Effect of the uncertainty in meteorology on air quality model predictions

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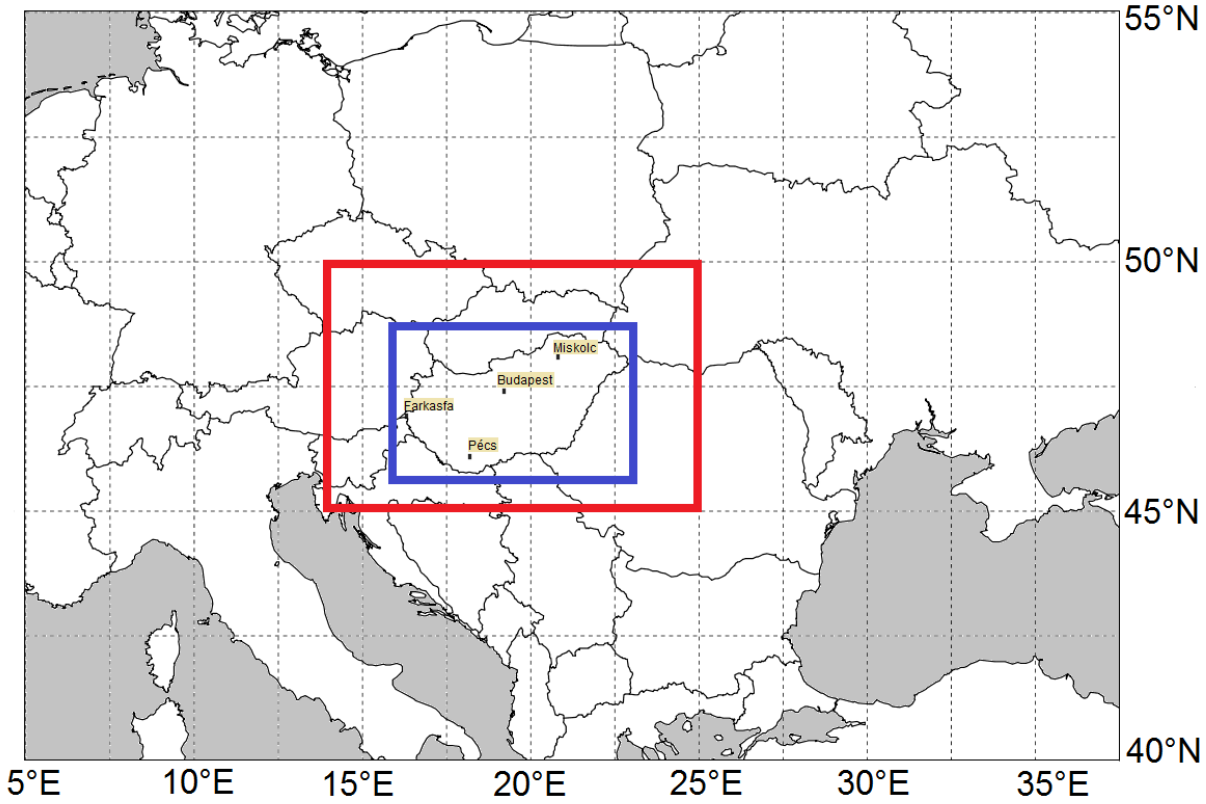
Short introduction



Grid spacing: 0.1° (10 km)

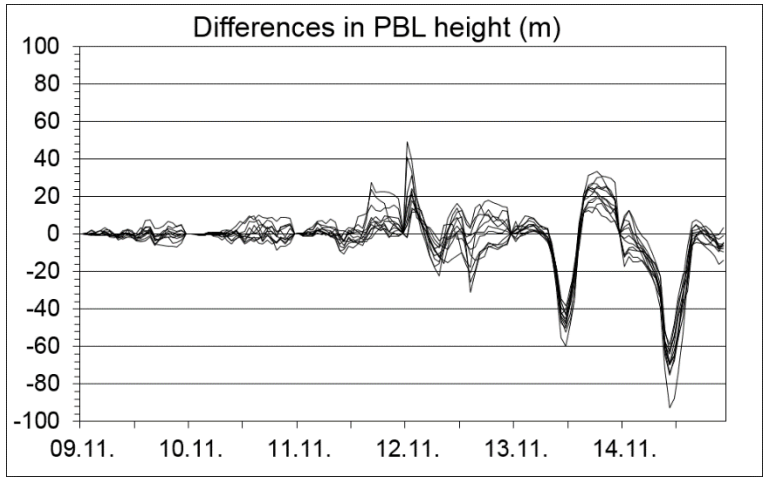
Informations about the modelling system:

CTM	CHIMERE (version 2017)
Meteorology	AROME and AROME-EPS
Emission	EMEP (year 2015)
Biogenic emission	MEGAN
BC, IC	LMDz-INCA

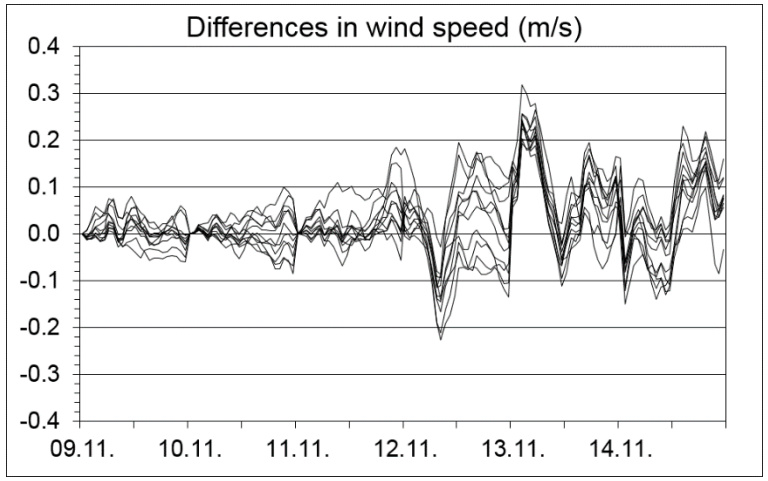
Episode situations:

6–13 January 2020
17–22 January 2020
09–14 November 2020

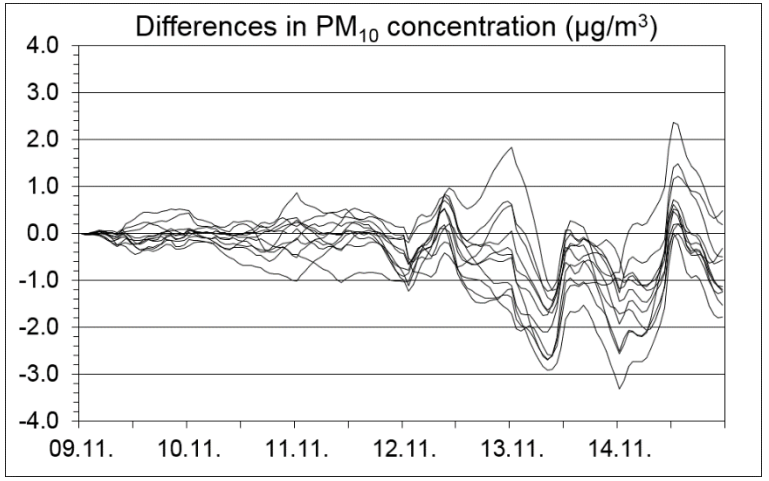
Results I. *Areal averages, 09–14 November 2020*



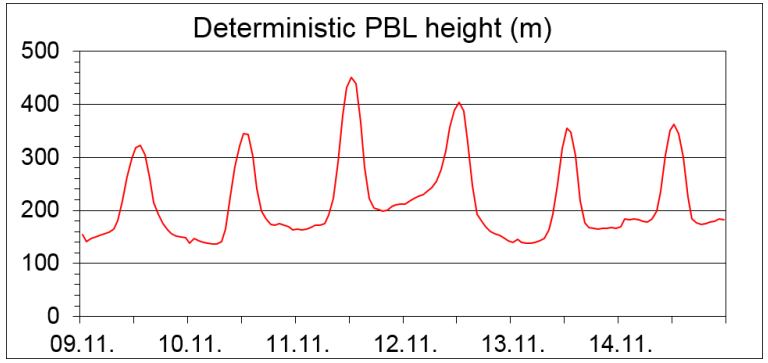
Largest differences:	+49 m
	–93 m

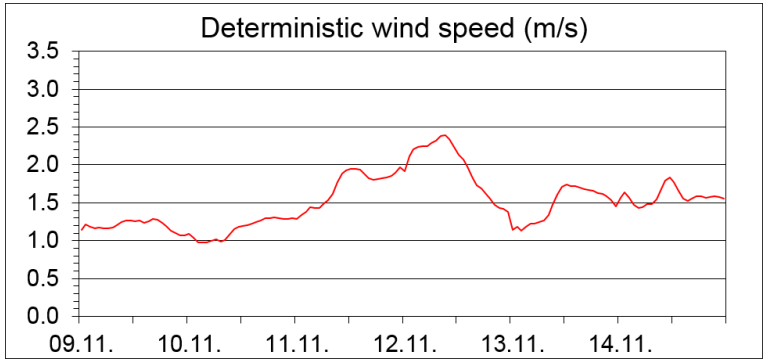


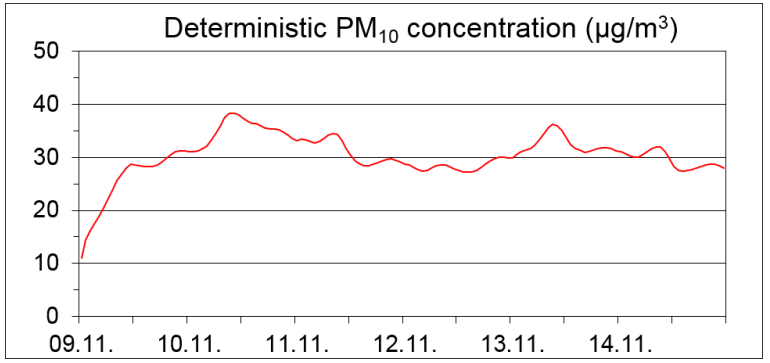
Largest differences:	+0.3 m/s
	–0.2 m/s



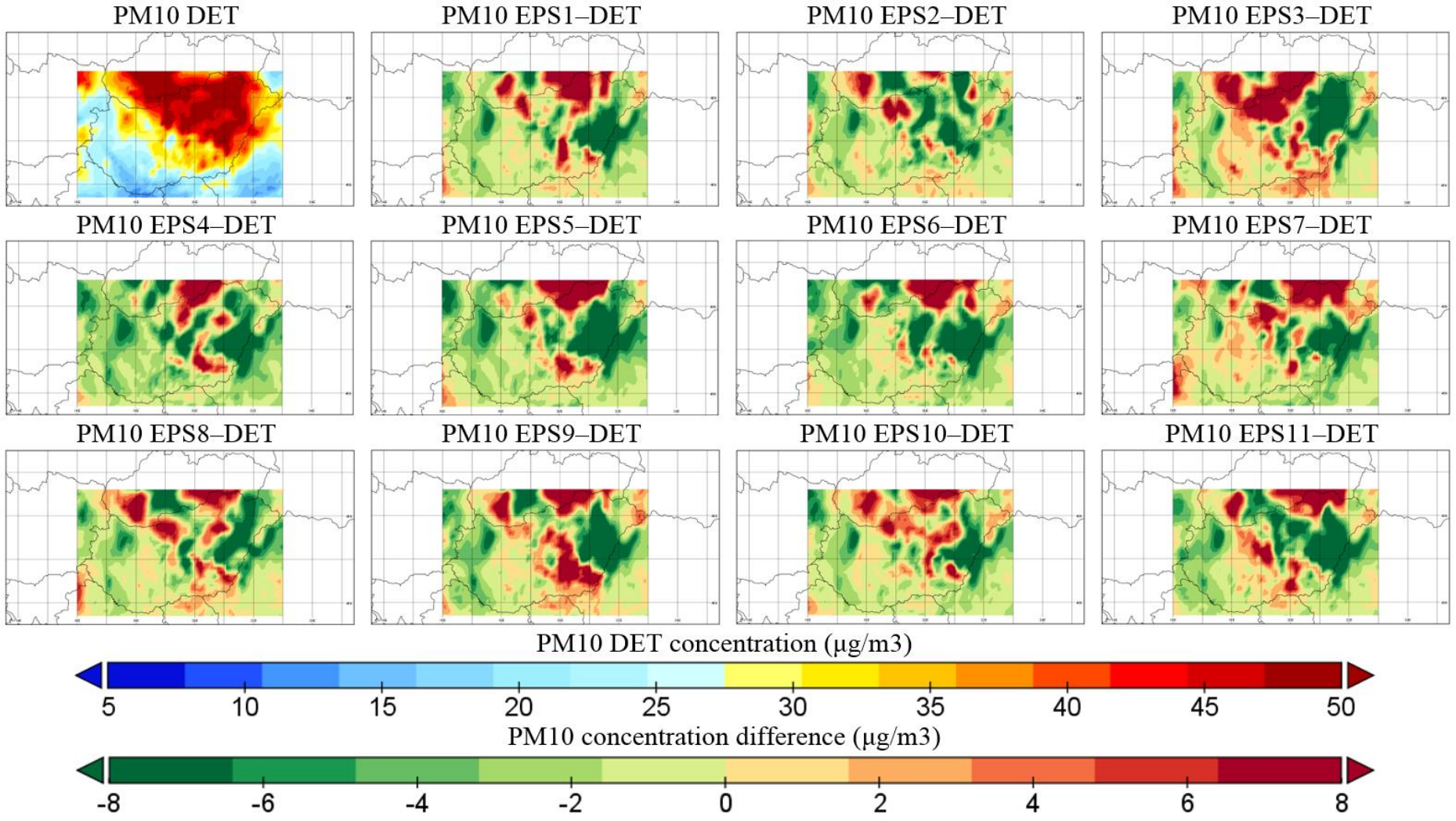
Largest differences:	+2.4 µg/m^3
	–3.3 µg/m^3



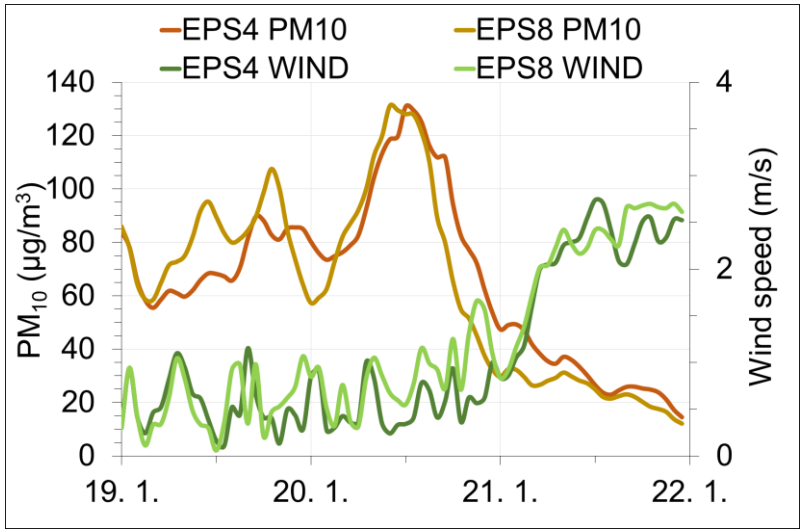


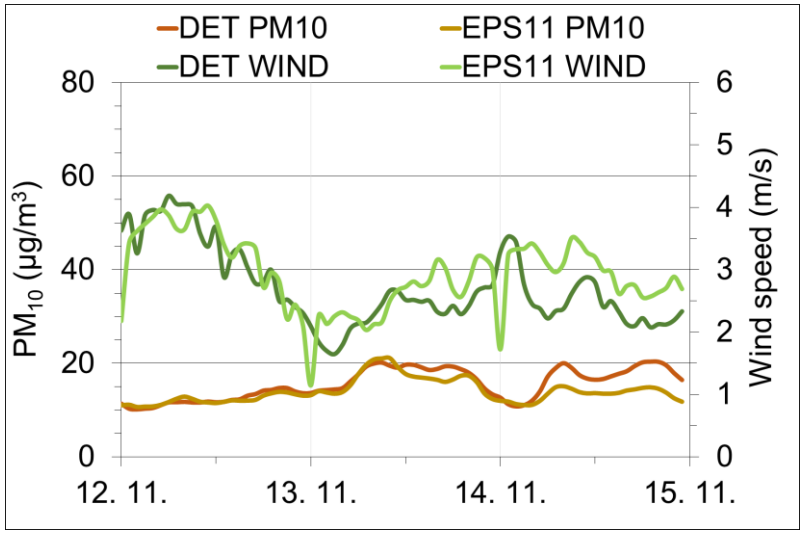


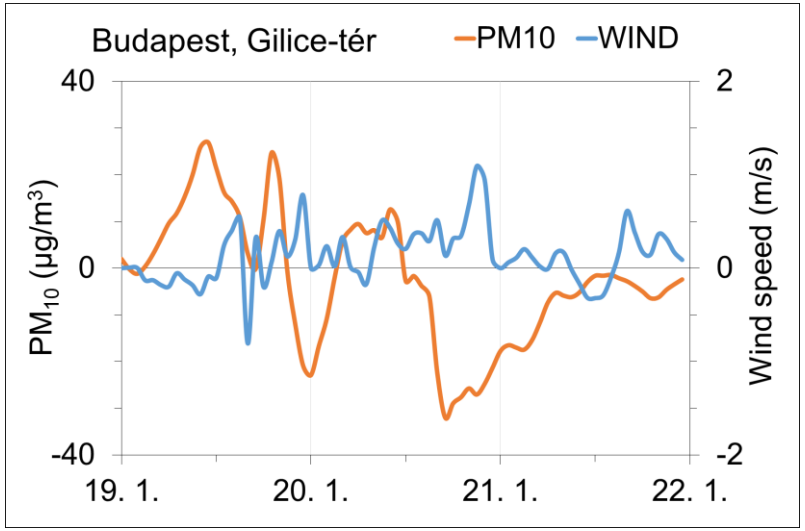
Results II. *PM_{10} concentration daily averages on 13. November 2020*

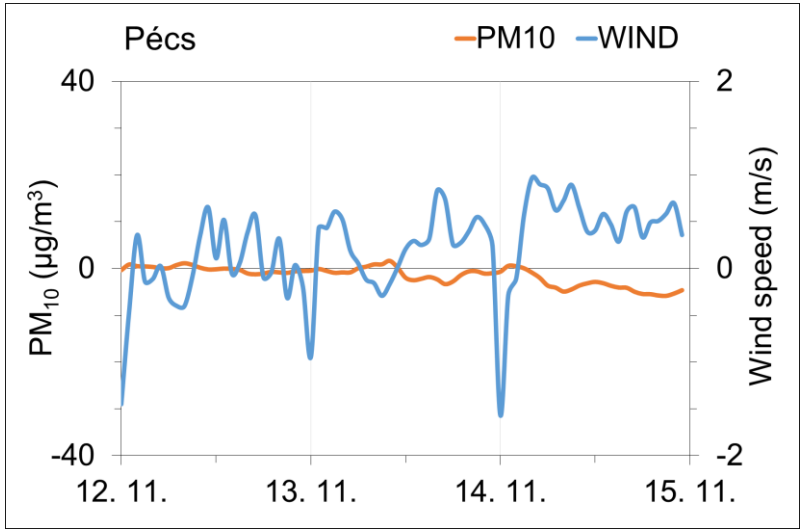


Effect of the EPS meteorology on the air quality forecast





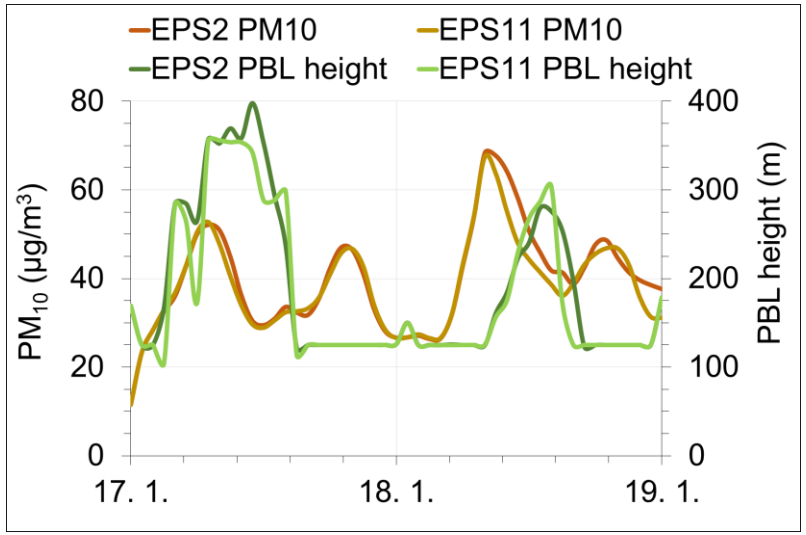


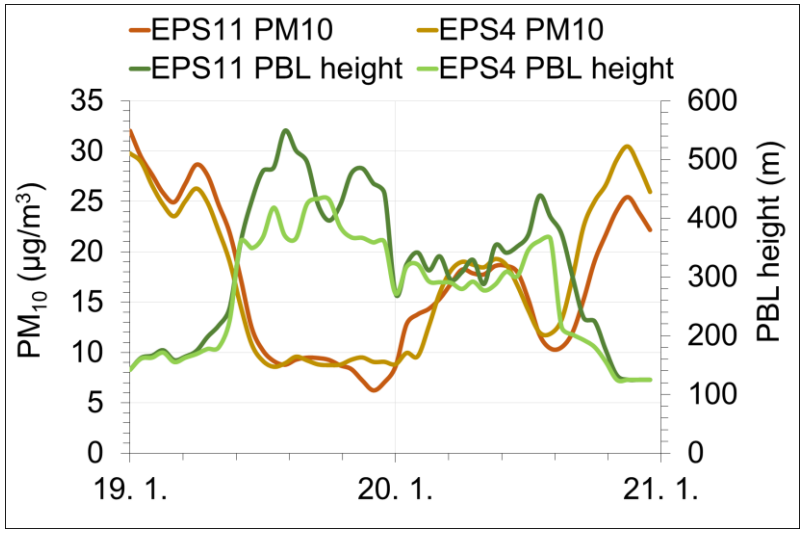


Wind	
Light	**< 2 m s^{-1}**
Strong	> 2 m s^{-1}

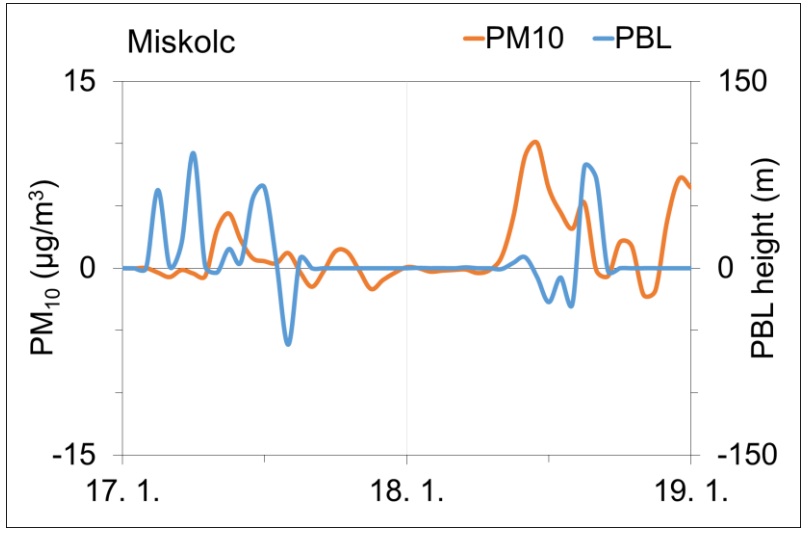
Light wind	PM_{10}
↑ 1 m s^{-1}	**↓ 10 µg m^{-3}**
↓ 1 m s^{-1}	↑ 5 µg m^{-3}

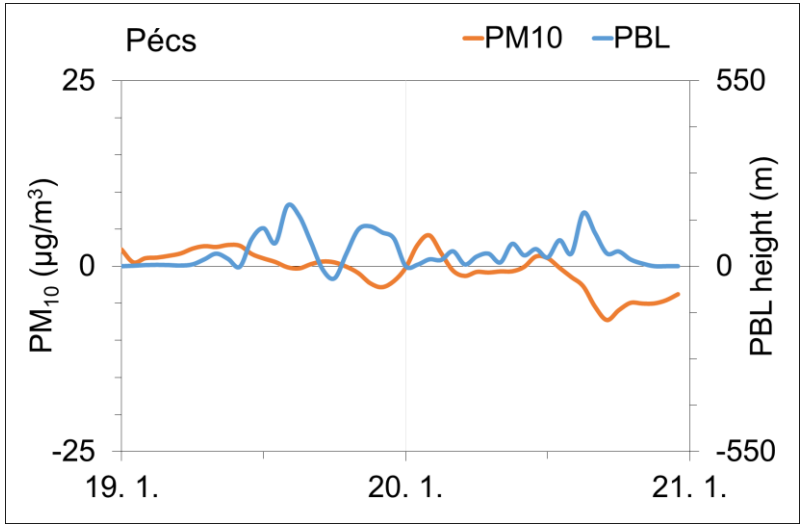
Effect of the EPS meteorology on the air quality forecast





PBL height	
Low	< 400 m
High	**> 400 m**





PBL height	PM_{10}
↑	↓
↓	↑

Conclusions

- The accurate meteorological forecast and the perfect emission pattern of sources are the basis of a good air quality forecast
- Key meteorological parameters: precipitation, wind speed, planetary boundary layer height

Wind

- The strengthening of wind speed causes the accumulated air pollutants to diffuse, thereby leading to an improvement in air quality and vice versa
- The differences in the concentration fields due to the modified meteorology (EPS members) are more pronounced in the case of lower wind speeds than they are in the case of higher wind speeds

PBL height

- Increasing boundary layer height is coupled with the decrease of pollutant concentrations
- A decrease in the planetary boundary layer height leads to a definite increase in concentrations
- The differences in the concentration fields due to the modified meteorology are more pronounced in the case of higher boundary layer than they are in the case of lower boundary layer height

THANK YOU FOR YOUR ATTENTION!