Seasonal Variability of Aerosol Composition in Switzerland: A Modelling Study

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Project

characterization of aerosol composition in summer and winter in Switzerland

Periods   : January-February 2006
                             June 2006

Air Quality Model : CAMx

Met- Model   : MM5 (initialized by COSMO)

IC and BC   : global model MOZART for
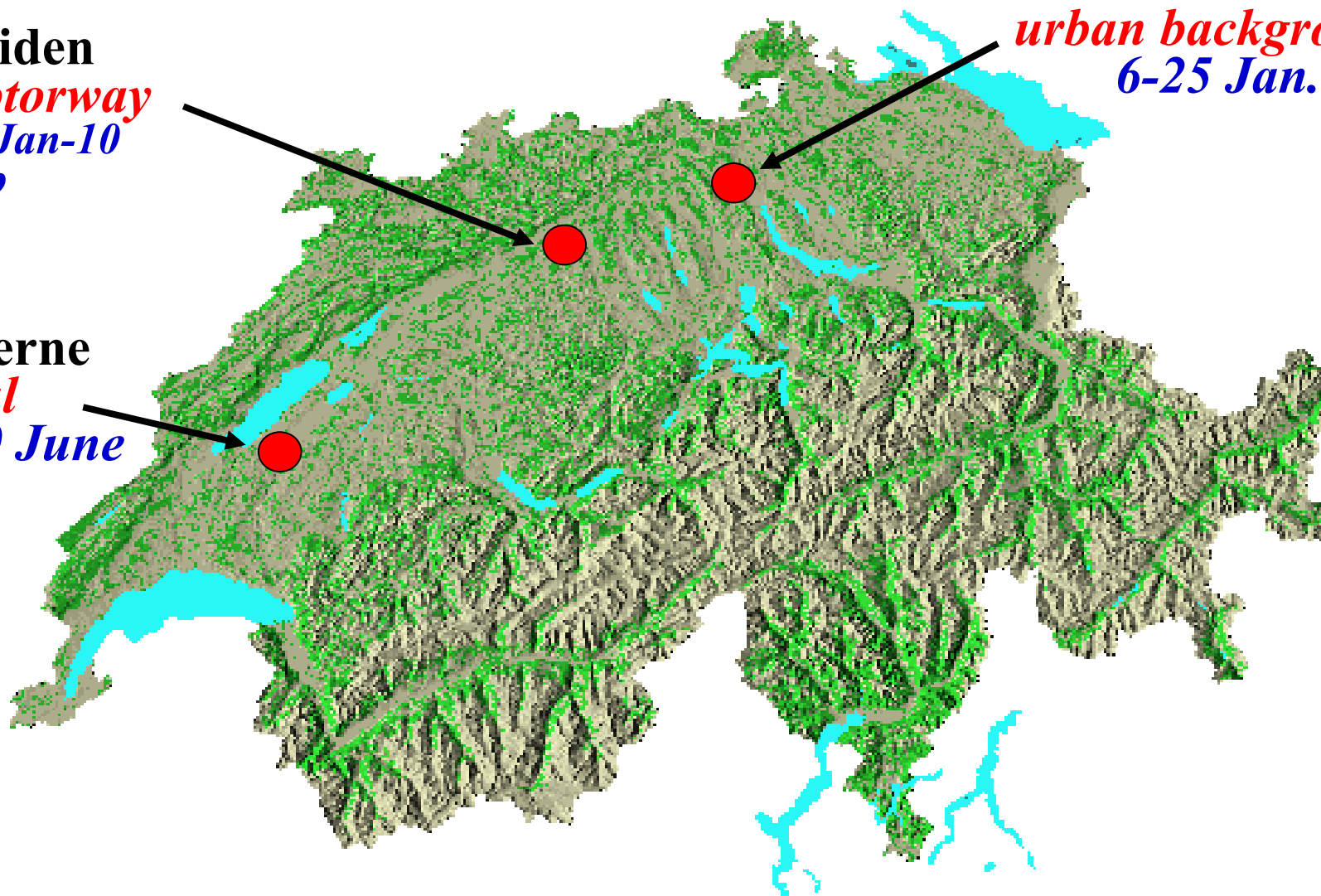   similar periods

CAMx Nested Model Domains

domain 1
27 km x 27 km

domain 2
9 km x 9 km

14 vertical layers

domain 3
3 km x 3 km
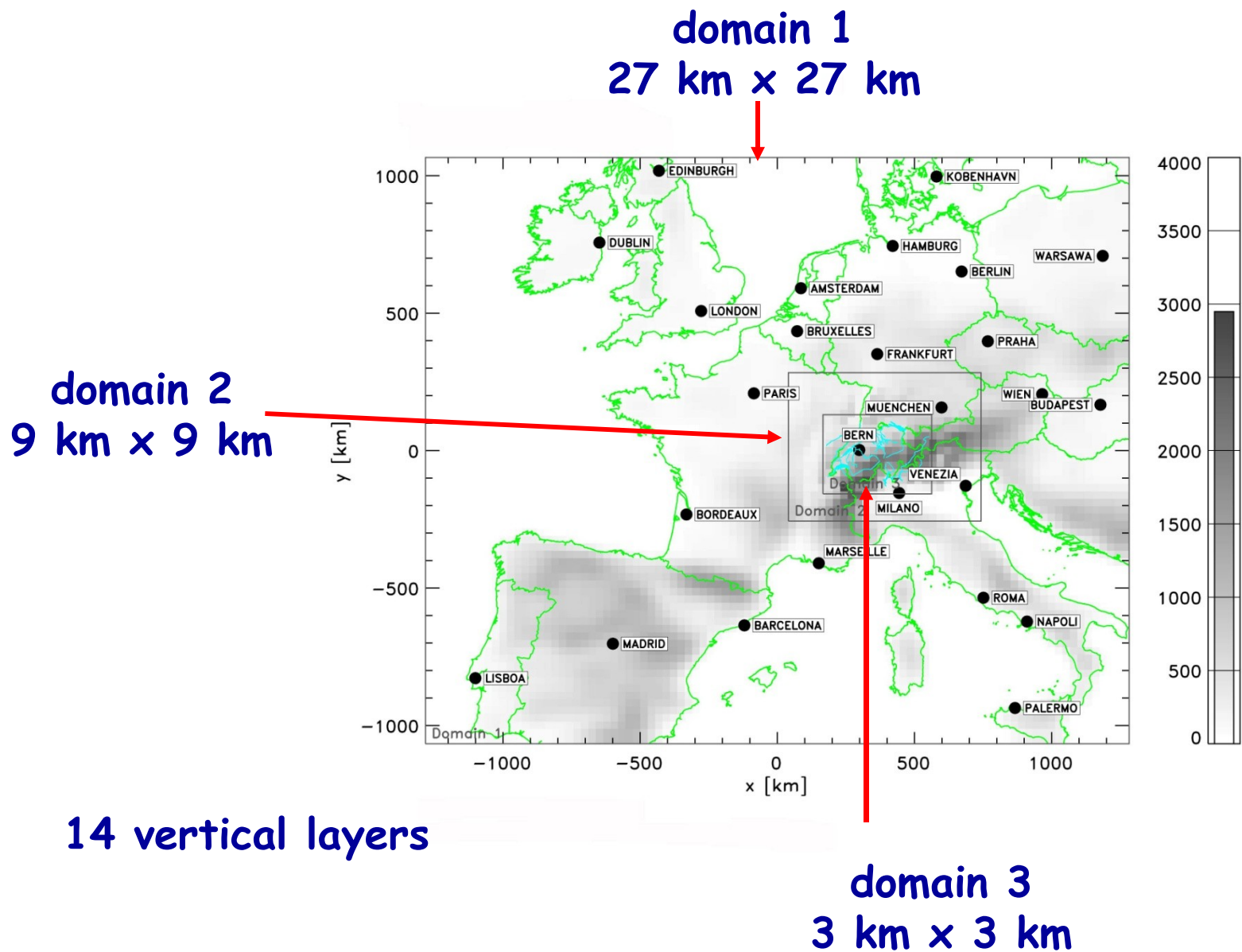
AMS Measurements in 2006

Zurich
urban background
6-25 Jan.

Reiden
motorway
28 Jan-10 Feb

Payerne
rural
1-30 June

Paul Scherrer Institut

LABOR FÜR ATMOSPHÄREN-CHEMIE

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Winter
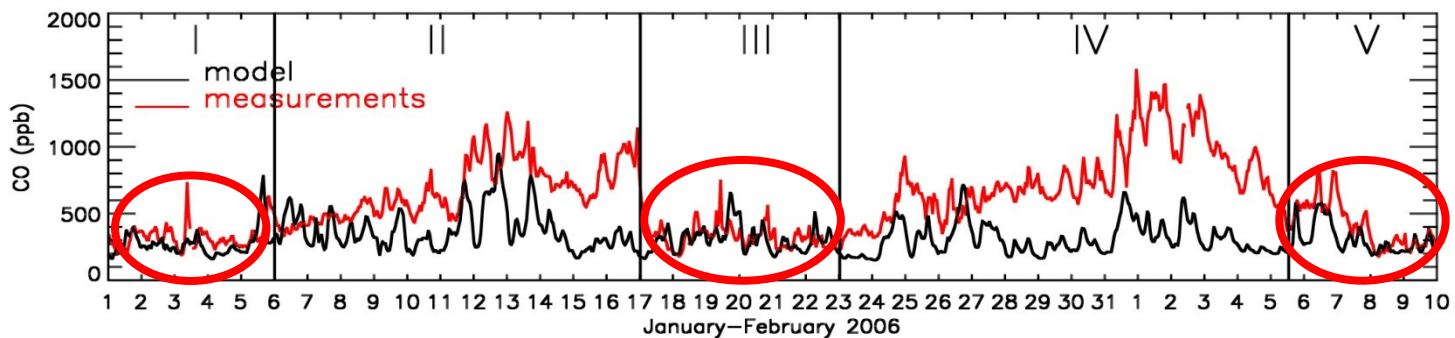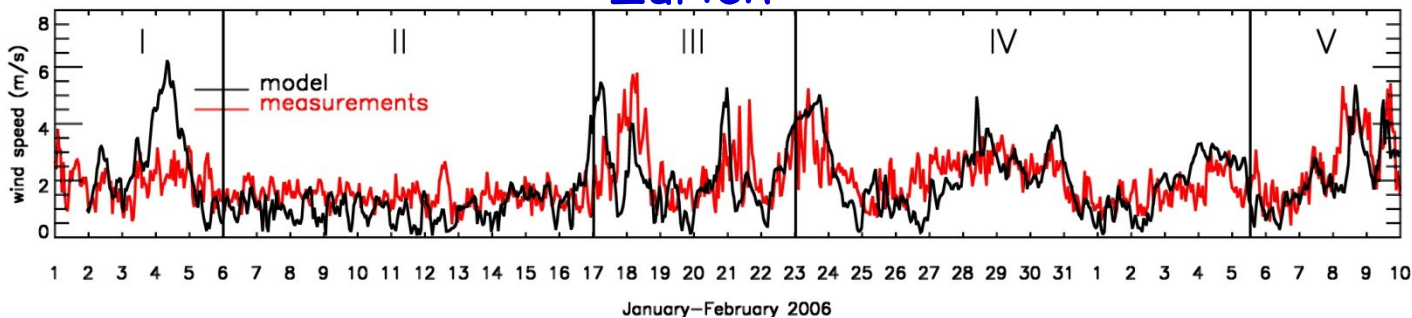
Zurich

| wind speed | 1-6 Jan. moderate | 6-17 Jan. low | 17-23 Jan. high | 23 Jan-5 Feb variable | 5-10 Feb high |

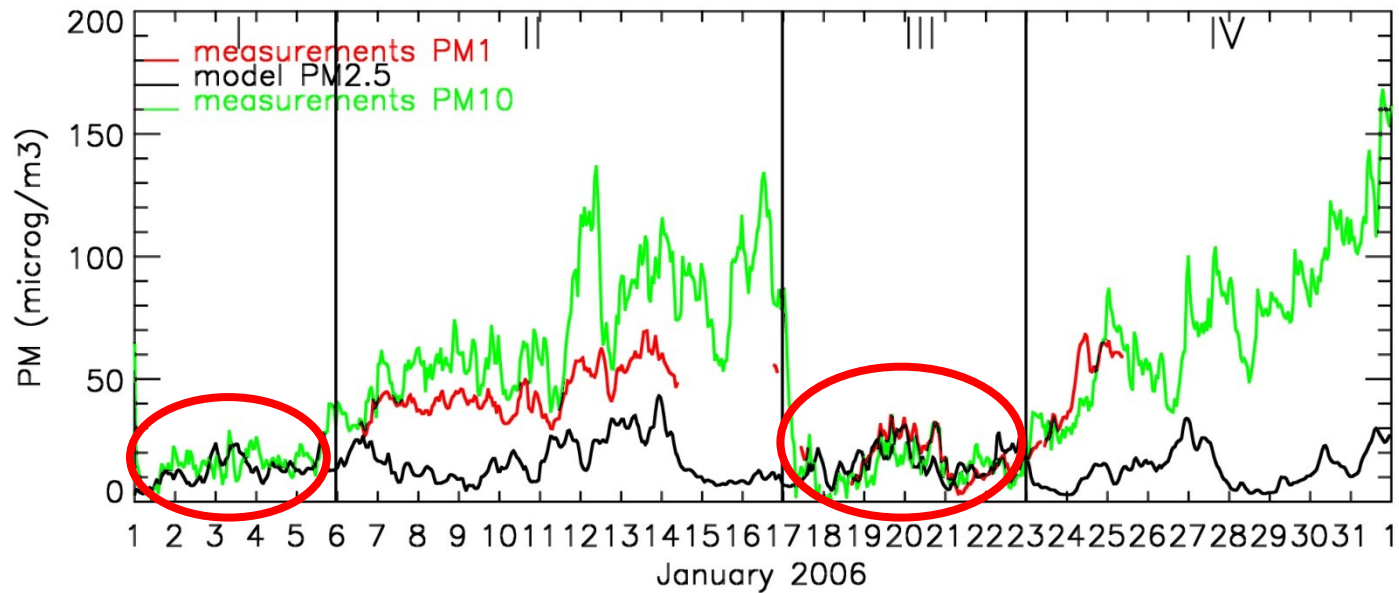# Vertical profiles of potential temperature
Payerne, January 2006

low wind
9 Jan.
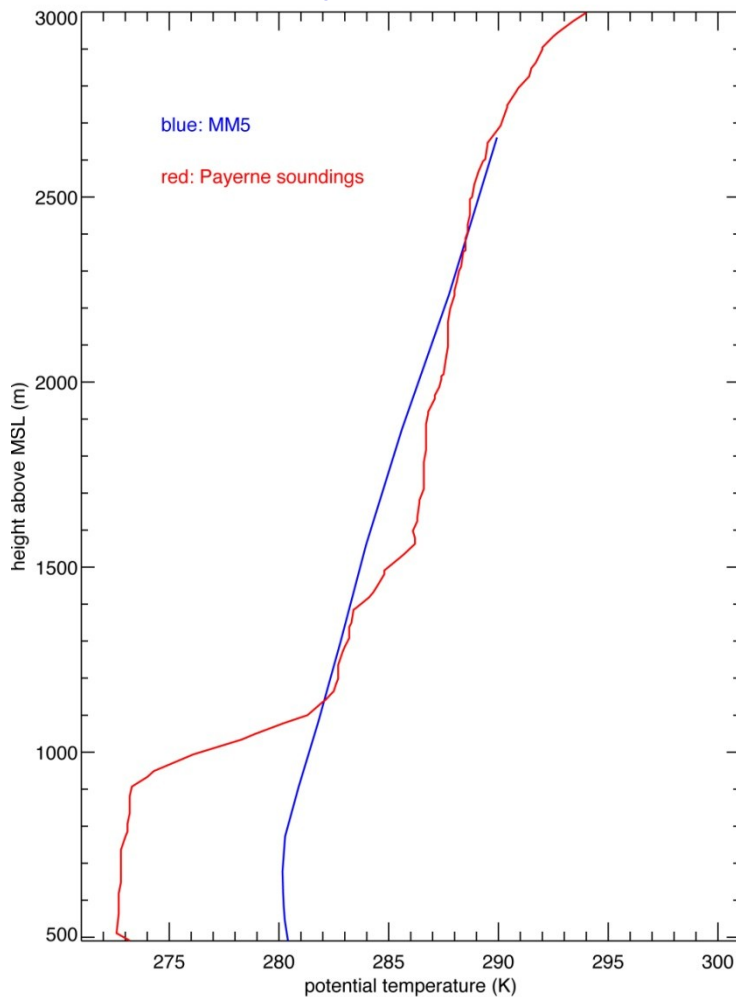
high wind
18 Jan.
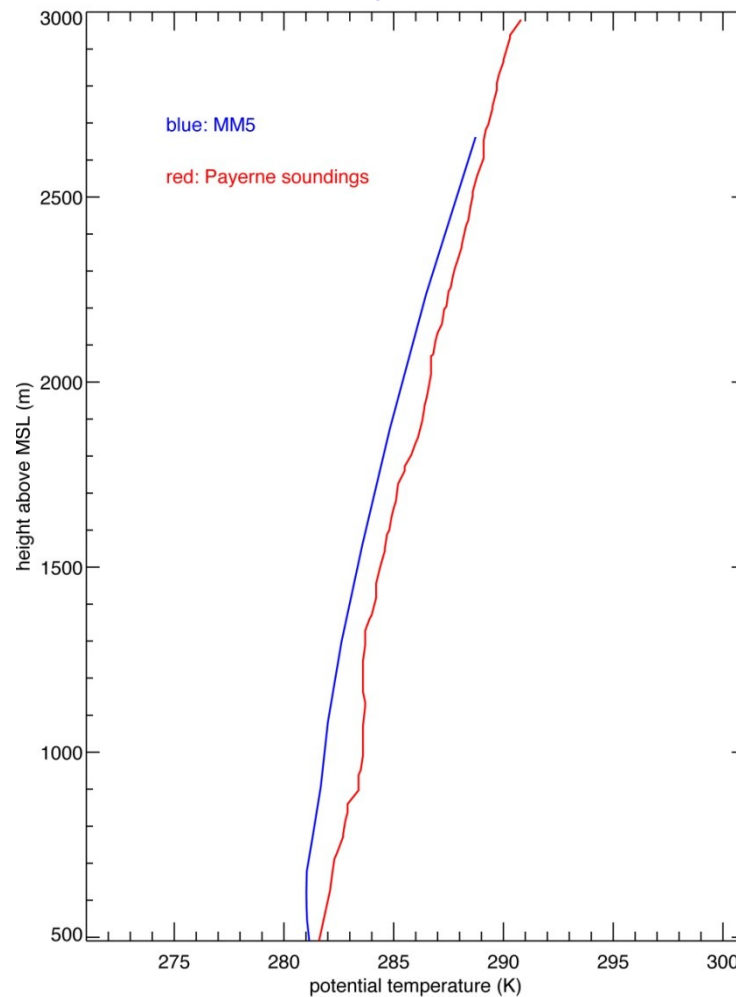
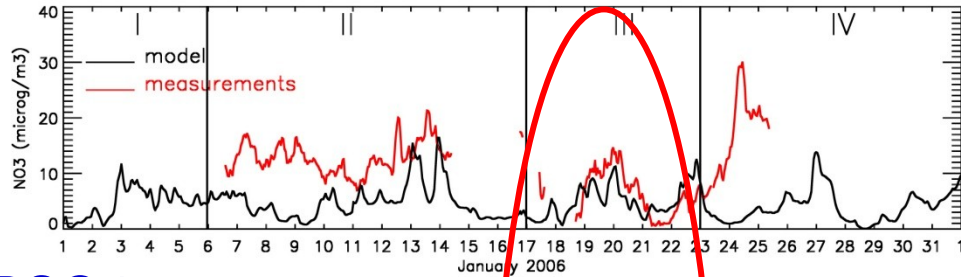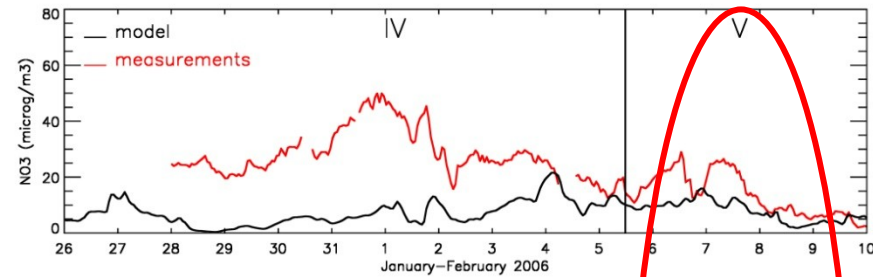Zurich (urban background)

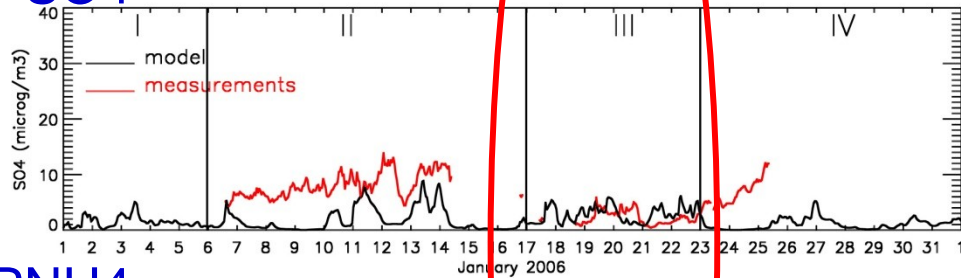

wind
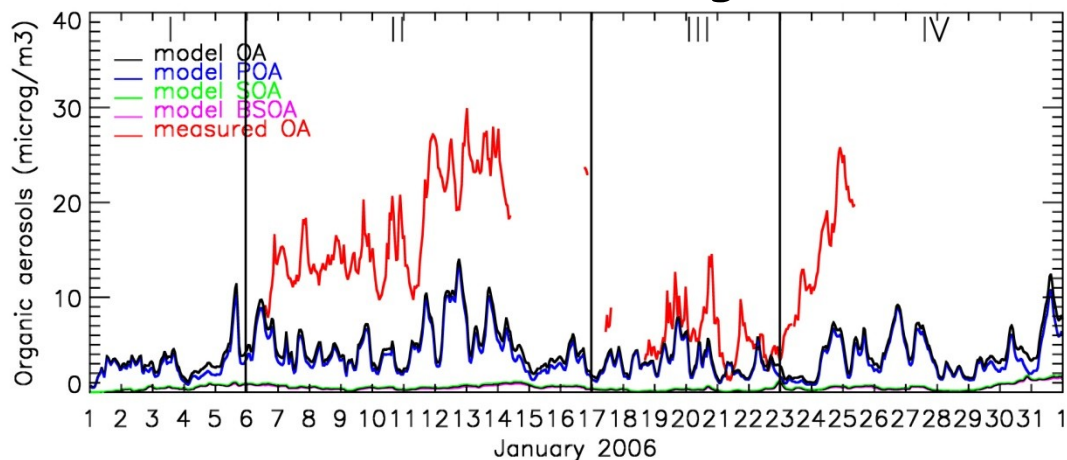speed   moderate   low   high   variable
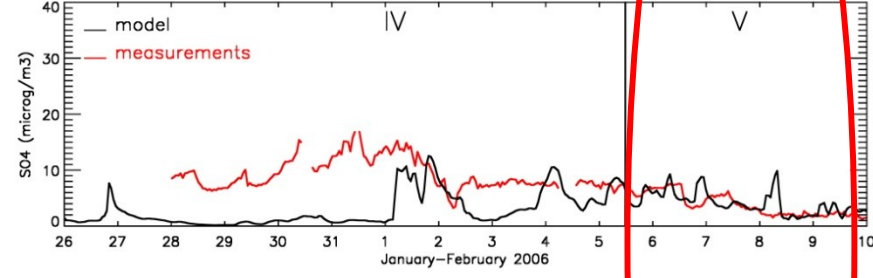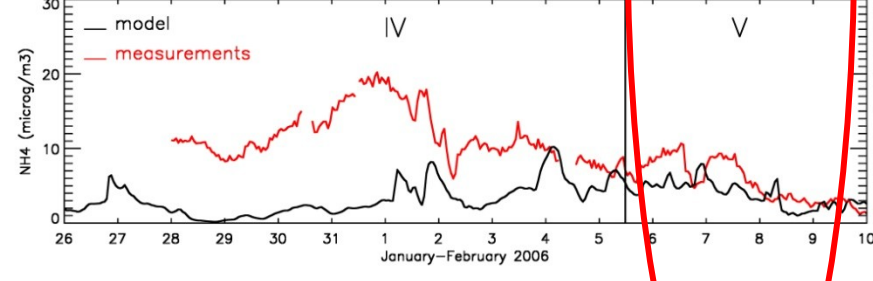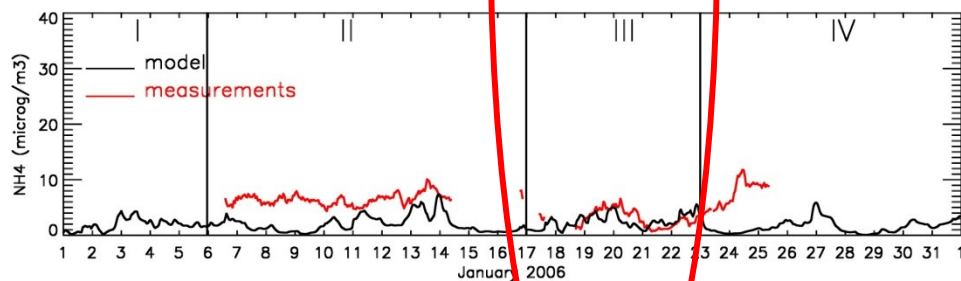
Inorganic Aerosols

Organic Aerosols

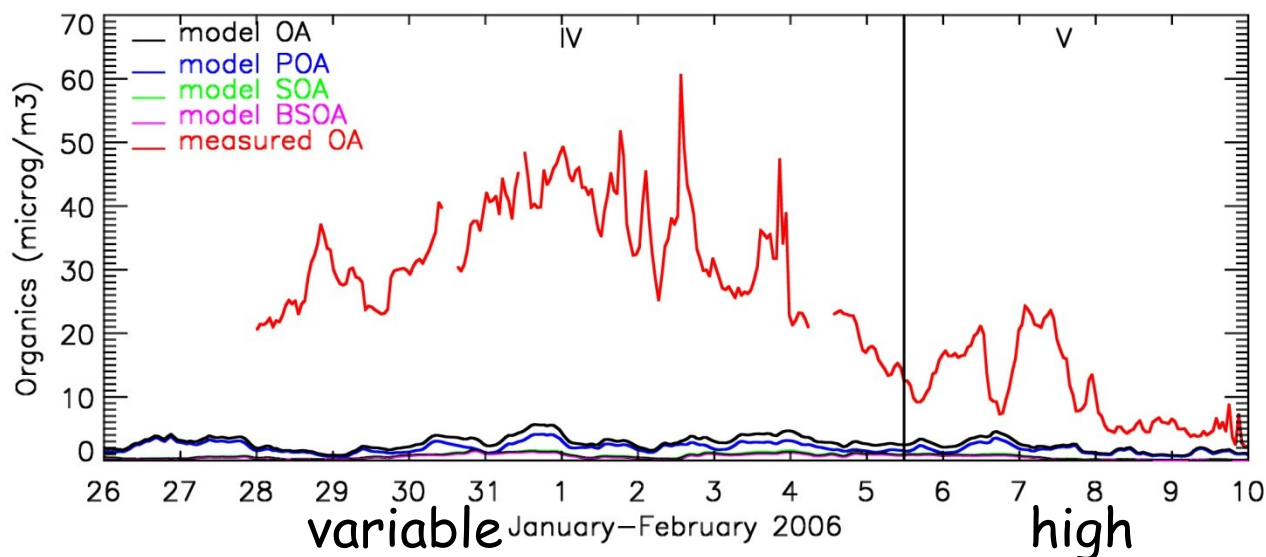## Zurich (urban background)

low   high   variable

- Underestimation especially in low-wind periods
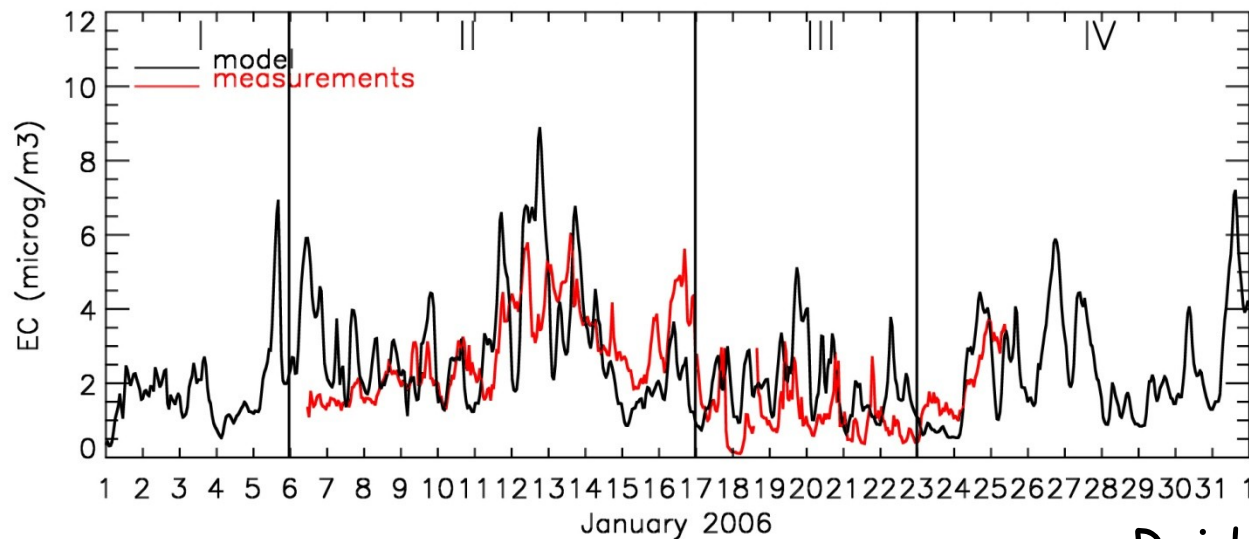- Model OA is mainly POA
- Model SOA is mainly BSOA

Reiden (motorway)
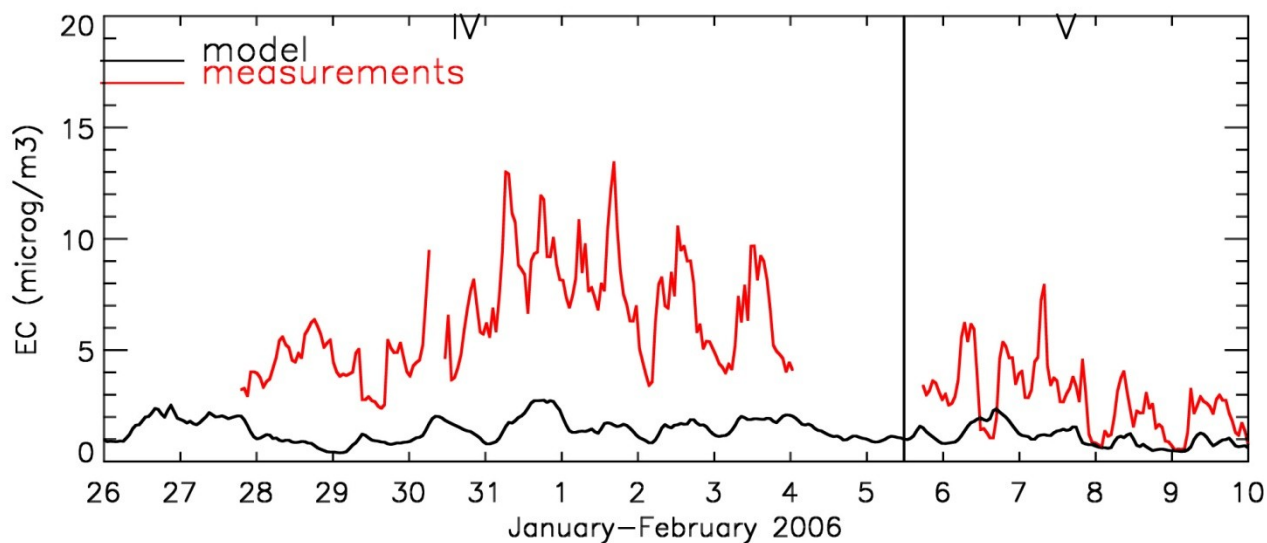

variable   high
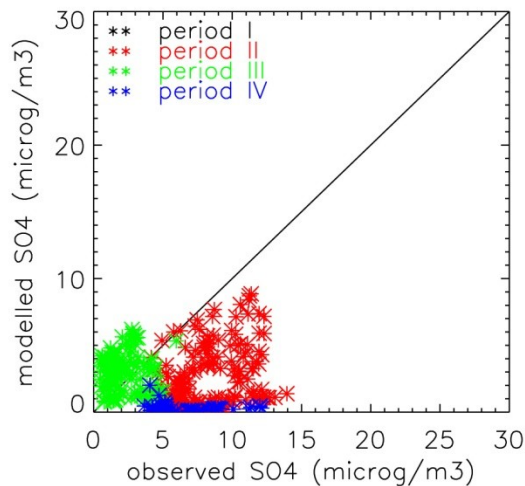
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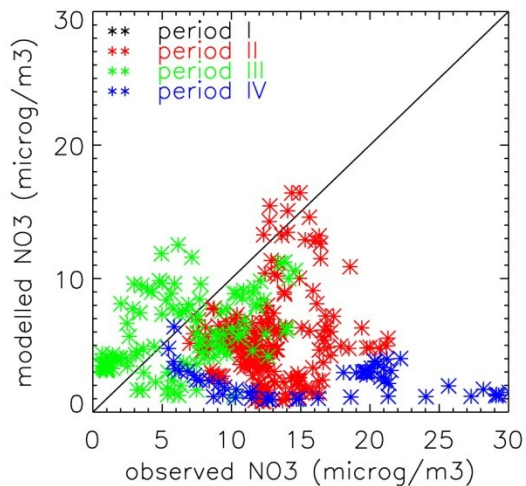# Elemental Carbon

Zurich (urban background)
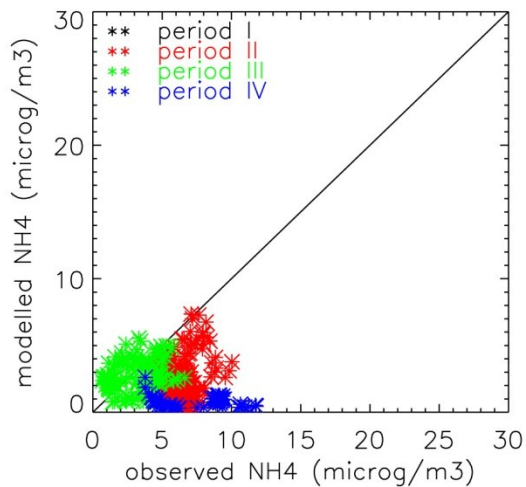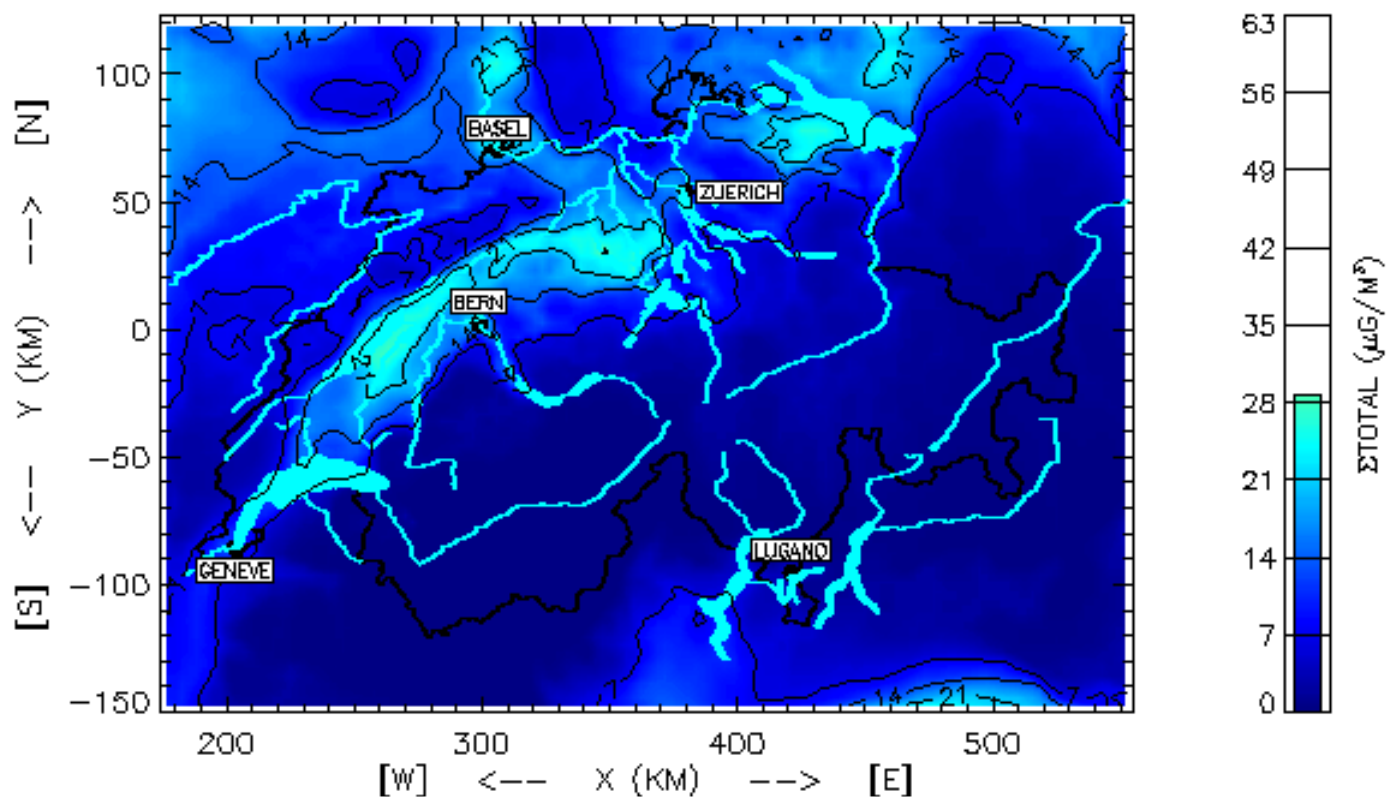
Slight overestimation

Reiden (motorway)

underestimation

wind speed

Period II: low
Period III: high
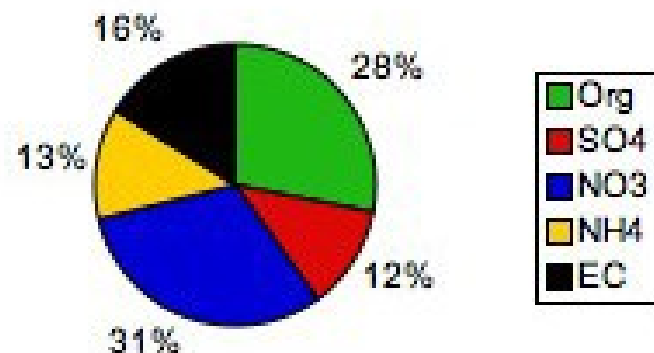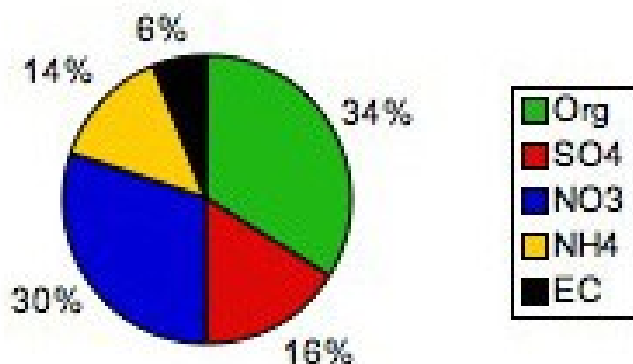Period IV: variable
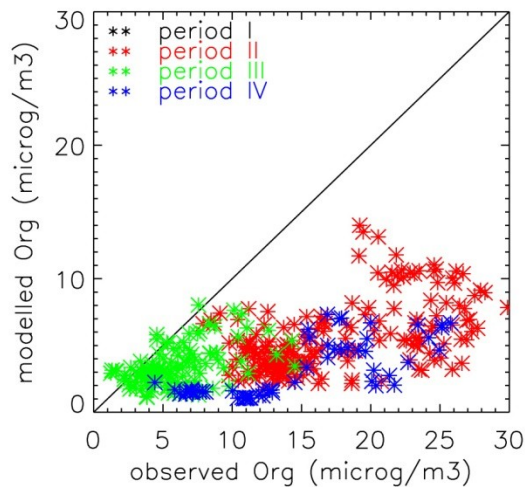
Predicted Total Aerosols (μg/m³)
19 Jan. 2006

Relative contributions

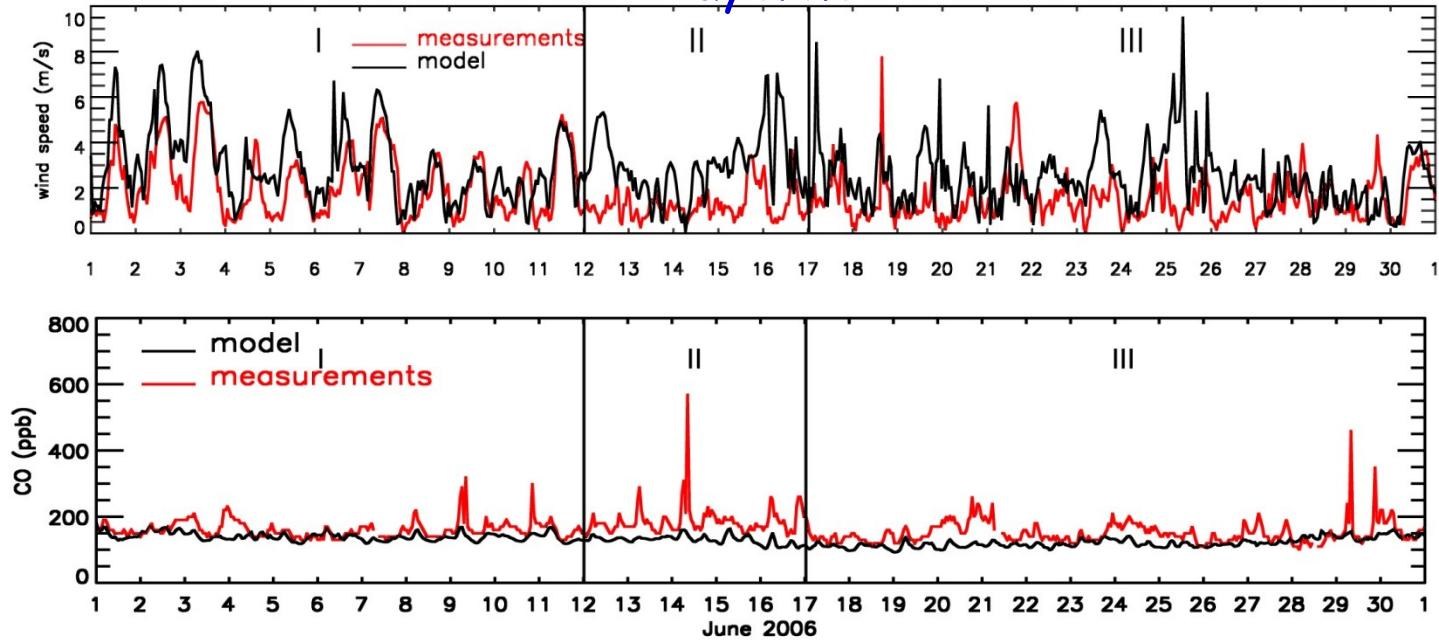## January 2006 (Zurich)

Measurements

Model

▪Main components are **particulate nitrate** and **organic aerosols**
▪60% of total aerosol mass is inorganic
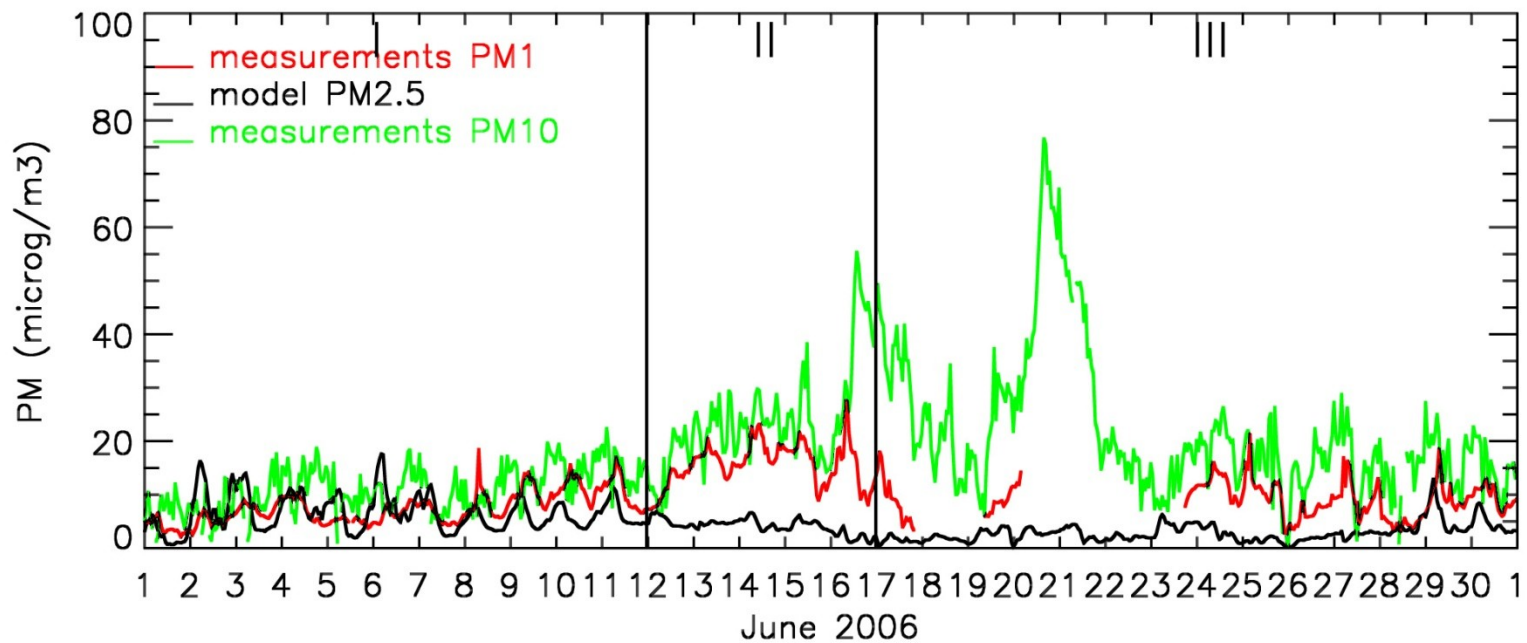▪**Organic aerosols** are underestimated, EC is overestimated

Summer

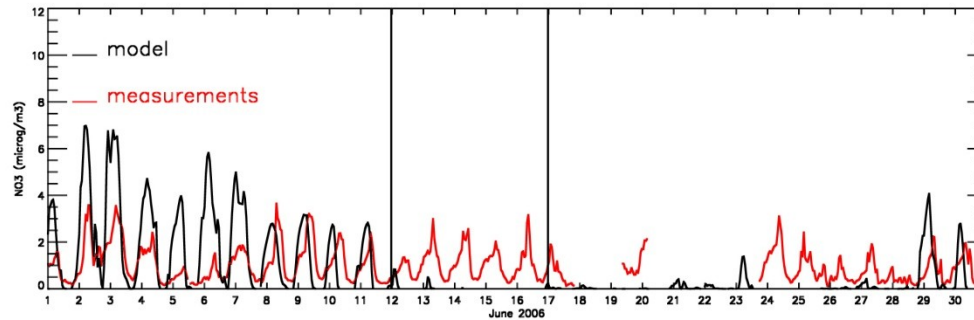Payerne

PM

Payerne (rural)

moderate-high   low-wind   variable
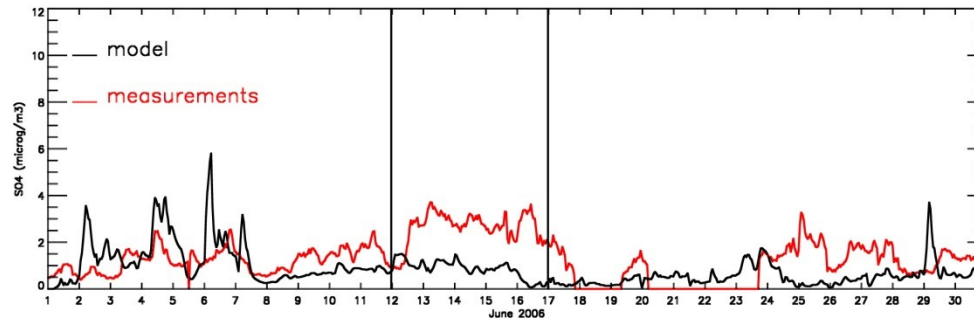
Inorganic Aerosols
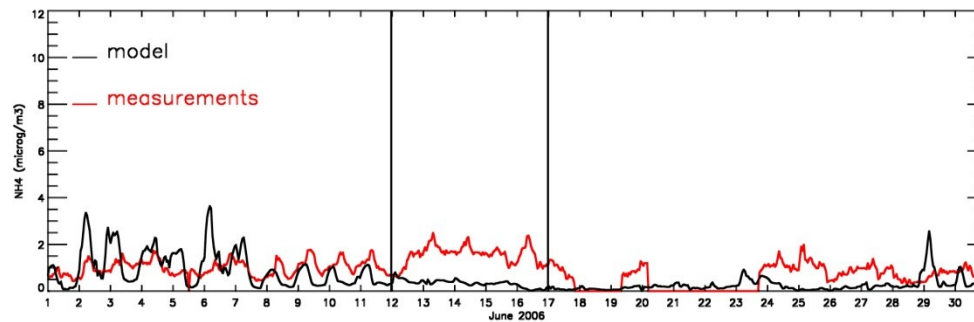
Payerne (rural)

PNO3
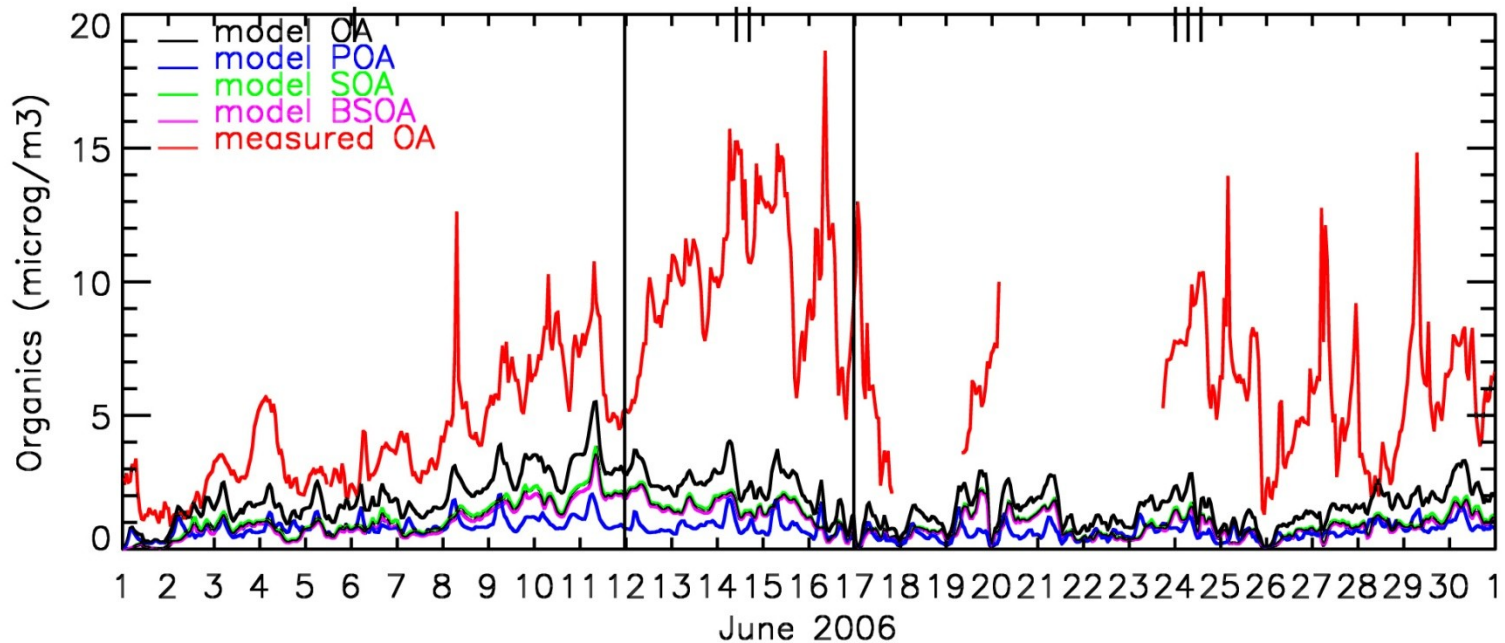
PSO4

PNH4

Wind: moderate-high   low   variable
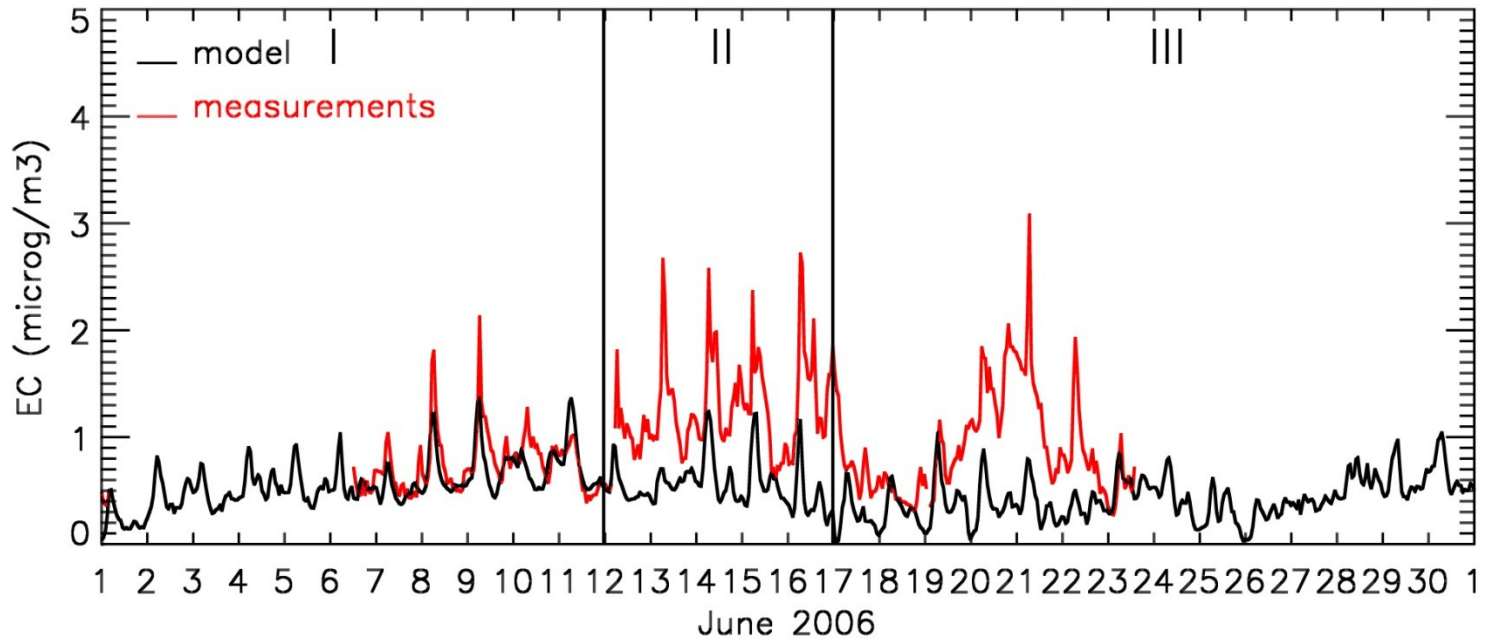
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Organic Aerosols

Payerne (rural)

- Underestimation especially under low-wind conditions
- Model OA is mainly SOA
- Model SOA is mainly BSOA
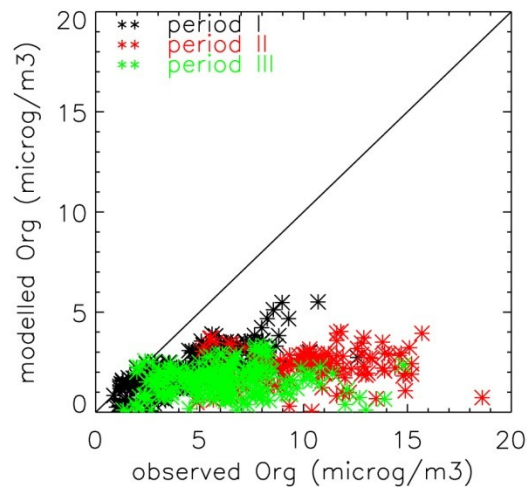
Elemental Carbon

Payerne (rural)

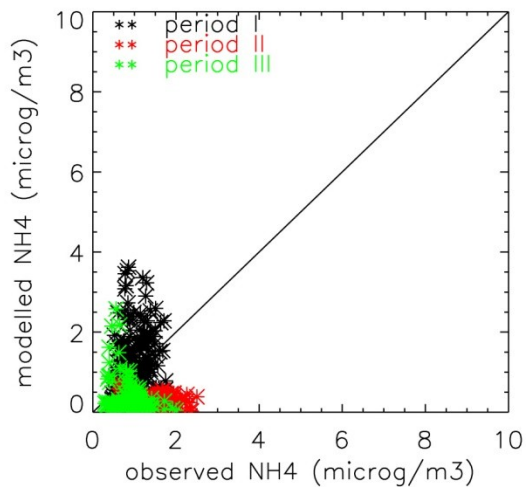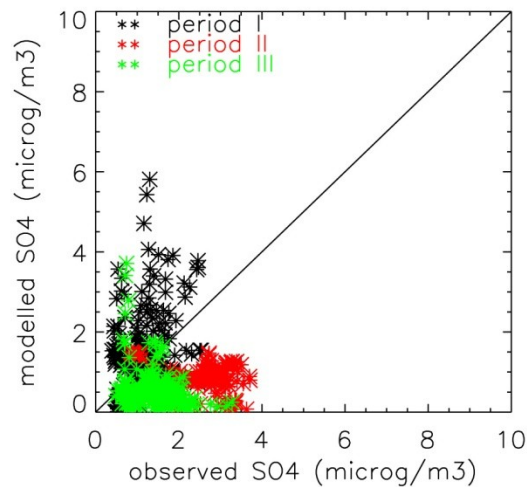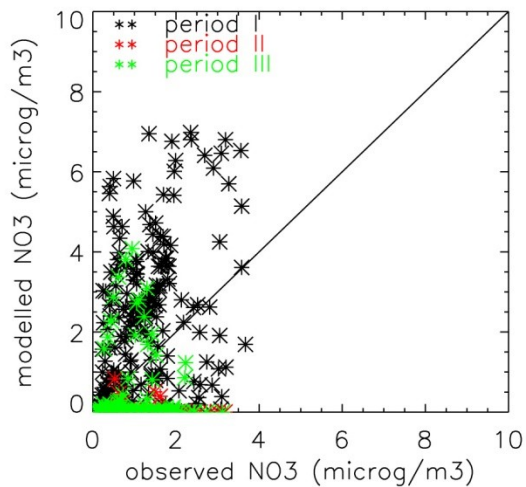**Wind:**   moderate-high   low   variable
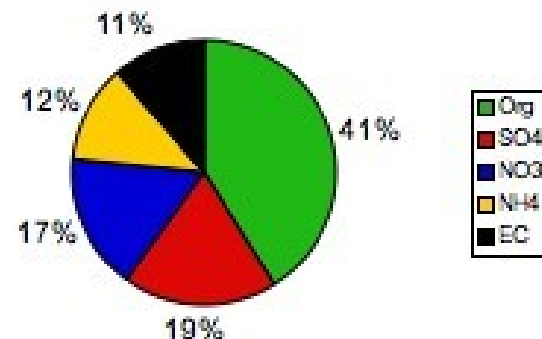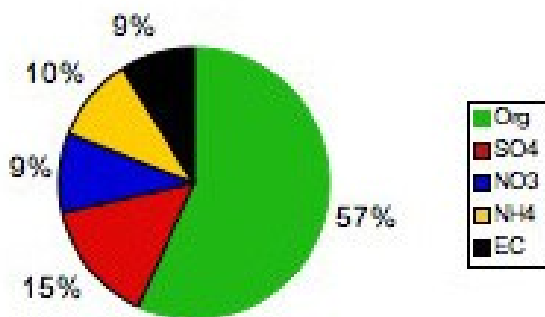
Predicted versus Observed

Wind speed

Period I: moderate-high
Period II: low
Period III: variable

June 2006 (Payerne)

Measurements

Model

- Main components are organic aerosols
- Organic aerosols are underestimated
- Particulate nitrate is overestimated

Conclusions

In general, model-measurement agreement gets worse under low-wind conditions.

	Winter Zurich (urban background)	*Summer* Payerne (rural)
Main components	organic aerosols particulate nitrate	organic aerosols
Organic aerosols (model)	mainly POA	mainly SOA
Performance	OA underestimated	OA underestimated

Still going on..

- Improvement of meteorological parameterization.

- Implementation of wood burning and sesquiterpene emissions in the emission inventory.

- CAMx simulations with an enhanced SOA module including :

      oligomerization processes

      SOA formation from isoprene, sesquiterpenes

Acknowledgements

BAFU

MeteoSwiss, INFRAS, Meteotest

ENVIRON

M. Schultz

ACCENT