



Aerosol modelling activities with WRF-Chem at ZAMG

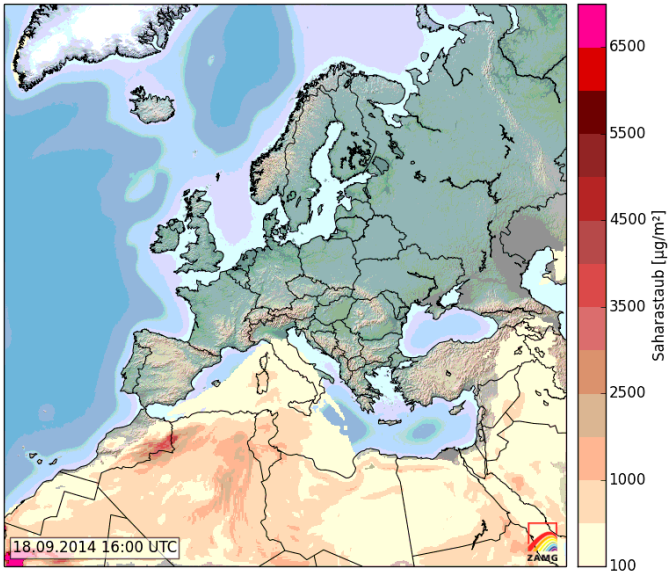
*Barbara Scherllin-Pirscher & Kathrin Baumann-Stanzer
Marcus Hirtl, Claudia Flandorfer, Matthias Langer, ...*



ZAMG
Zentralanstalt für
Meteorologie und
Geodynamik

Overview

Scherllin-Pirscher & Baumann-Stanzer



Sahara dust forecasts



Volcanic eruptions

Masenberg/5 km

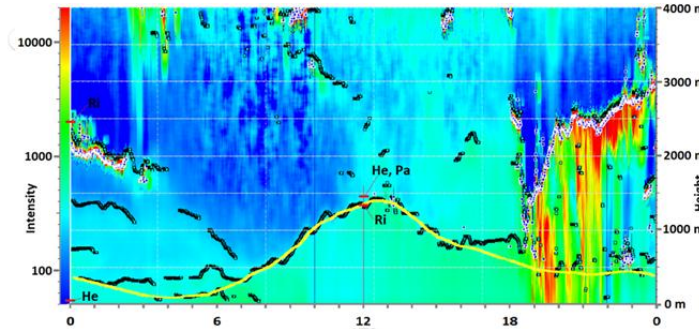


Evaluation

Letztes Update Modell: 2017-11-08 06:00:56 UTC
 Letztes Update Messwerte: 2017-11-08 06:07:55 UTC

R	0.466	Correlation
FB	0.367	Fractional Bias
NMSE	0.32	Normalized mean square error

Werte aus Tagesmittel berechnet (19.04.2017 bis 11.11.2017)



Ceilometer measurements



Modeling system

Scherllin-Pirscher & Baumann-Stanzer

WRF-Chem operational runs at ZAMG:

- 2 domains
- 2-way nesting
- 47 model levels
- non hydrostatic and all feedbacks considered

1 hour simulation time for 1 day forecast (1248 CPUs) –
→ HPCF (only meteorology 6x faster!)



optional: additional grids
with finer resolution

z.B. 1 km

12 km

4 km

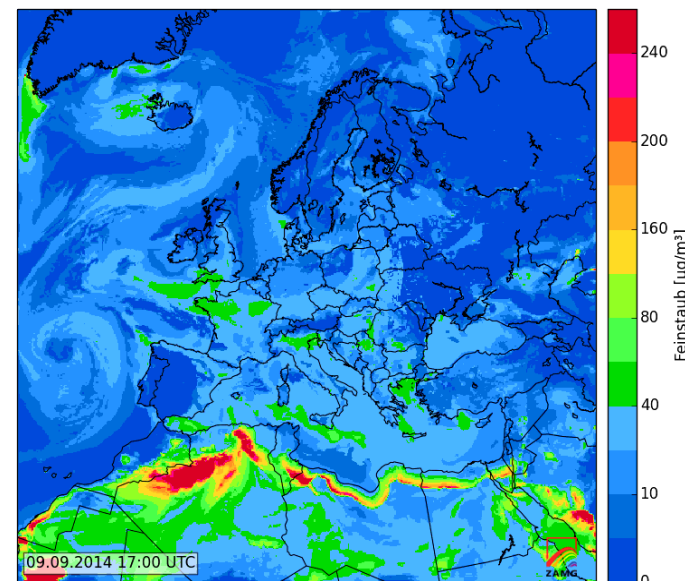


Products

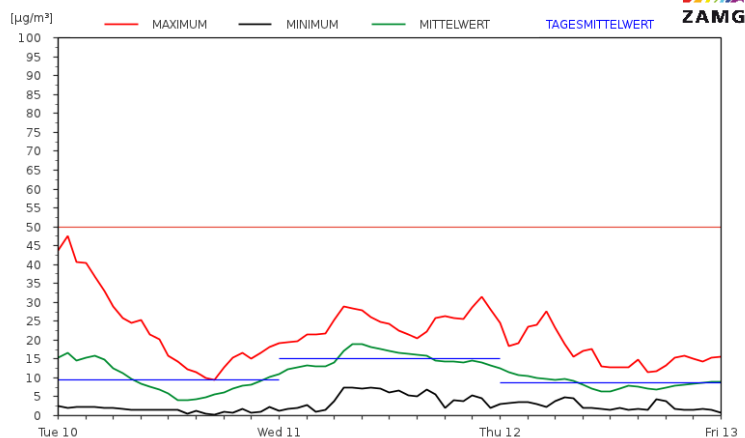
Scherllin-Pirscher & Baumann-Stanzer

Forecasts 2 x per day 72 hours:

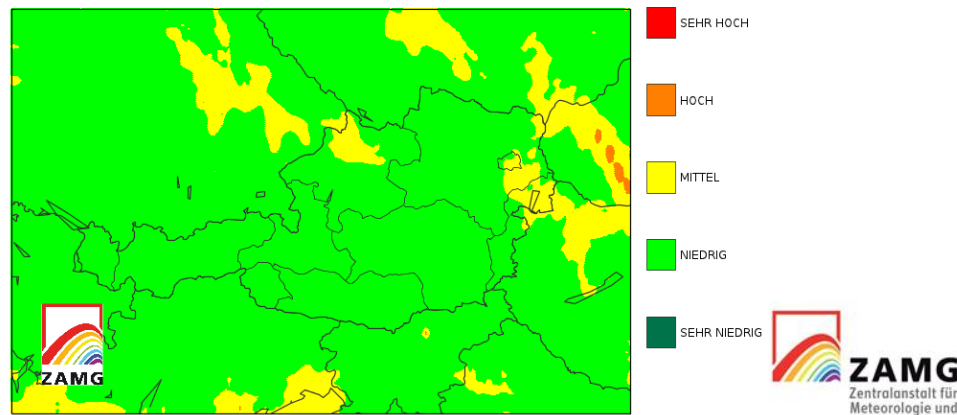
- 3 dimensional distribution of various chemical species and meteorology
- Air quality index
- Time series for selected regions
- Area averages- and maximum concentration values
- Dissemination:
 - ZAMG Webpage
 - Expert portal
 - Per E-mail to federal governments



PM10-Vorhersage für Oberösterreich
2013-09-10 00 UTC + 72h



Luftqualitätsindex 2013-09-10

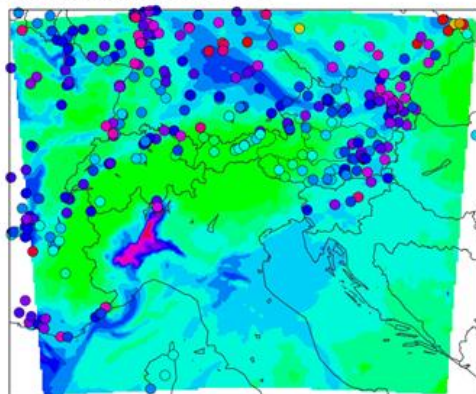


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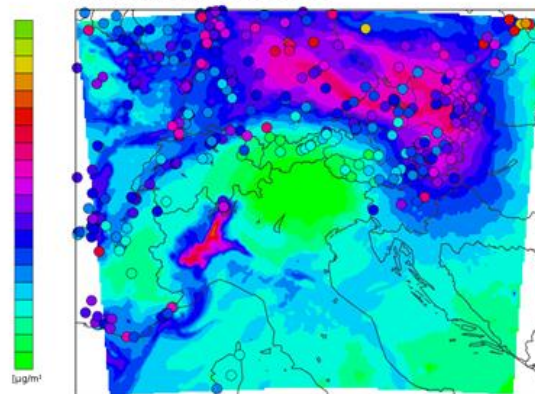
Prognose vom 2013-09-10_00 UTC

GSI (Gridpoint Statistical Interpolation) 3DVAR

PM10-Vorhersage fuer 2014-03-10-00

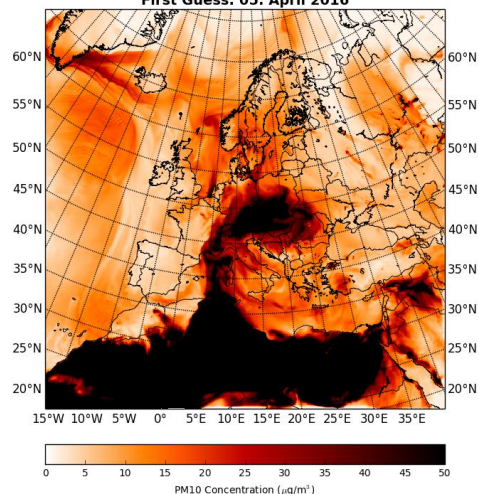


PM10-Vorhersage fuer 2014-03-10-00

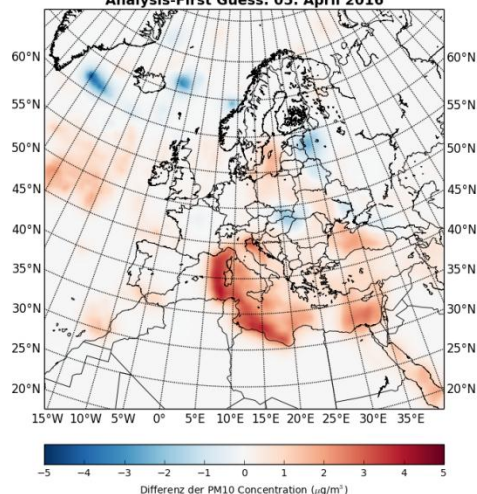


Assimilation of PM observations from EEA
→ PM10 significantly increases, e.g., in the Eastern part of Austria

First Guess: 05. April 2016



Analysis-First Guess: 05. April 2016

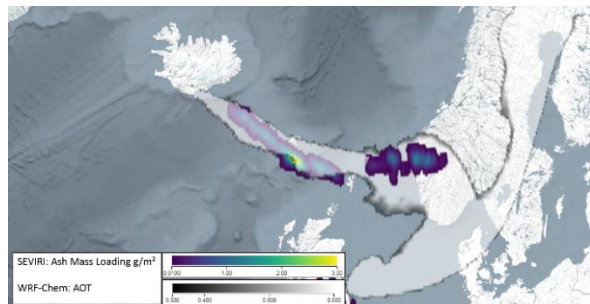


Assimilation of MODIS AOD during a Sahara dust event in April 2016
→ higher concentrations over large parts of Europe (especially over the Mediterranean sea)

Application: Volcanic Eruptions

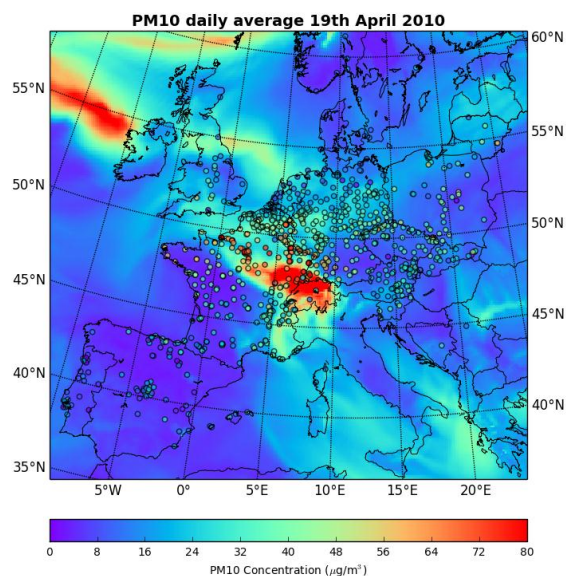
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April/May 2010: Eruption of the Eyjafjallajökull volcano



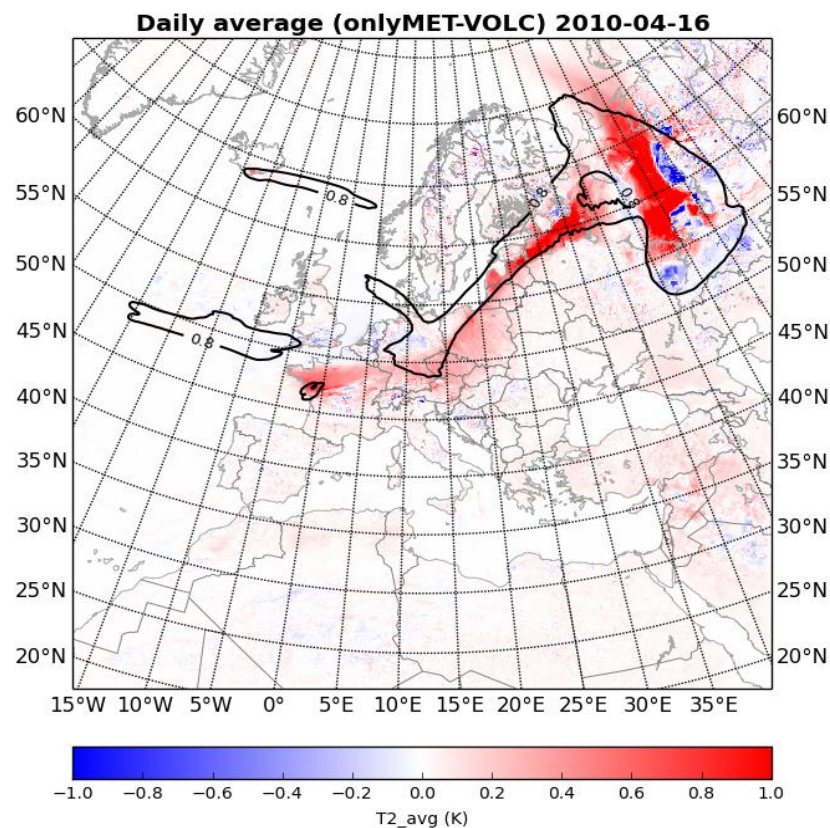
SEVIRI ash mass loading

Evaluation of the location of the plume with ground measurements and satellite observations



PM10 measurements

Aerosol feedbacks



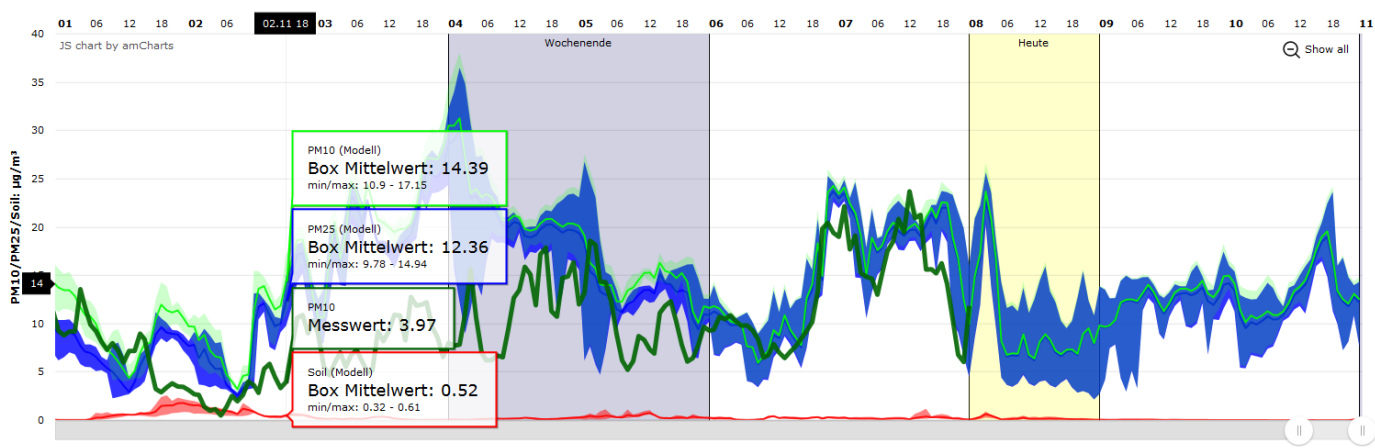
2m temperature difference (daily mean) between the two model runs (onlyMET-VOLC), black: 0.8 AOT contour line.

Evaluation

Scherllin-Pirscher & Baumann-Stanzer



Masenberg/5 km



On-line evaluation
of pollutants

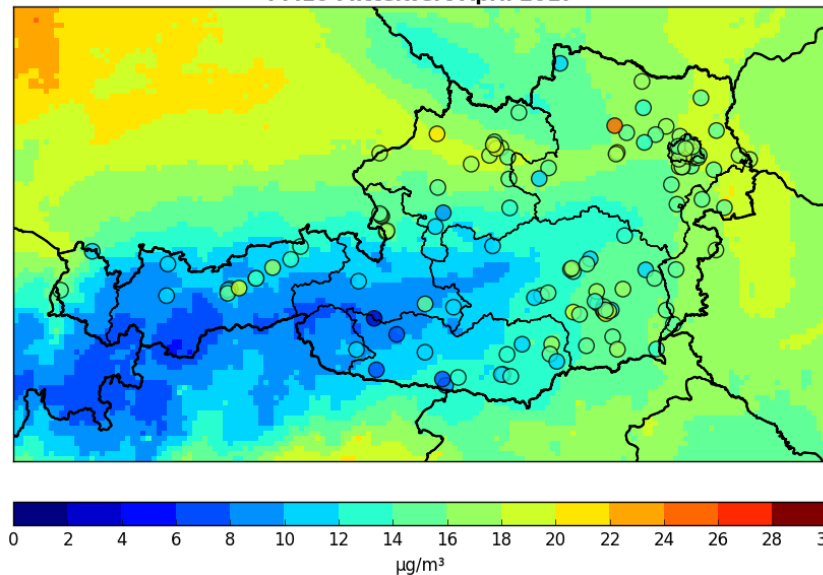
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PM10	
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Monthly mean PM10
concentrations

PM10 Mittelwert April 2017



Ceilometer Messungen

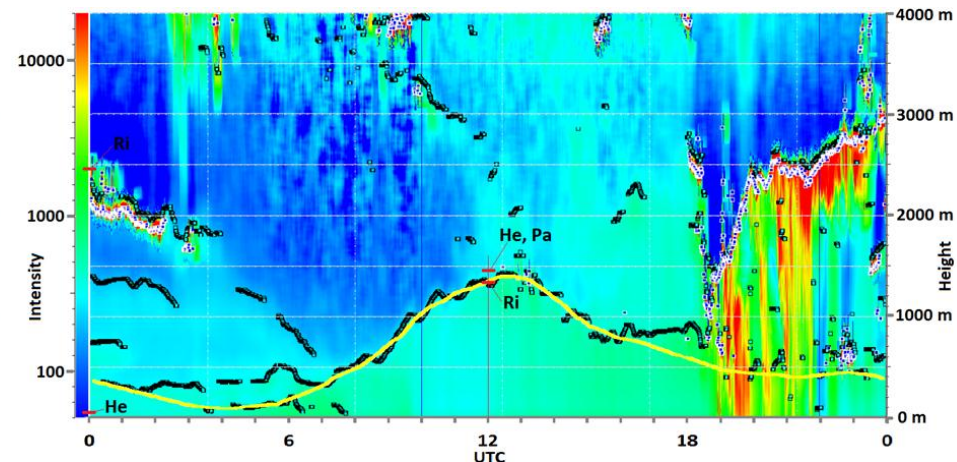
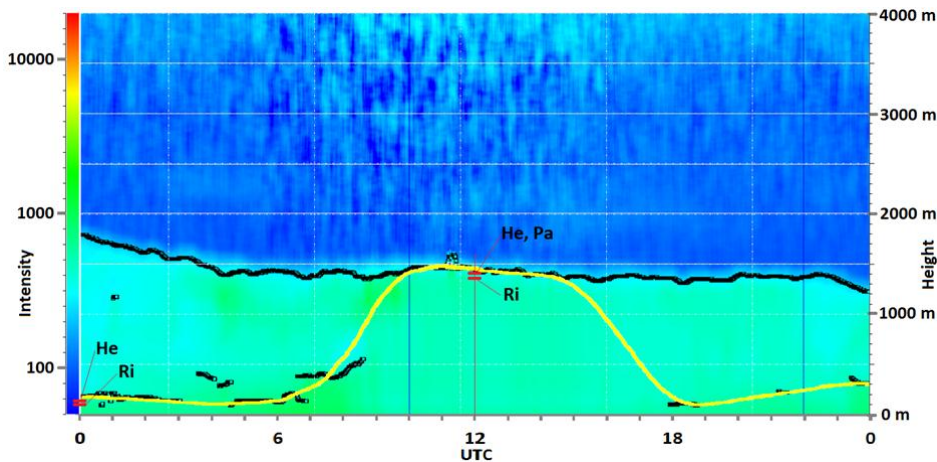
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Ein Ceilometer nutzt das LIDAR (Light Detection And Ranging) -Verfahren als Messprinzip. Dabei werden kurze LASER (Light Amplification by Stimulated Emission of Radiation) -Lichtimpulse senkrecht in die Atmosphäre emittiert und dort von Aerosolen zurückgestreut.

- Wolkenhöhen, Wolkenschichtdicken, Bedeckungsgrad
- Aerosolschichthöhen -> Mischungshöhe



Vaisala-Ceilometer CL51



Ceilometermessnetz Österreich

Scherllin-Pirscher & Baumann-Stanzer

● ZAMG

■ ACG

