Interior air quality testing at idling mode: test results end discussion

Andrey KOZLOV
Zinaida BULYCHEVA

Central scientific research automobile and automotive engine institute

Tested cars and measured pollutants

Tested Cars:

- ✓ Car#1 – gasoline fuel
- ✓ Car#2 – diesel fuel

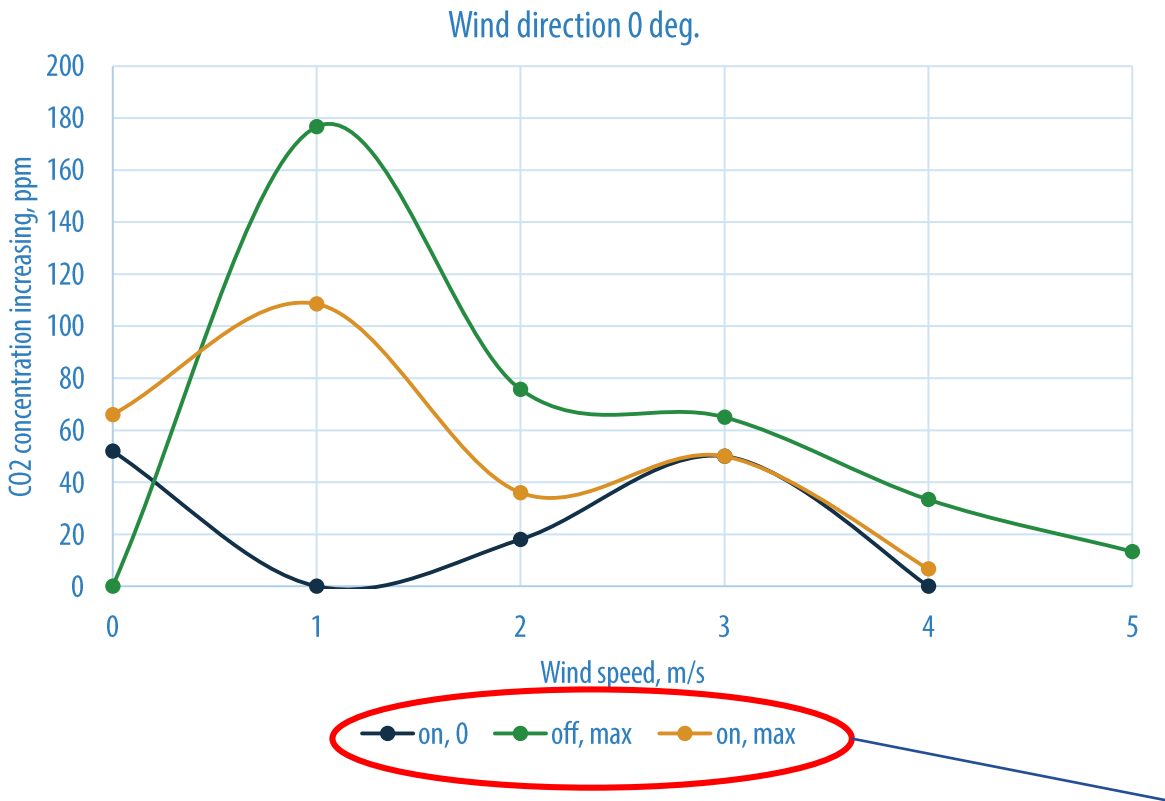
The list of measured pollutants in vehicle interior air under test:

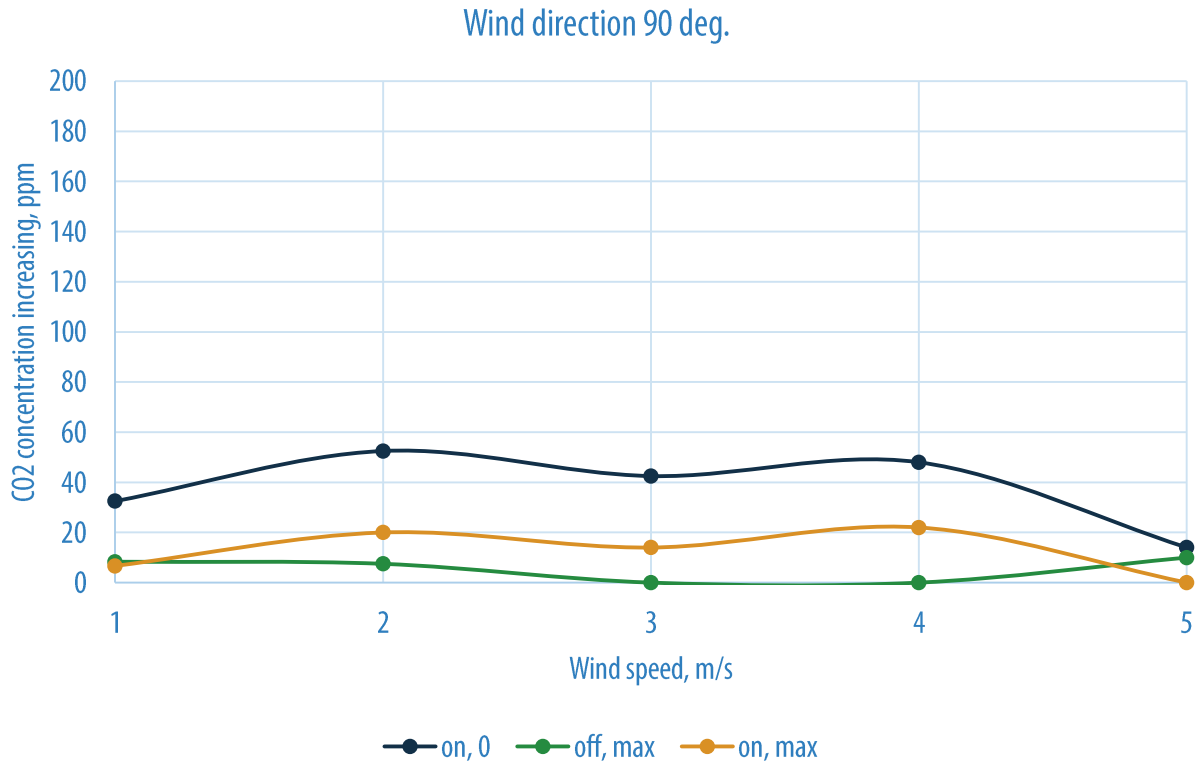
- ✓ Carbon dioxide (CO_2)
- ✓ Carbon monoxide (CO)
- ✓ Nitric oxide (NO)
- ✓ Nitrogen dioxide (NO_2)

Tests period: May-June 2018

Test results car#1 (gasoline)

CO_2 concentration





At wind direction 45 deg. observed concentration increasing was not more than 10 ppm

on,0 – recirculation ON, ventilation OFF
off, max – recirculation OFF, ventilation MAX speed
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Test results car#1 (gasoline)

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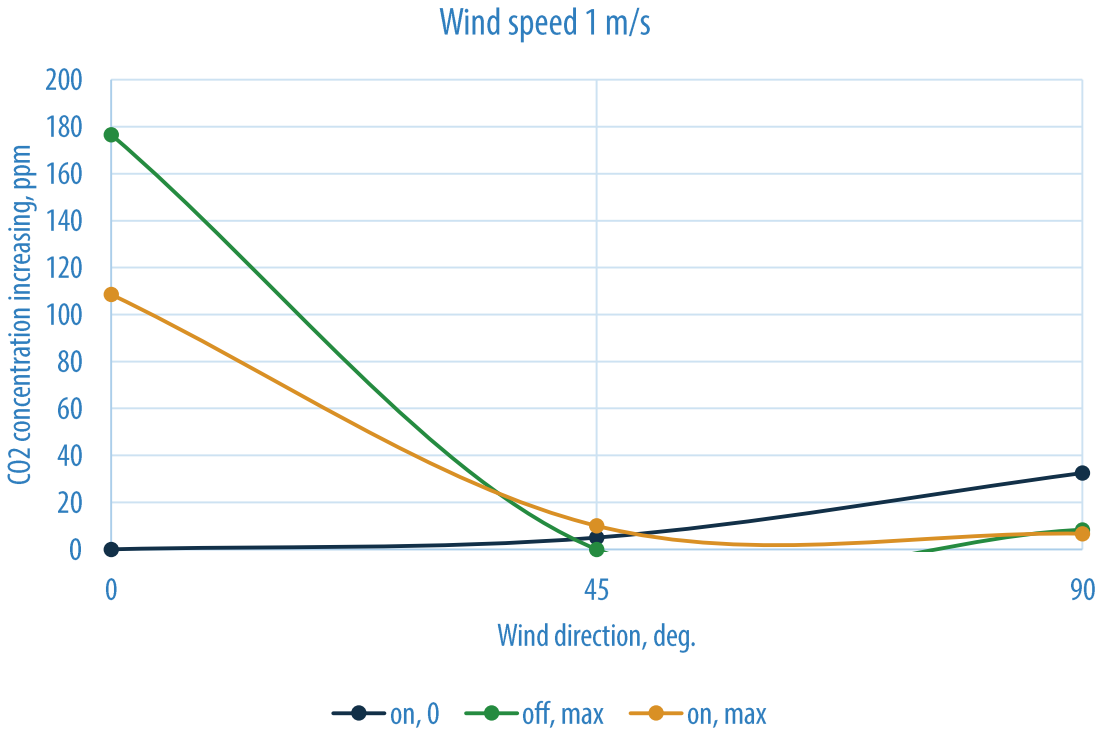

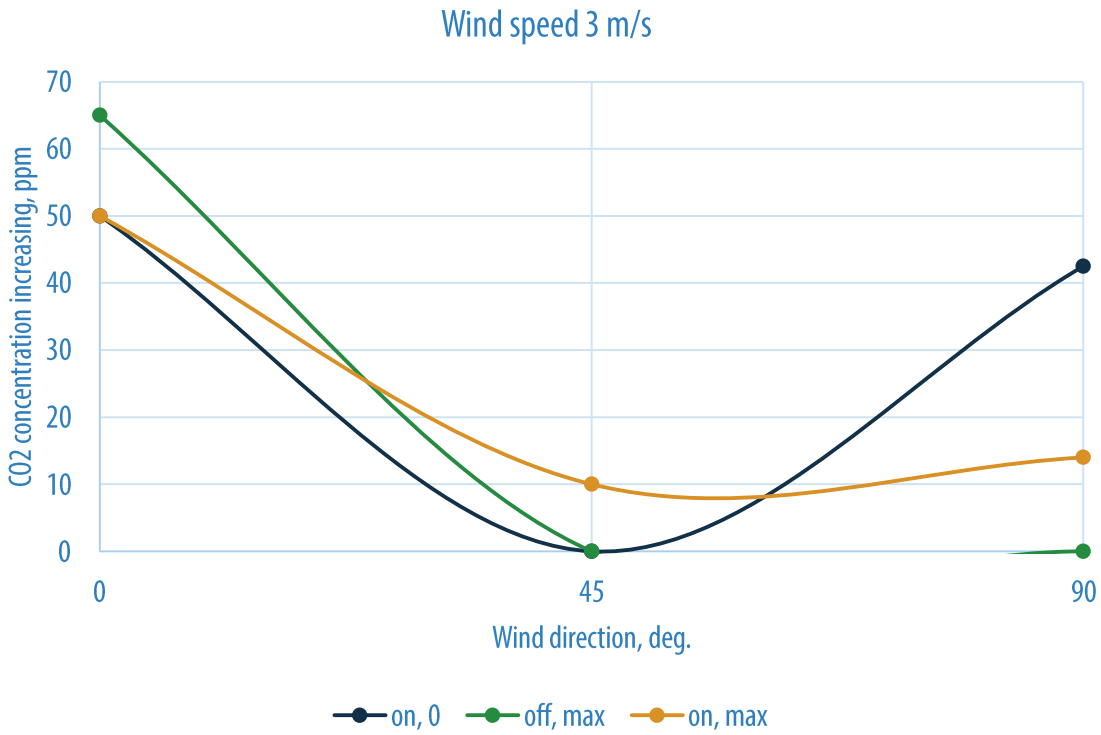

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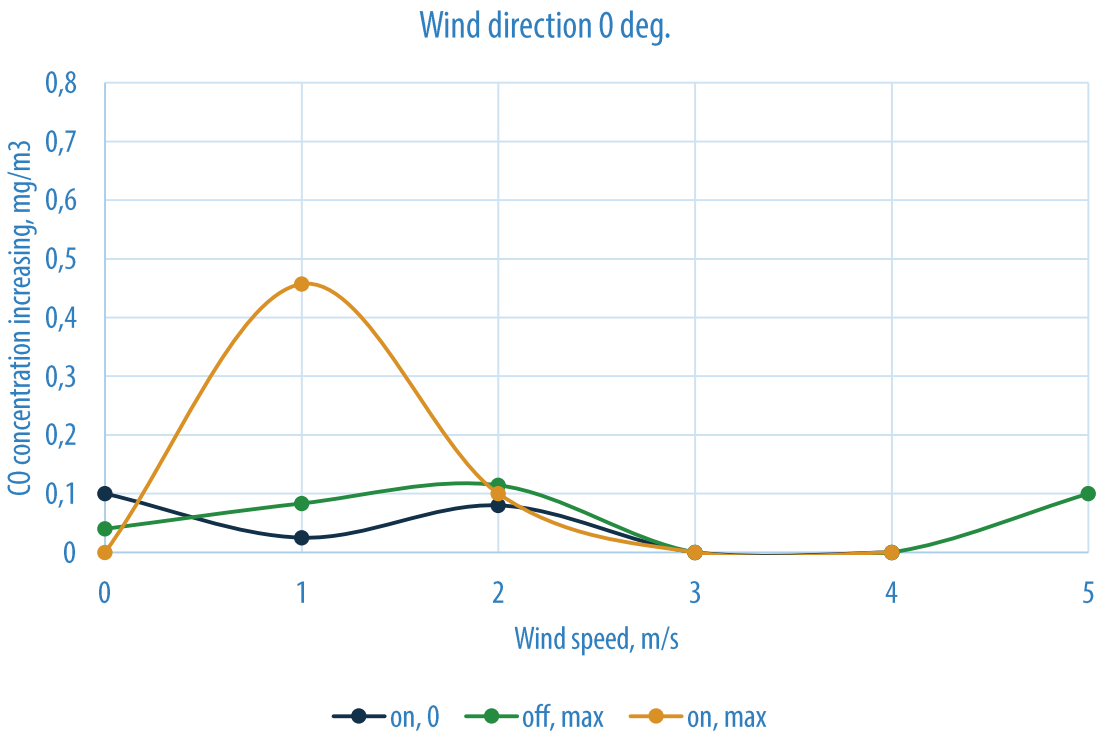
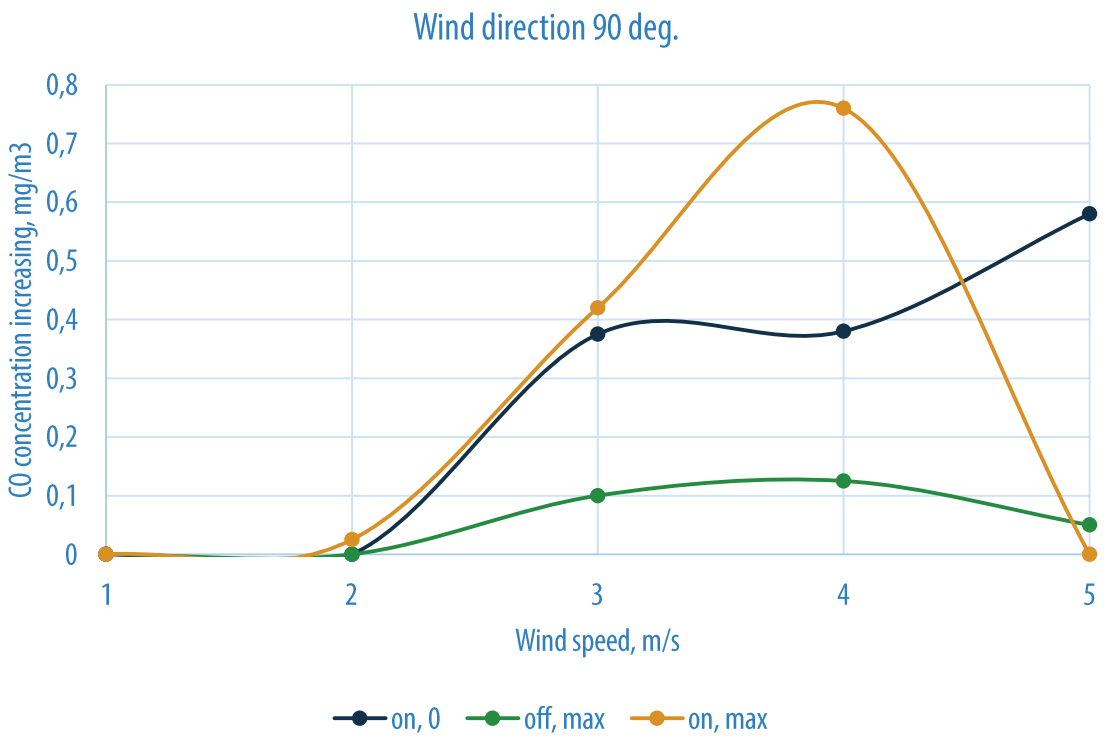
CO concentration





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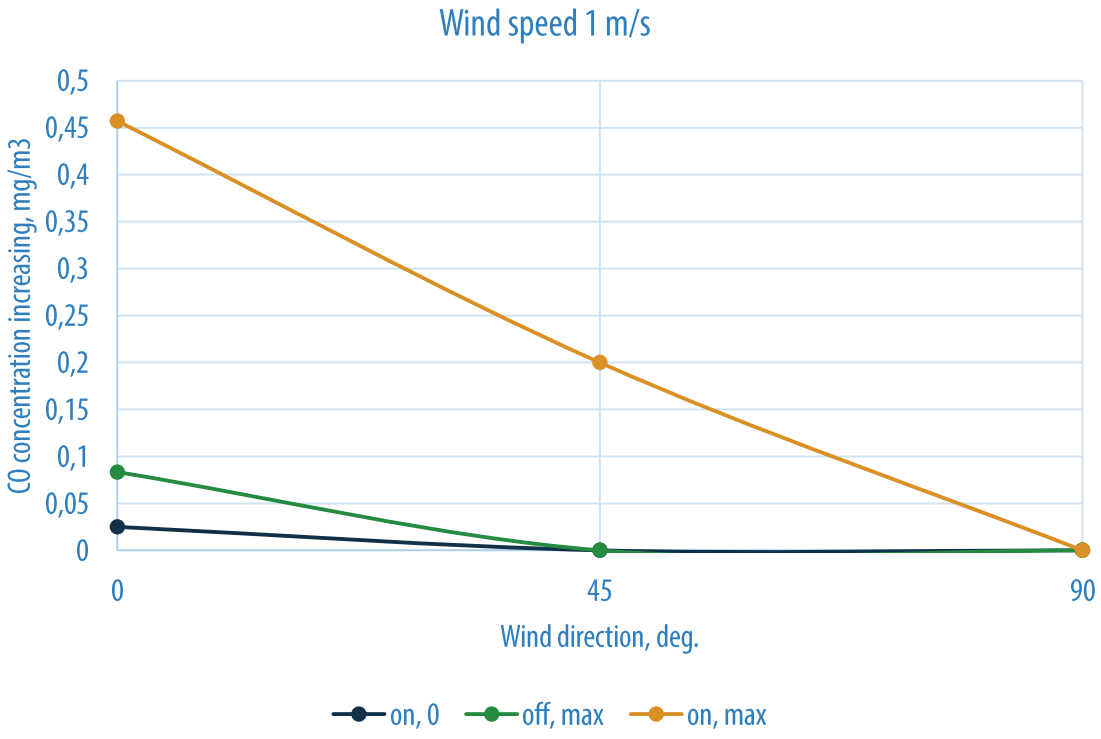

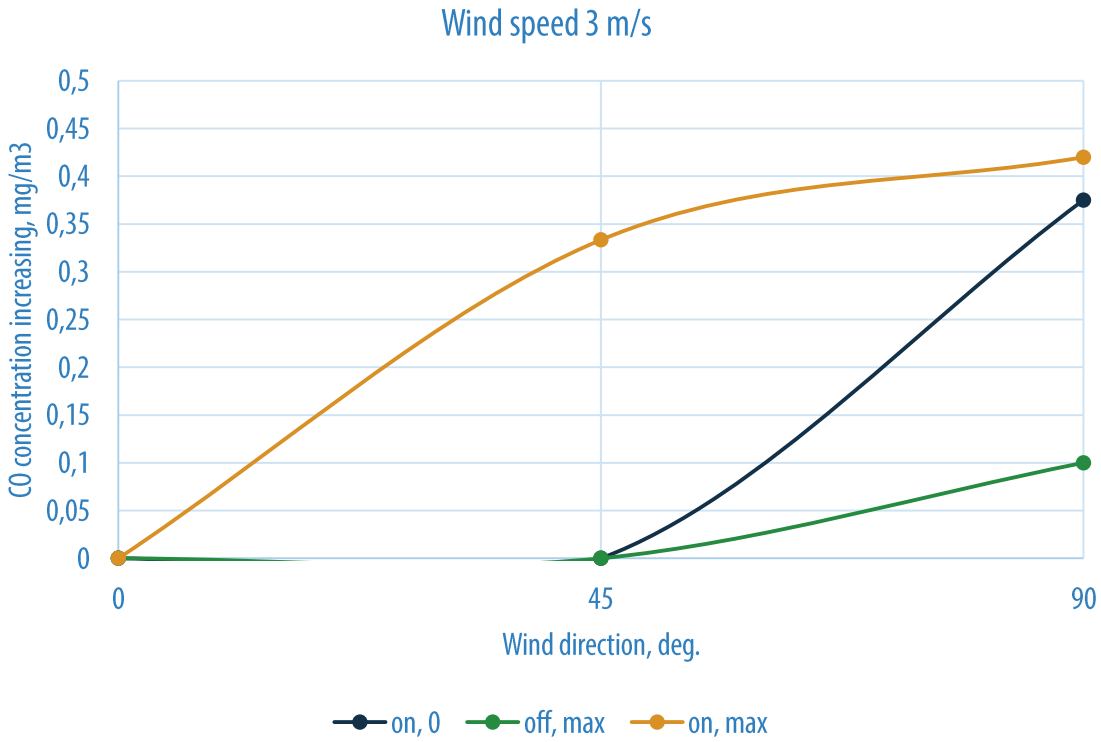

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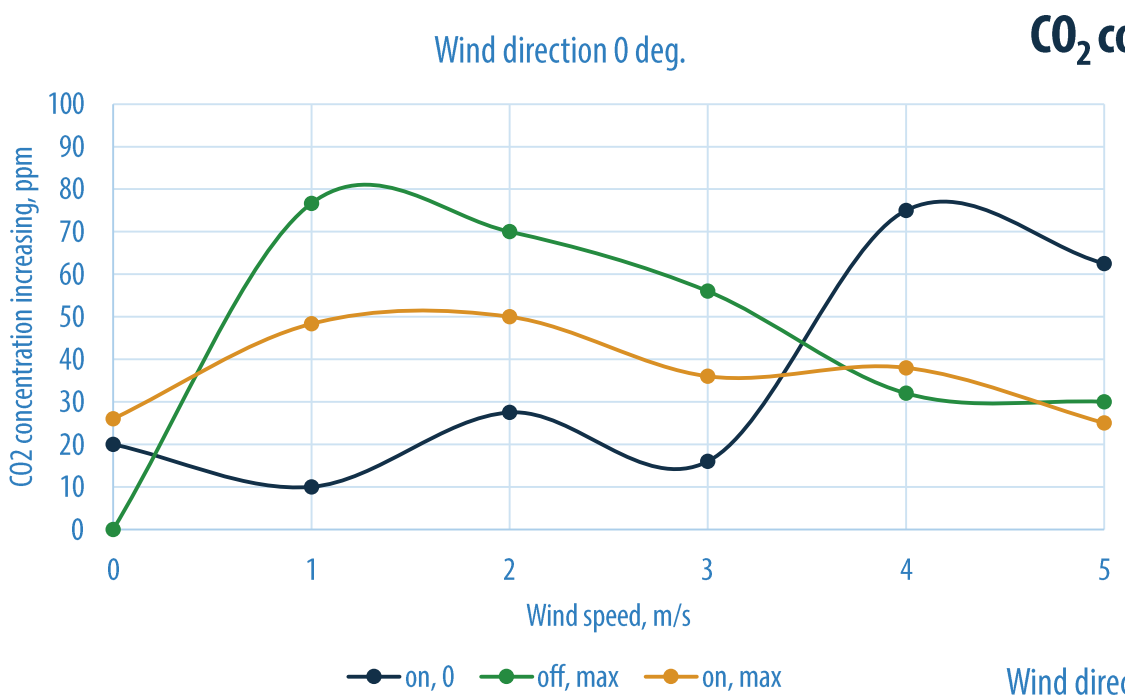
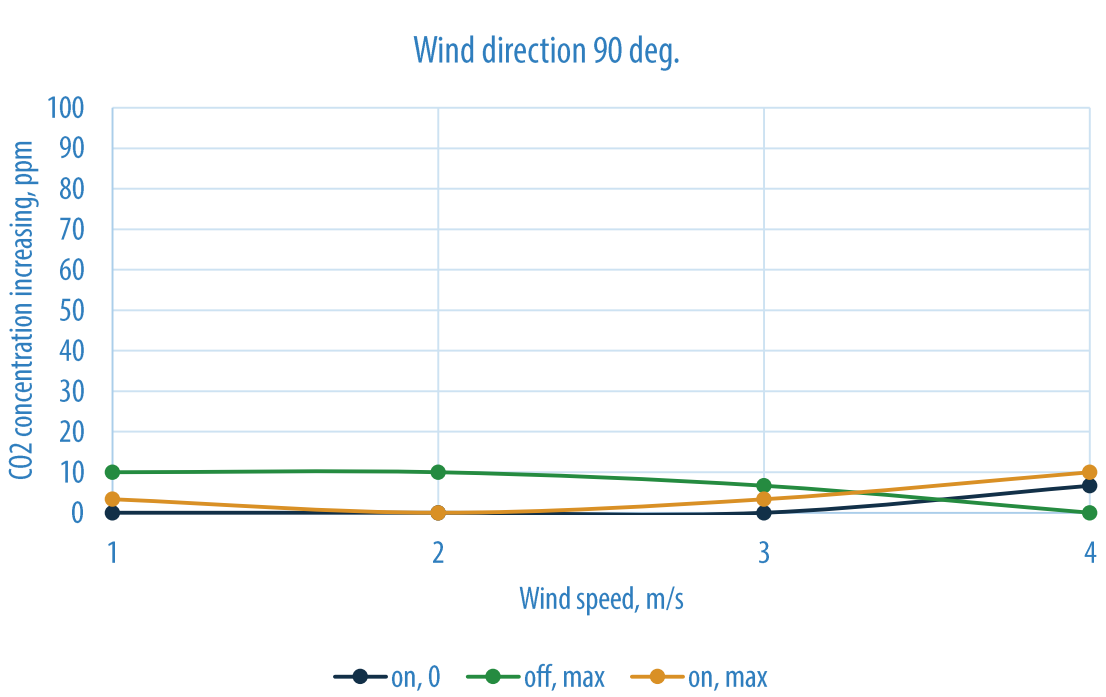
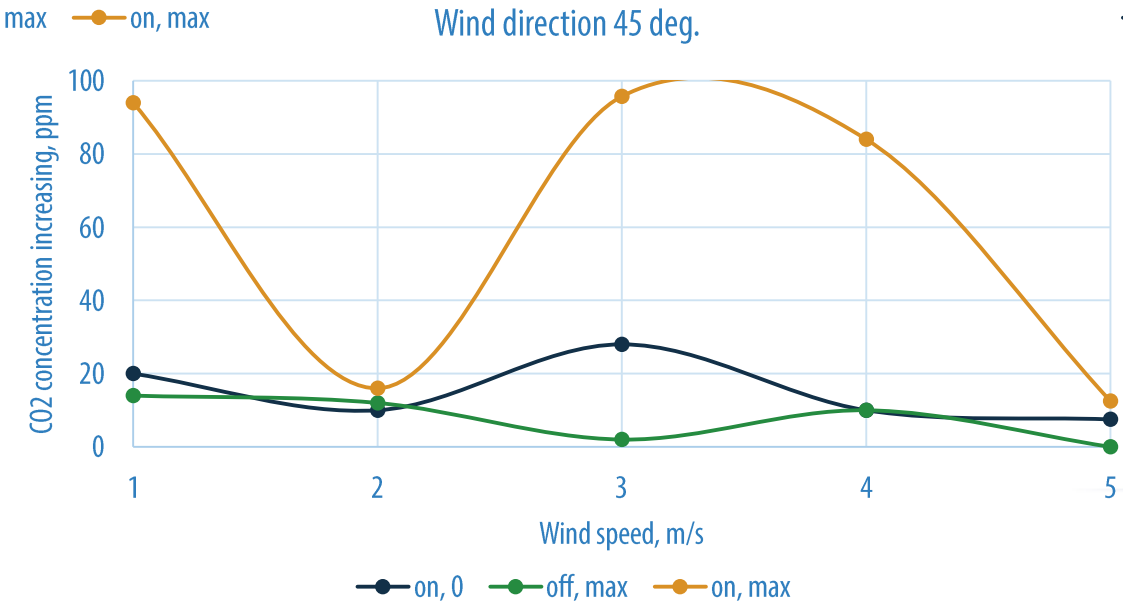
Test results car#2 (diesel)

CO_2 concentration







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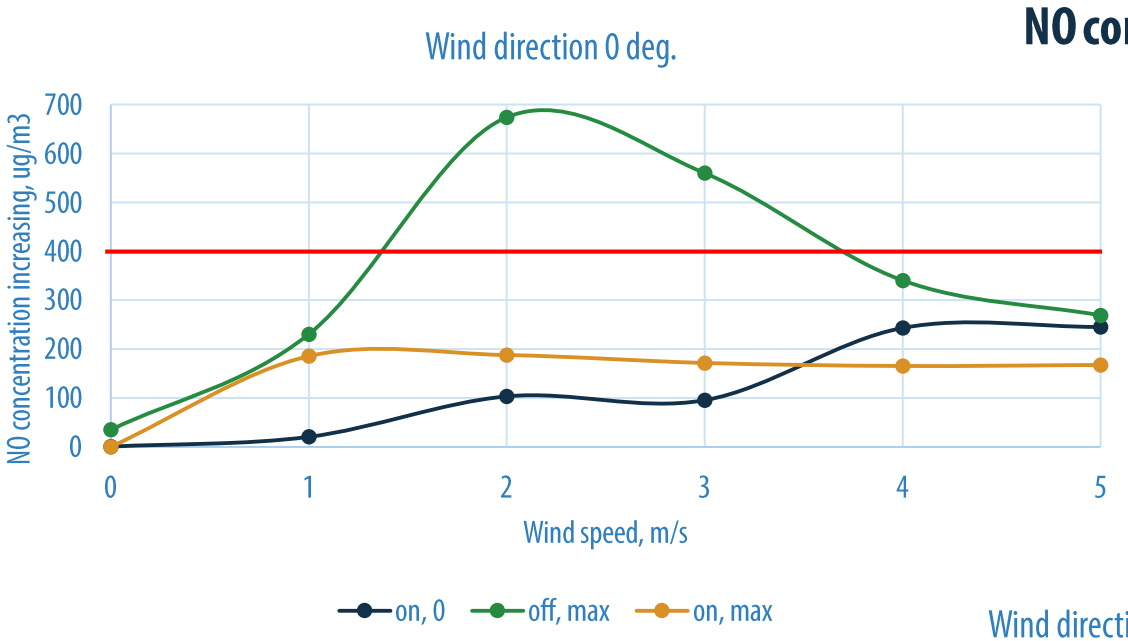
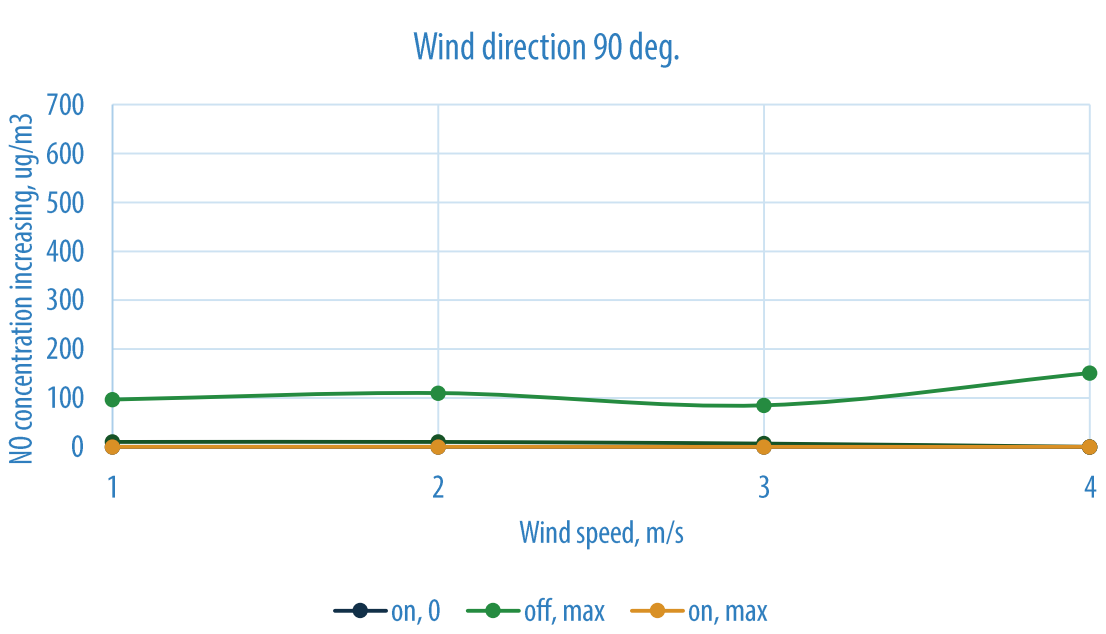
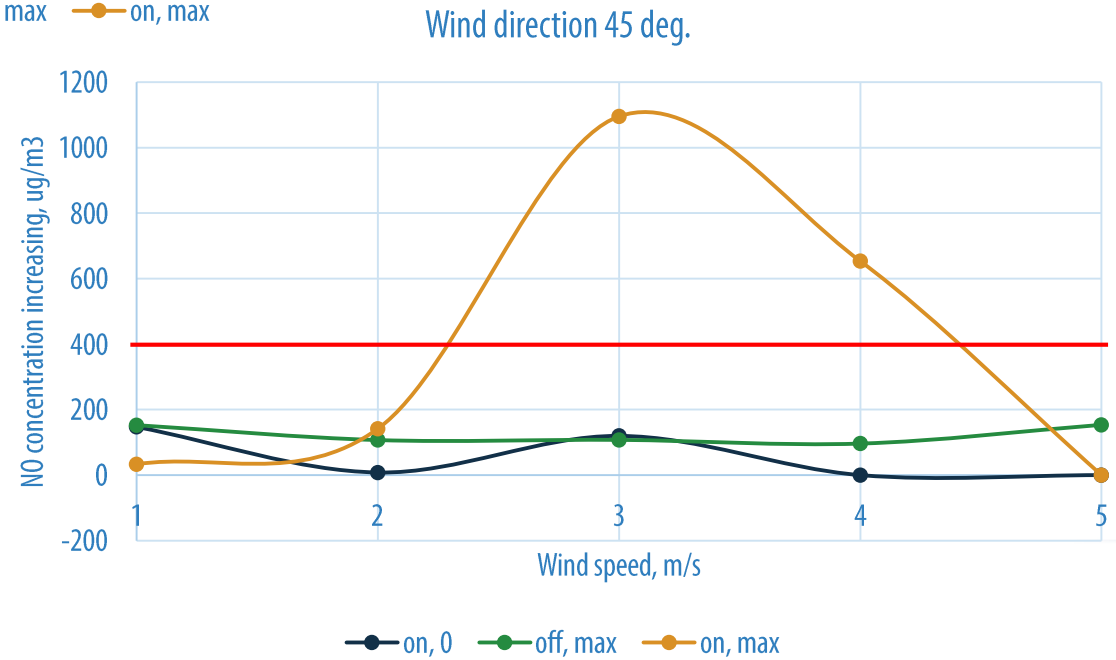
Test results car#2 (diesel)

NO concentration







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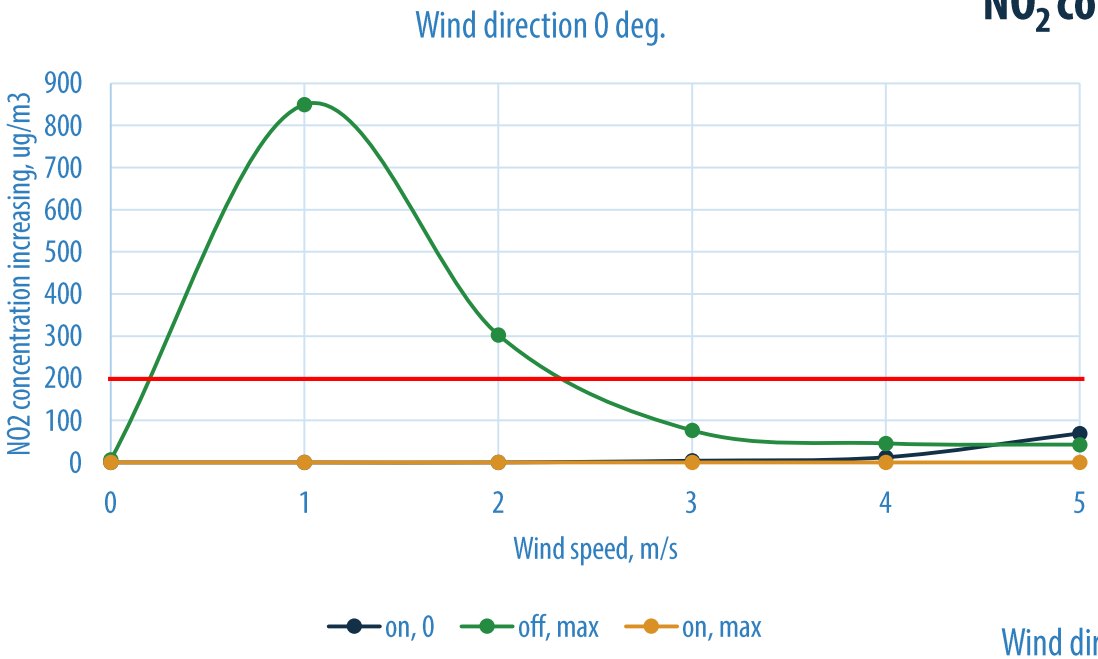

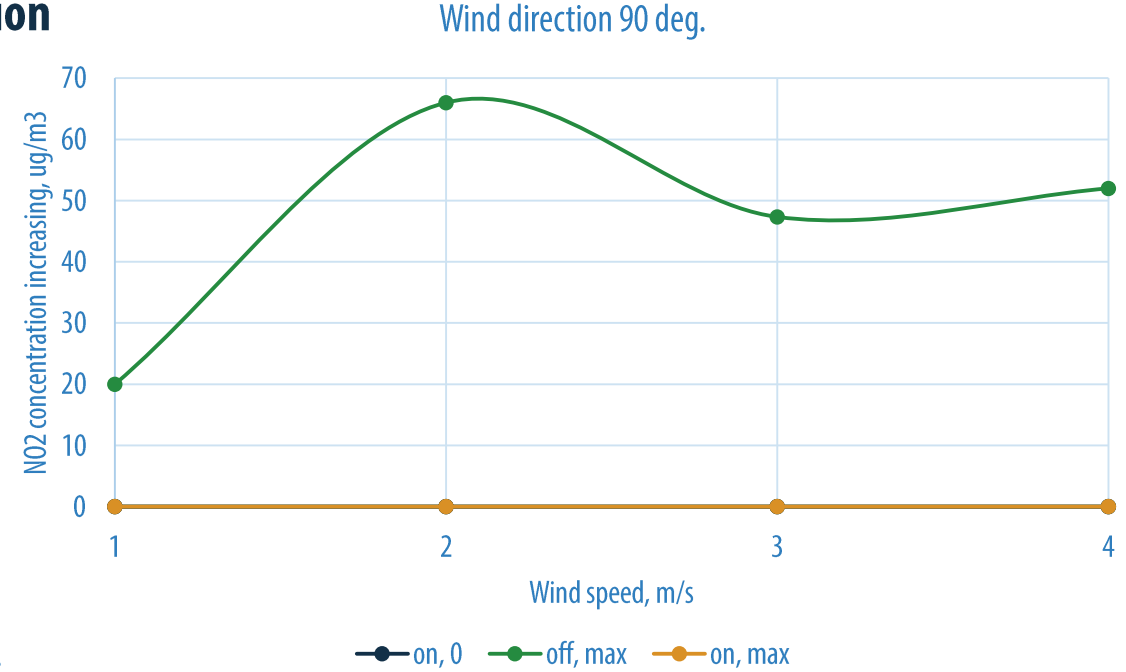

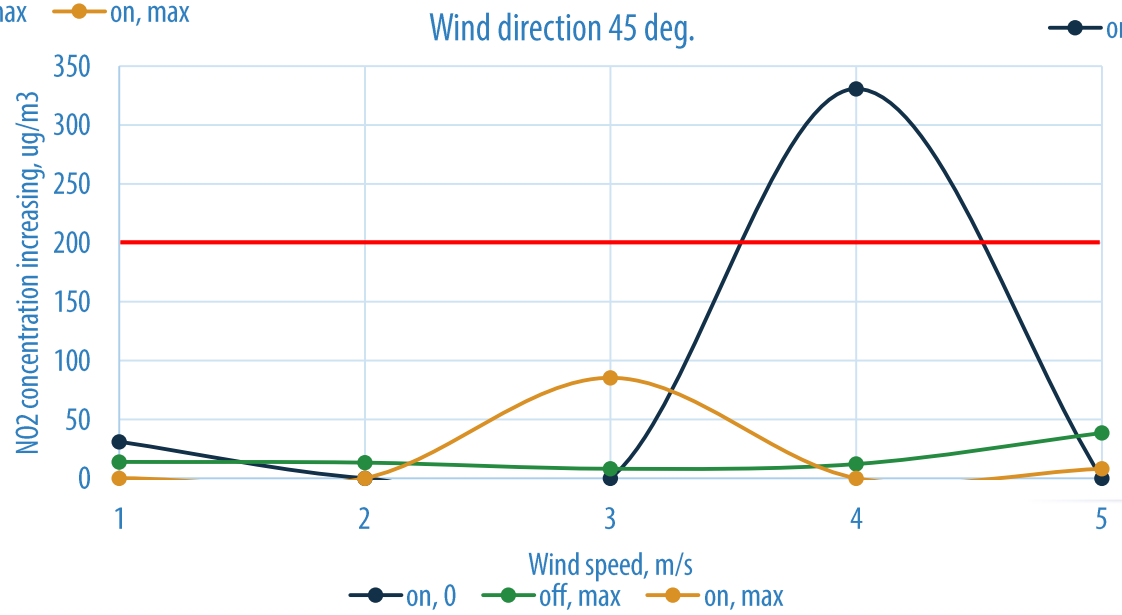

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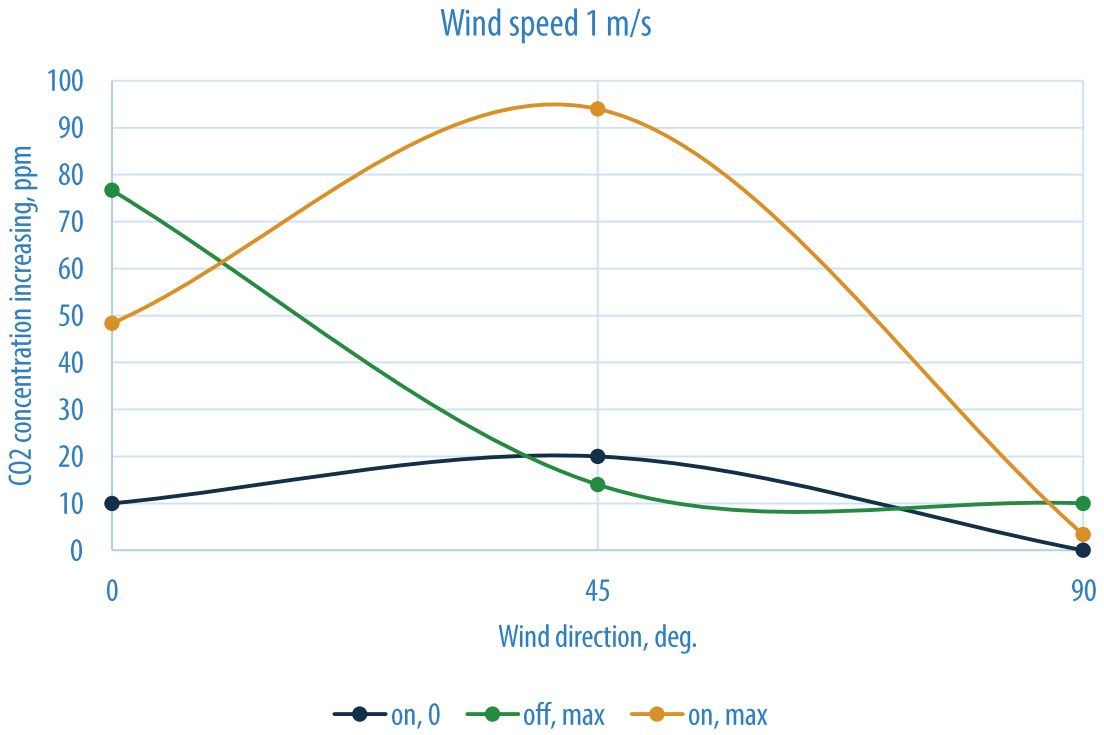
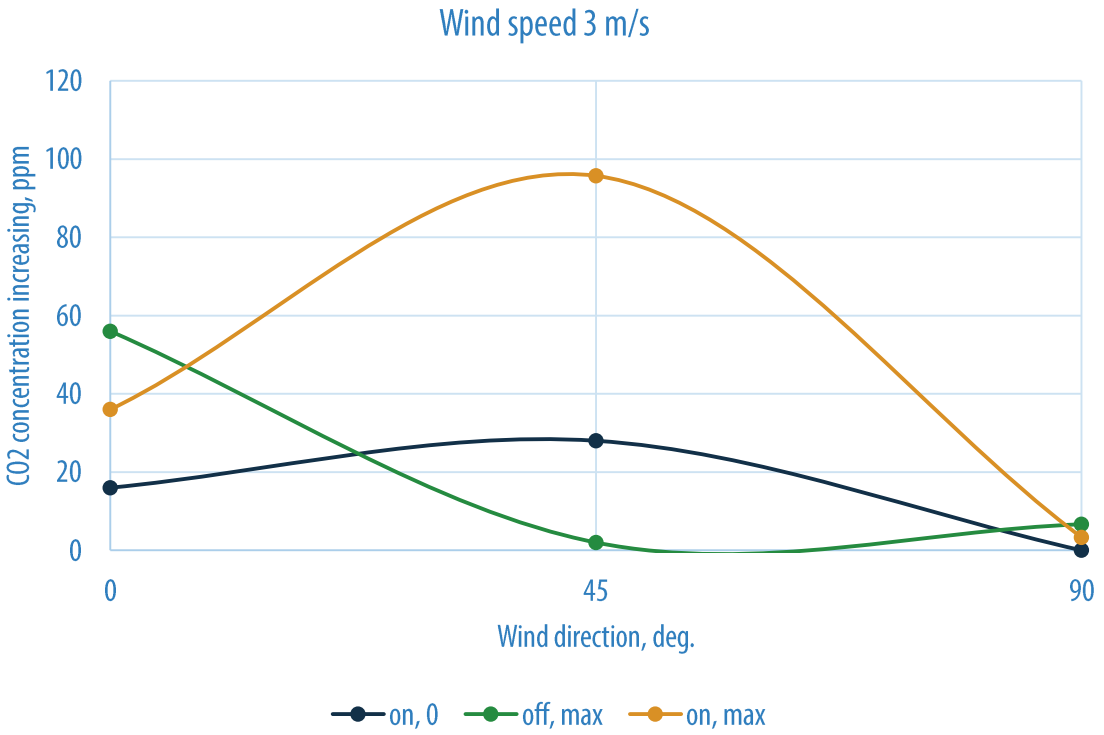
CO_2 concentration





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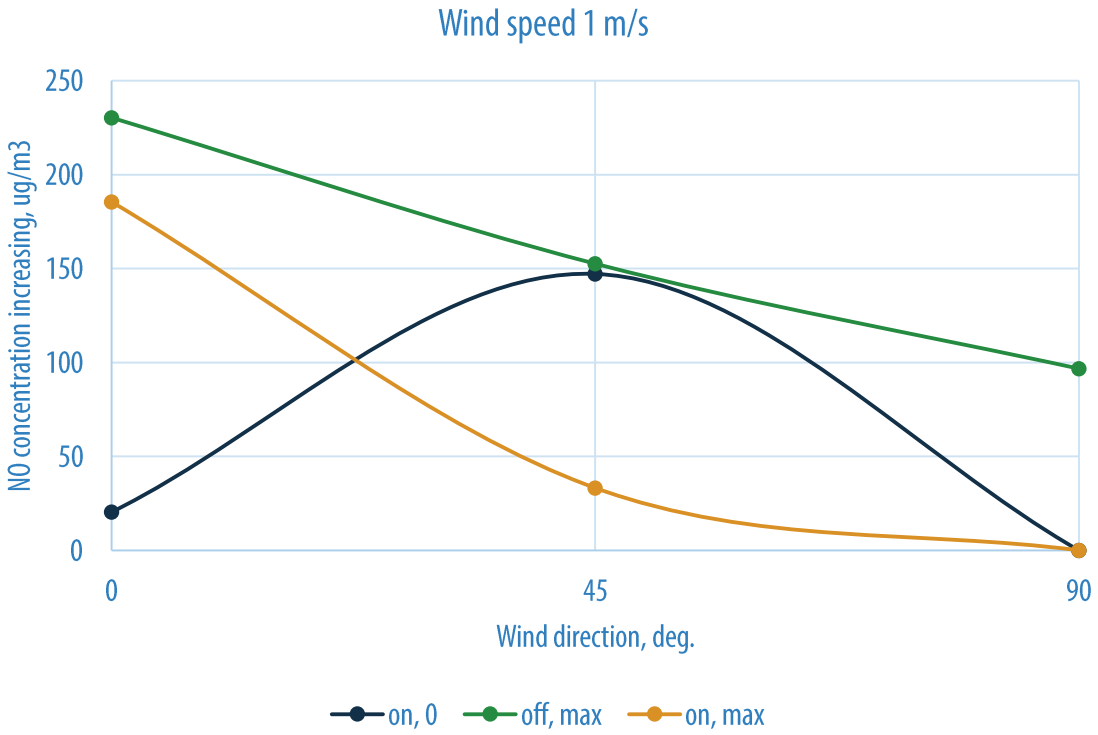

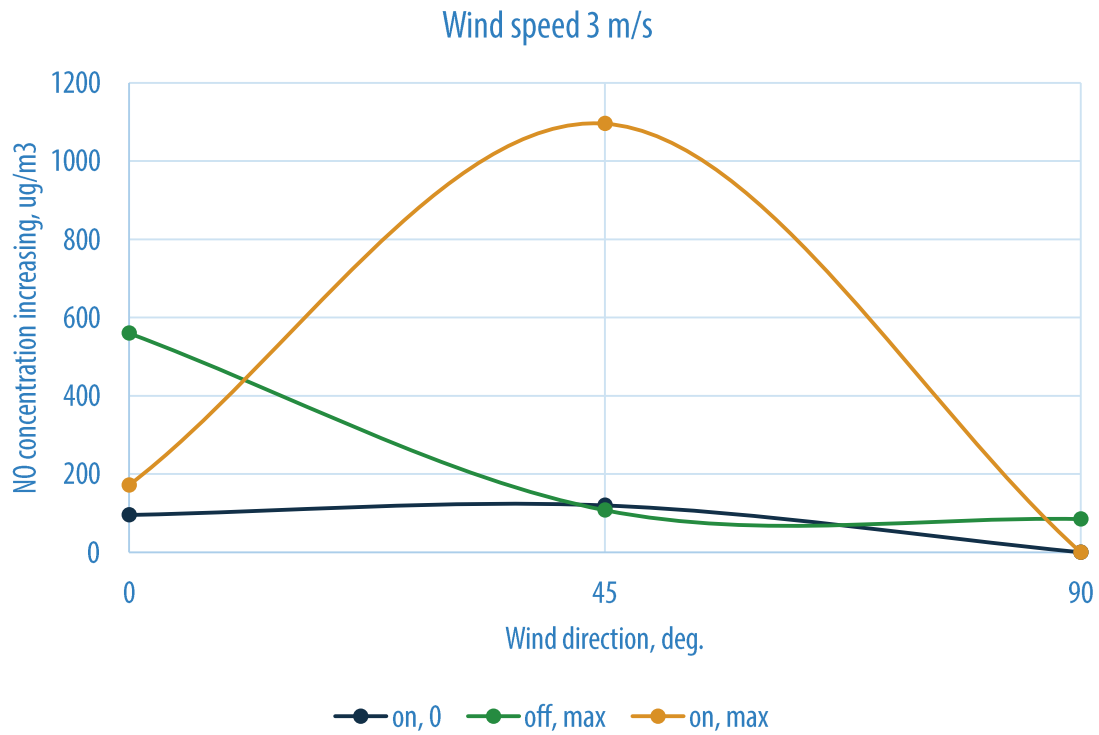

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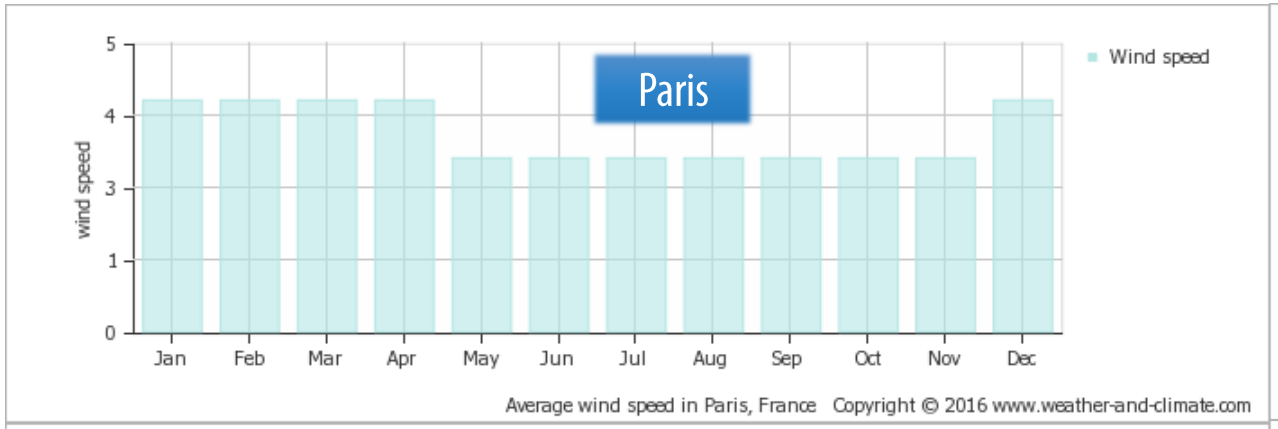
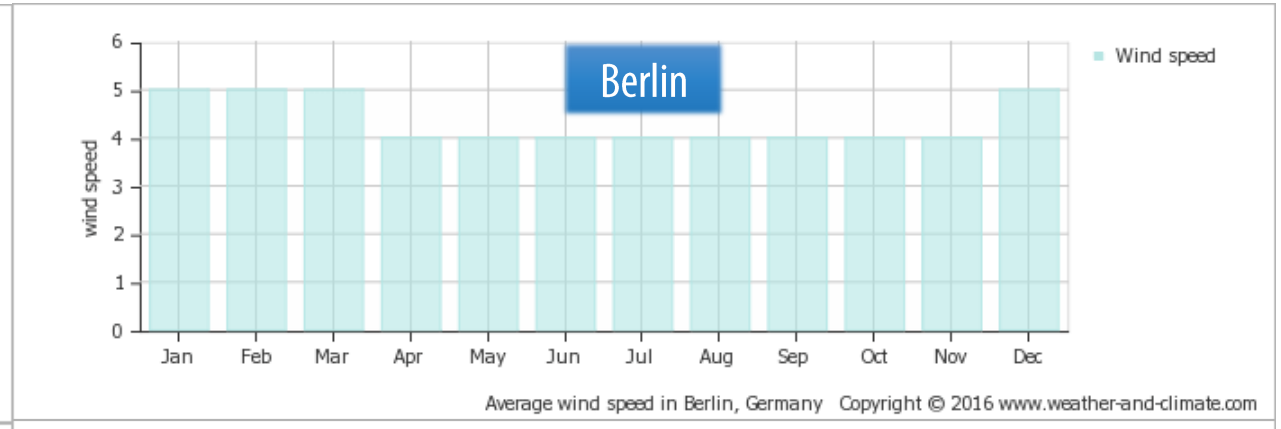
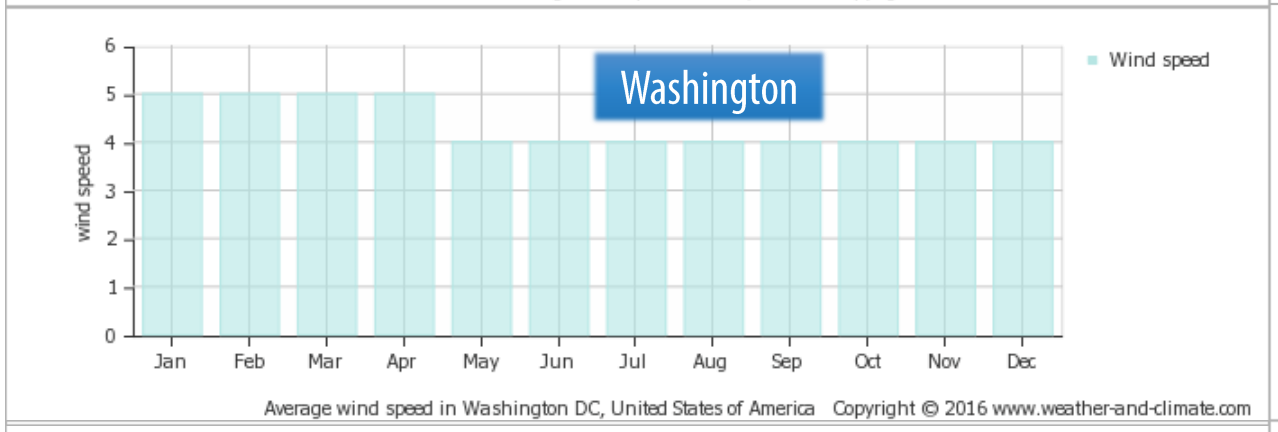
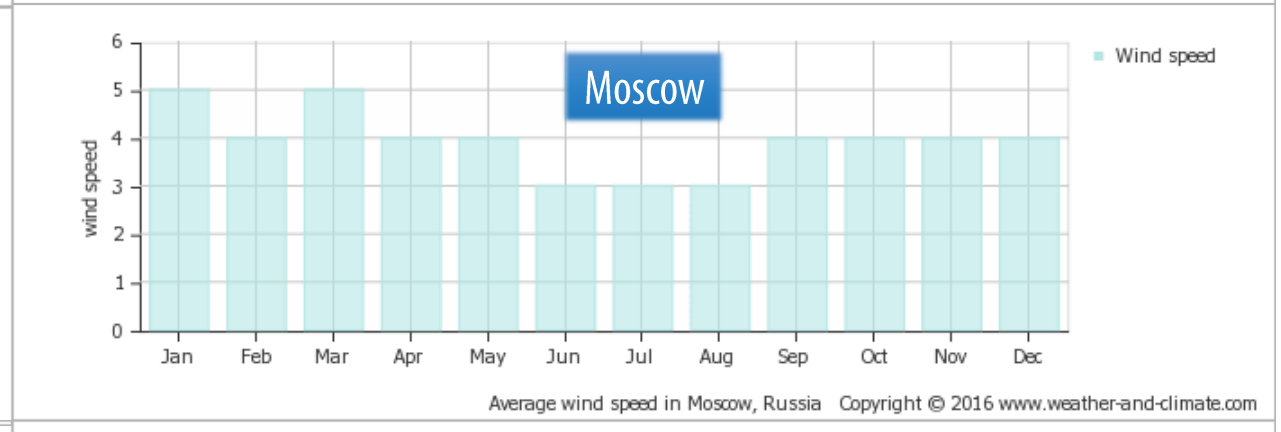
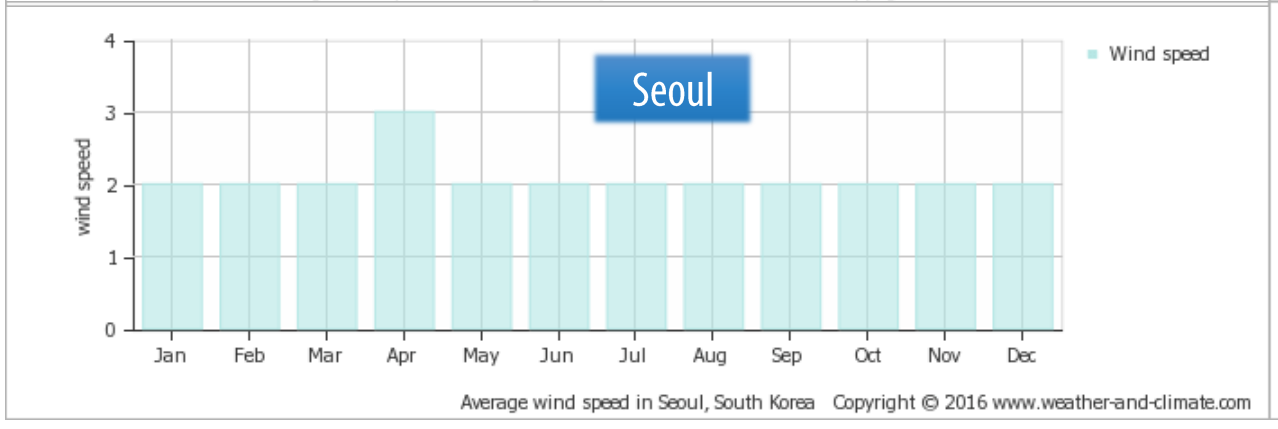
Average wind speed in different cities

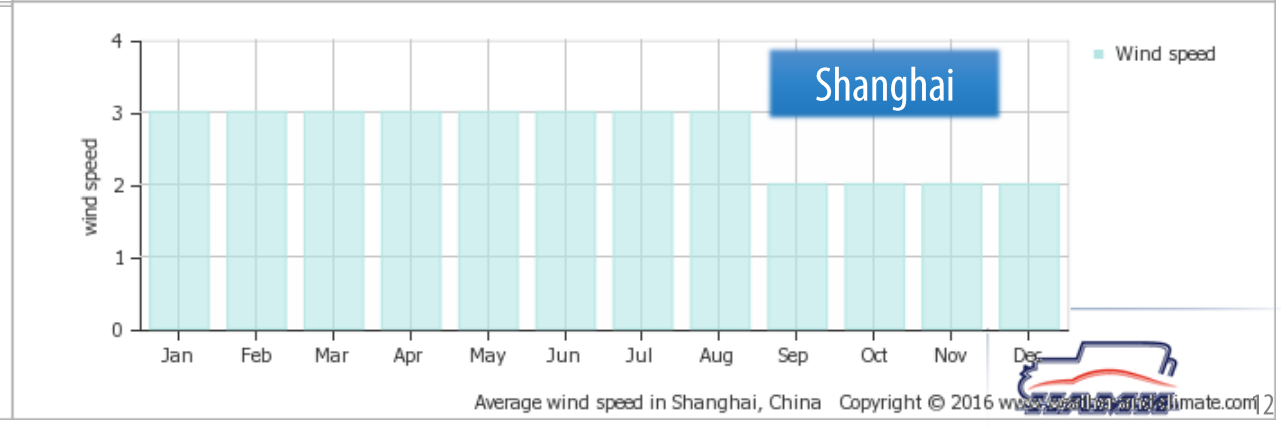




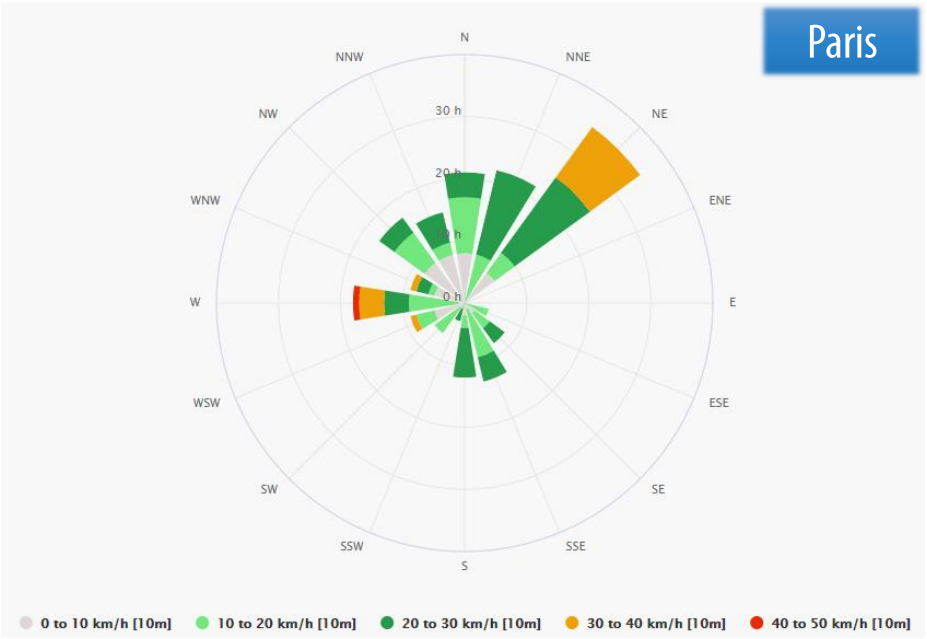


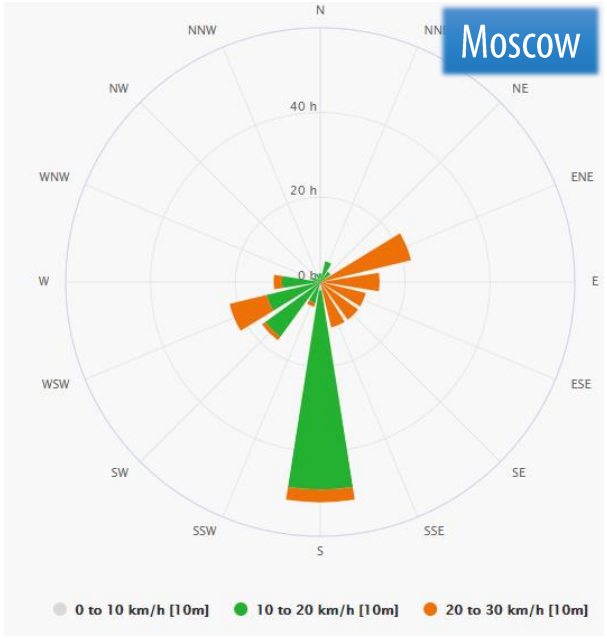


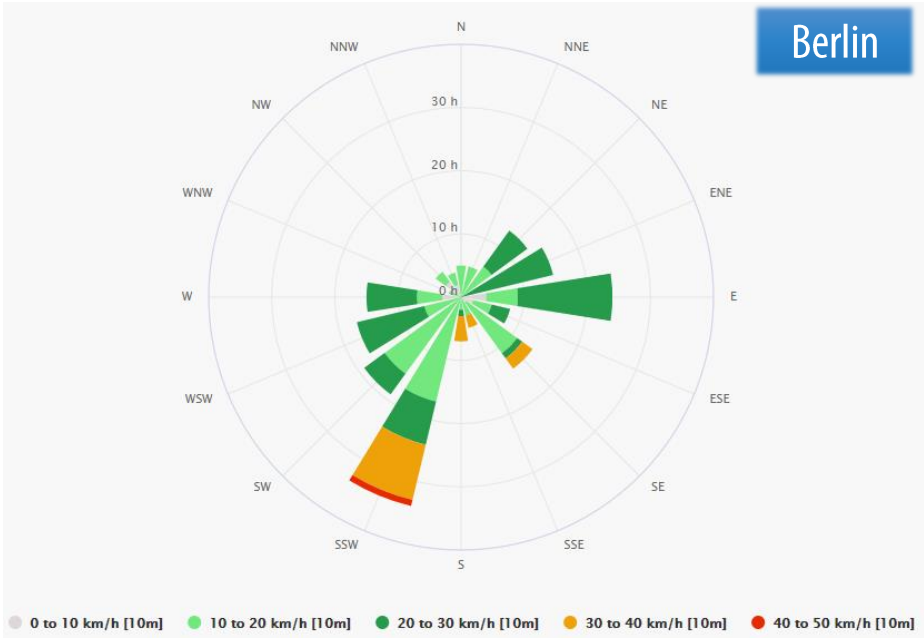


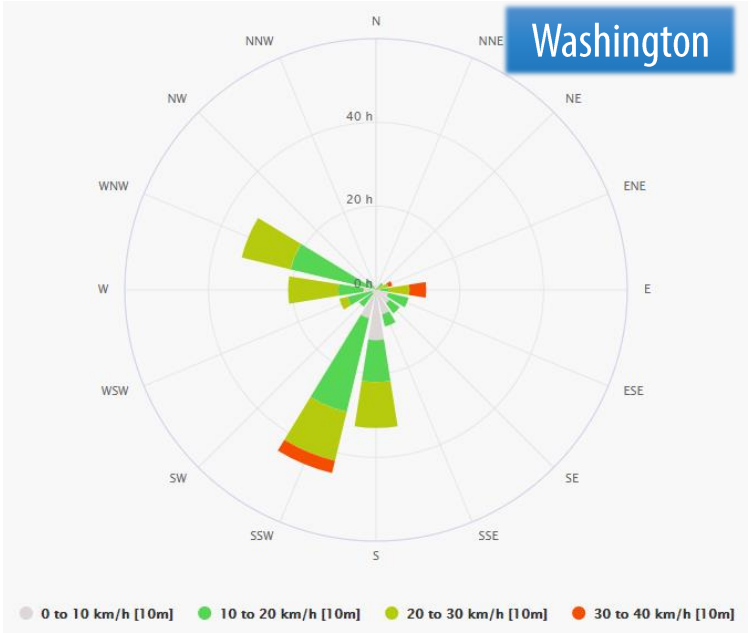


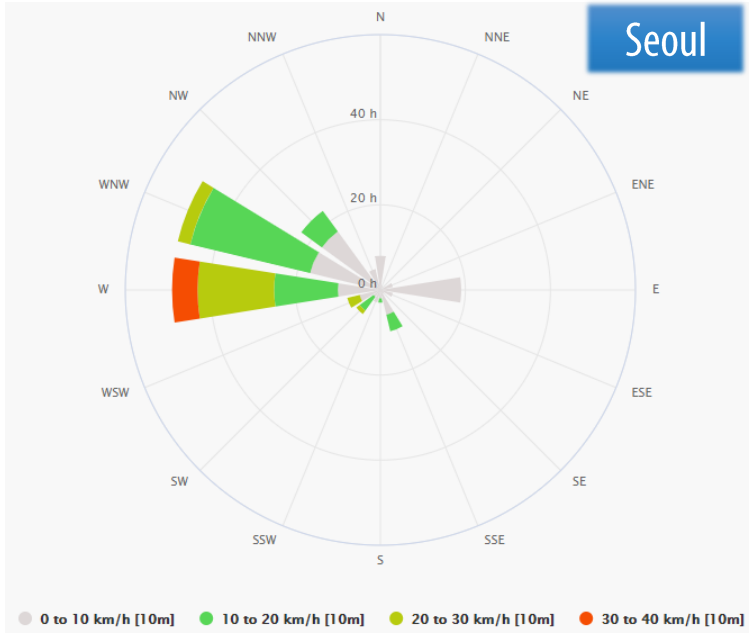
Wind roses of different cities

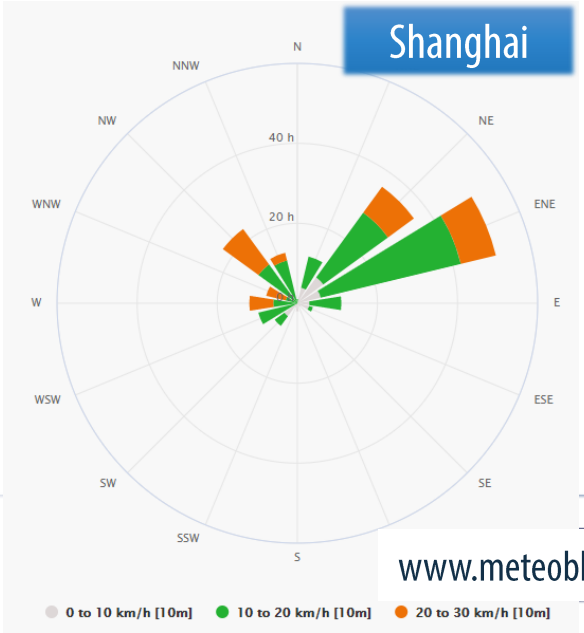








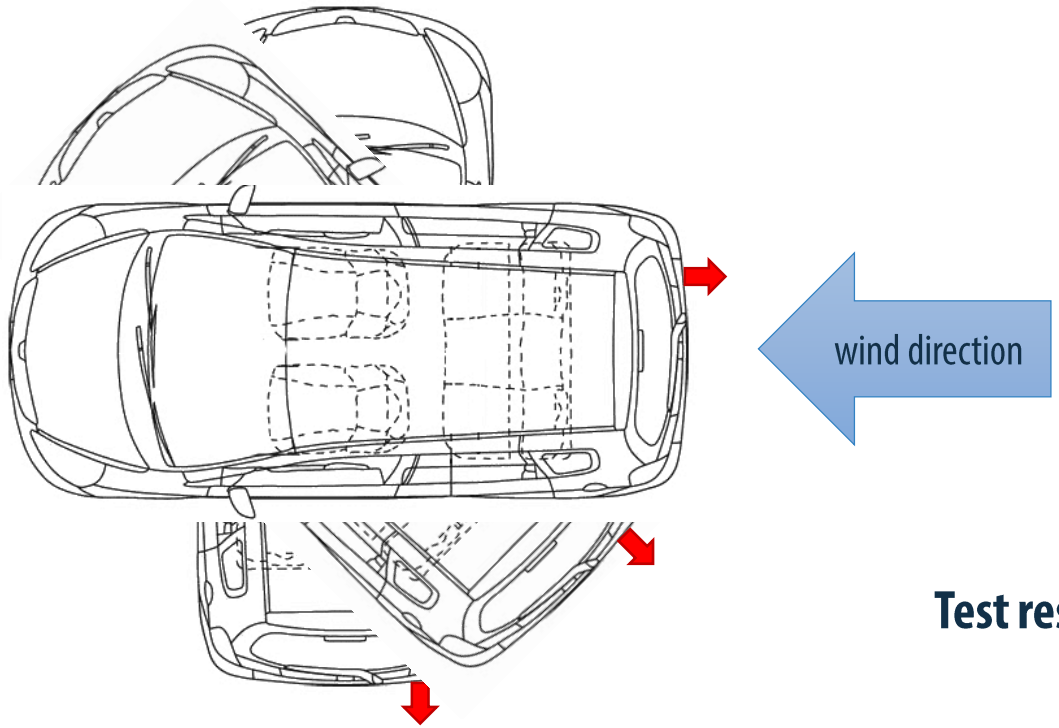




I variant: open area

- real world conditions
- small test cost

- less accuracy and repeatability



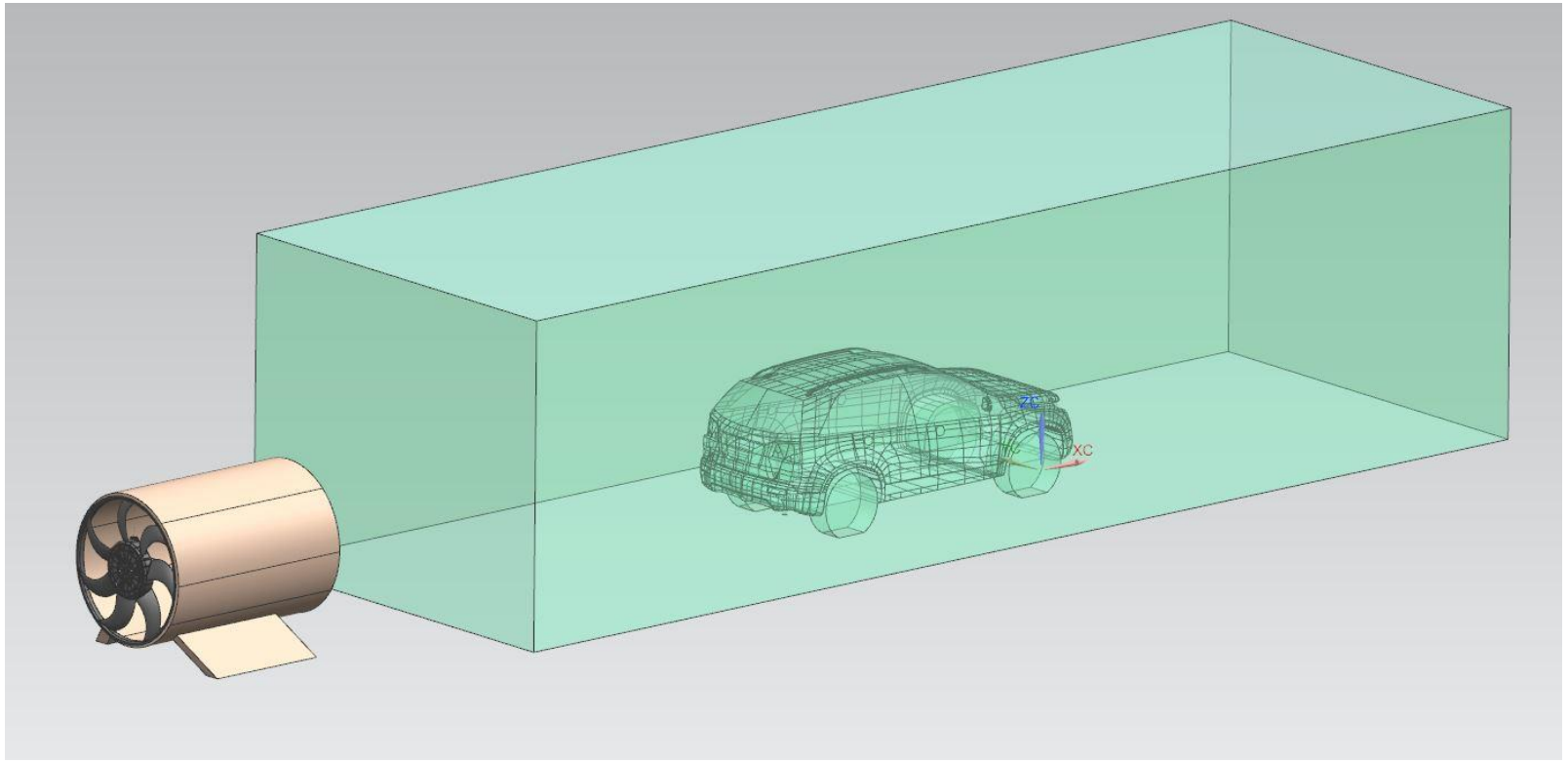
Wind direction	0 deg.	45 deg.	90 deg.
Wind speed, m/s	1-2	3-4	3-4
Ventilation speed	MAX	MAX	MAX
Recirculation	OFF	ON	ON

Test result: maximal measured concentration from all measured conditions/HVAC mode

II variant: wind tunnel

➢ accuracy and repeatability

➢ more expensive equipment
➢ for different position against wind it is needed big tunnel



Test conditions:

Wind speed:

➢ **1-2 m/s**

Wind direction:

➢ **0 deg.**

Ventilation mode:

➢ **Recirculation OFF**
➢ **Ventilator speed - MAXIMAL**

Conclusions

1. There are two options for measuring concentrations of harmful substances in interior air:
   - on the open area (this option allows to reproduce real world conditions)
   - in the wind tunnel (this option allows to have more reproducible results)
2. Every vehicle has its own configuration of body shape and ventilation channel location, so it is difficult to find one common set of test conditions for all types and models. It is advisable to make some measurements at different combinations of wind speed and directions and than define maximal measured concentration from all measured cases as the result of idling mode test.
3. As an option for test on the open area could be measurement during 2…3 days (or some measurements during one hole day) with averaging of measurement results at the same combinations of wind direction and HVAC operation mode.

Thank you for your attention!

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