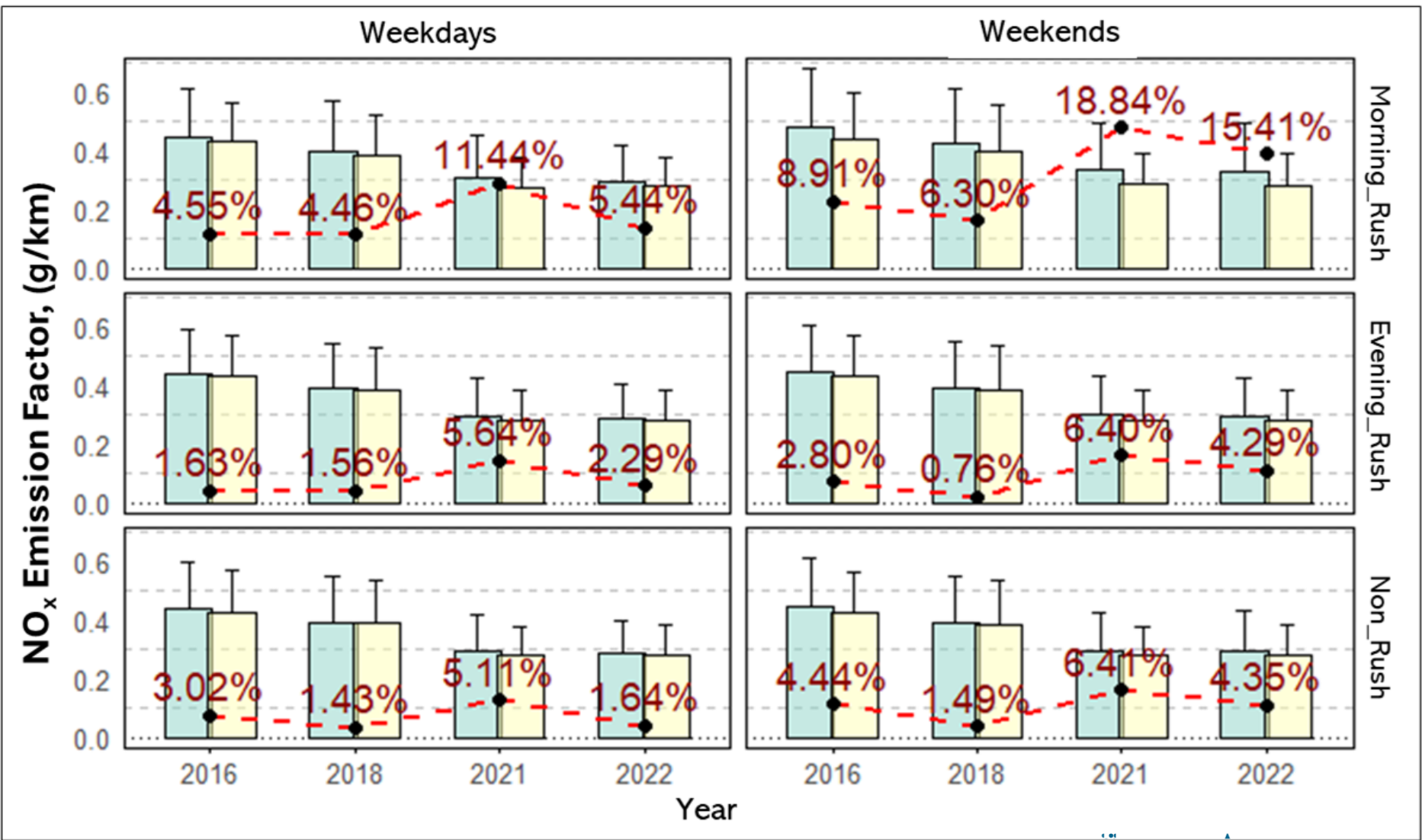


Easter Annual



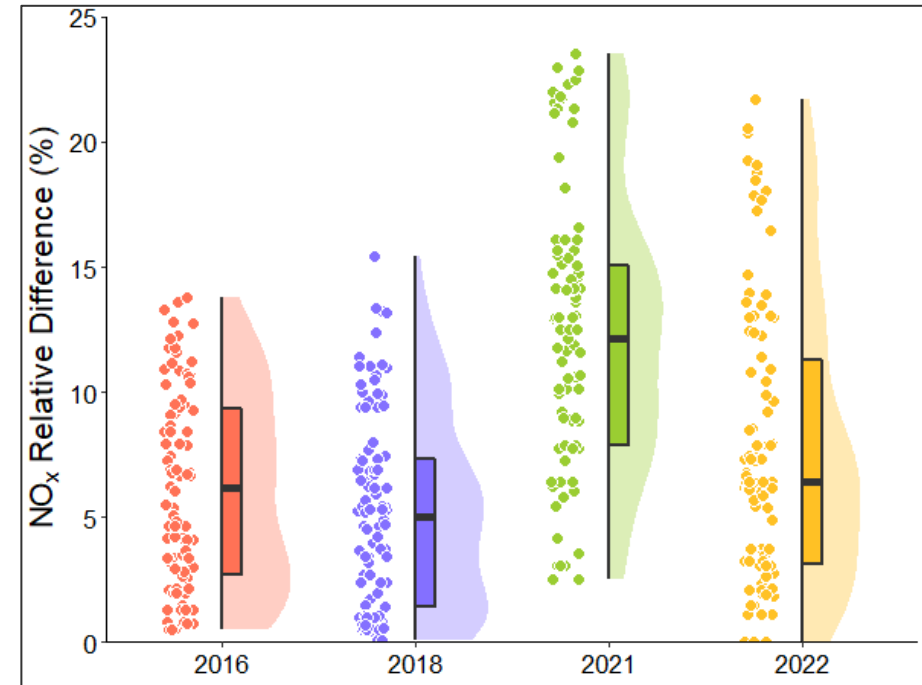
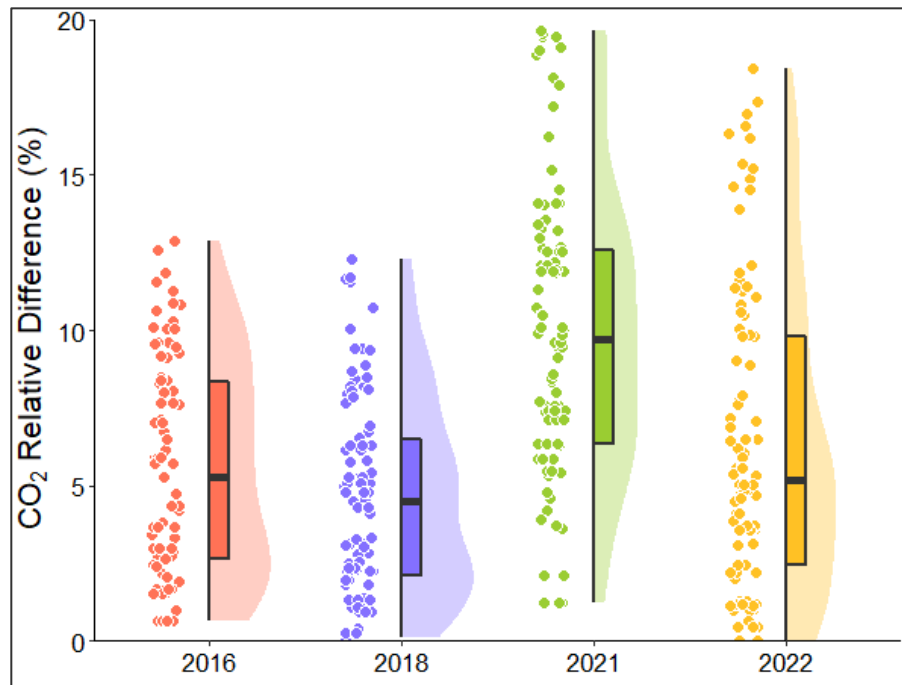
Impacts on Urban Transport

(e.g.)Easter Holidays



Impacts on Urban Transport

(e.g.)Easter Holidays



- CO2 and NOx EF follow Vehicle Specific Power (VSP) patterns
- CO2 EF increased by 5% (10 g/km)
- NOx EF increased a 5-7% (0.025- 0.034 g/km)



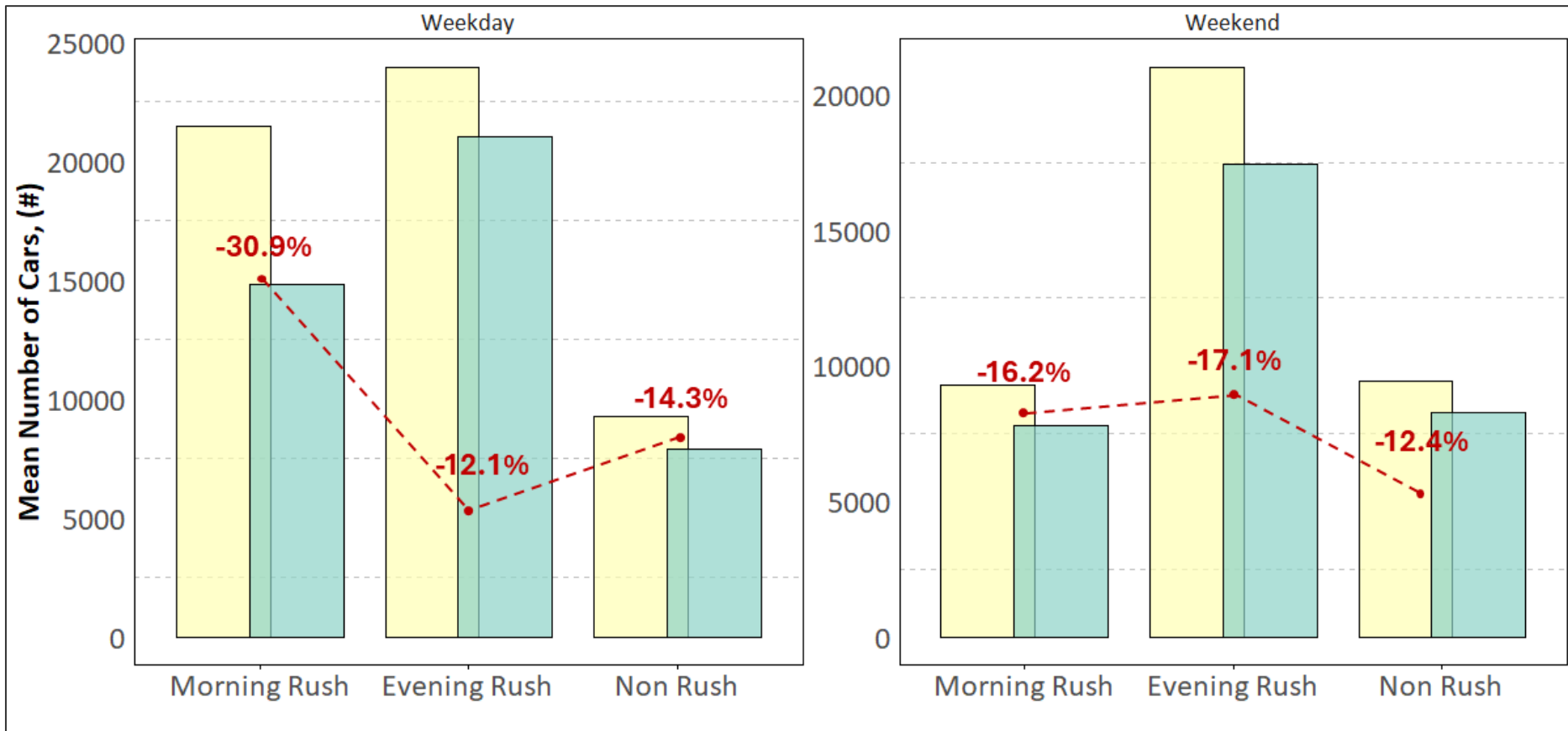
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Conclusion

The average number of cars during Easter



Conclusion

- This study assessed the impact of calendar events (e.g., holidays) and meteorological events (e.g., heatwaves) on **urban transport** and **vehicular emissions** in Birmingham, UK.
- **Both** calendar and meteorological events led to **increased vehicle speeds** and more dynamic driving behaviours compared to regular traffic conditions.
- Emission factors for pollutants like CO₂ and NO_x were **consistently higher** during these events, indicating a clear impact on urban air quality.
- Reduced congestion during certain events, such as holidays, contributed to higher emissions per vehicle despite **lower traffic volumes**.
- The findings highlight the sensitivity of urban mobility and air quality to changes in driving patterns, reinforcing the need for adaptive traffic management strategies to mitigate environmental impacts.



Thank you!

Q & A Time



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