PM emissions from natural events in Europe- the NatAir view

- Overview of the NatAir Project -

J. Theloke, W. Winiwarter and the NatAir Team

Participating institutions

systems research

IER

AEA TECHNOLOGY
ENVIRONMENT

Sciences de l'environnement
Institut Pierre Simon Laplace

JOENSUUN YLIOPISTO

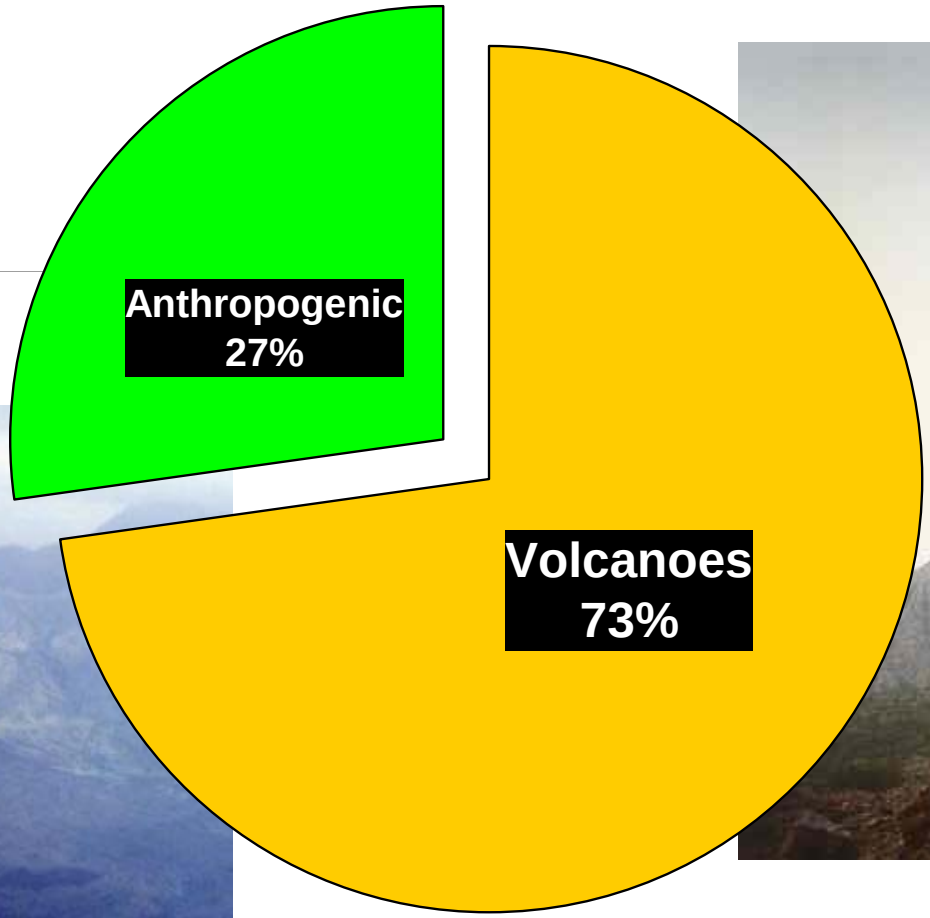
APAT

ies
Institute for Environment and Sustainability

Natural vs. Anthropogenic sources

The Focus of NatAir is the „natural background“ of air pollution

SO_2 emissions from Volcanic activities vs. Anthropogenic activities in Italy



Source: Vestreng, 2004, EMEP emission inventory

Objectives of NatAir

Improvement of the methodologies to quantify natural and biogenic emissions to the atmosphere and application for Europe

- Improvement of calculation methods
  - Especially regarding the emissions of primary particles and secondary aerosol precursors from natural and biogenic sources
- Reduction of uncertainties of calculated emissions from biogenic and natural sources
- Assessment of policy instruments applied by the EU and UNECE/CLRTAP
- Contribution to the CAFE Process
- Revision of the Chapter “other sources” of the EMEP/CORINAIR Atmospheric Emission Inventory Guidebook

Approach

Definition of system boundaries

Analysis of the state-of the-art methodologies

Development of improved emission calculation methods

Qualitative assessment of the climate change impact

Meteorology of 2000

Meteorology of 1997

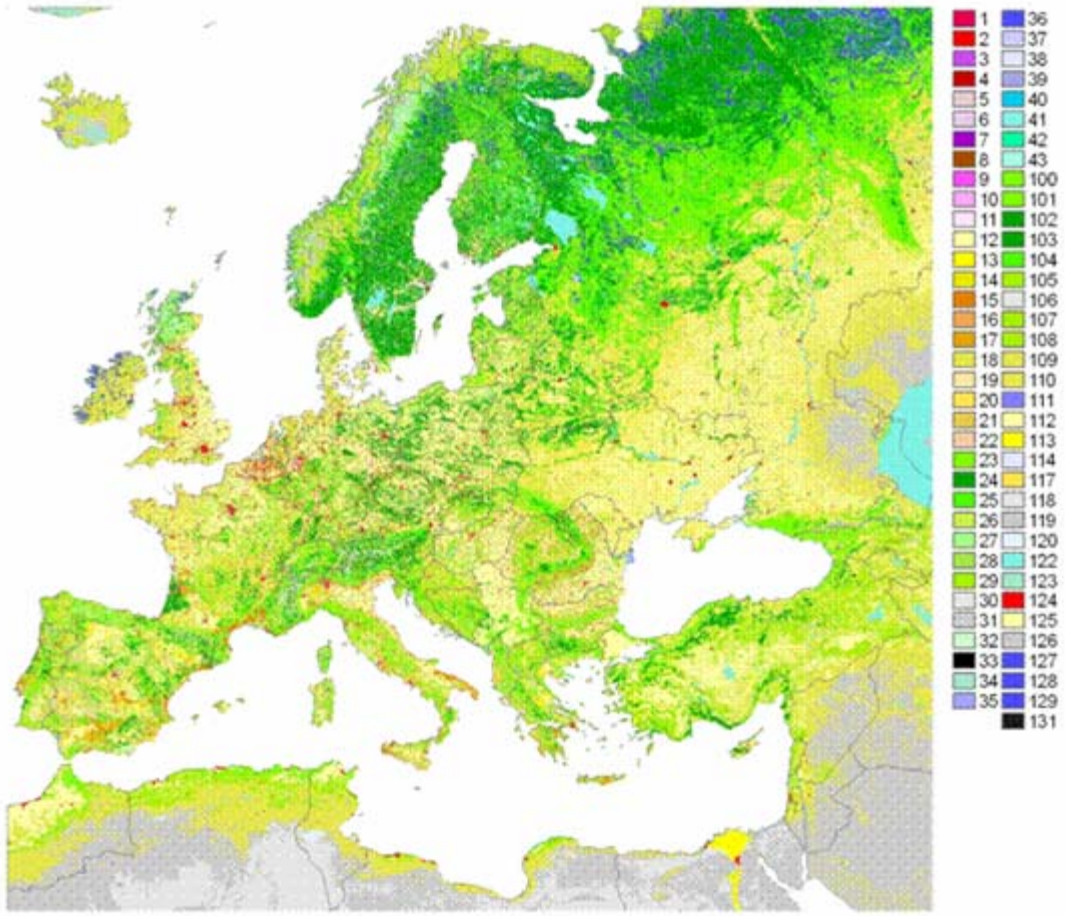
Temporal and spatial resolved emissions 2000, incl. anthropogenic

Temporal and spatial resolved emissions 2010, incl. anthropogenic

Qualitative assessment of uncertainties

Modelling of test cases in a CTM (CHIMERE) under variation of the anthropogenic emission levels

Scope and resolution of NATAIR



Spatial Resolution:

- 10 km x 10 km

Temporal Resolution:

- Hourly
- Monthly

Vertical Height:

Distinction between below and above the boundary layer

Land use data from Corine 2000 and GLC

Definition of system boundaries

- Identify emission sources and compounds to be covered by NatAir
- Differentiation anthropogenic – natural
  i. Fraction of an activity used / affected by humans
  ii. Coverage in international inventorying guidelines
  iii. Reporting practice by countries

Source selection

- Sources covered by the EMEP/CORINAIR Atmospheric Emissions Inventory Guidebook (AEIGB)
- Additional sources covered by NATAIR

Human appropriation of nature

- **Concept: natural systems have been influenced ("colonized") by humans**
  Lit.: Haberl et al., Fischer-Kowalski et al.
- **Quantification is possible by comparing society's metabolism to the natural metabolism**
  i. **Harvested biomass vs. NPP**
  ii. **Animal stock vs. undisturbed population**
  iii. **Wetland reclamation and artificial wetlands**

Recommendations from NatAir about the system boundary definition

- NatAir consider all emissions sources as defined originally in the DoW
- Propose of changes in reporting practice: countries should take responsibility for vegetations fires as well as for pets (e.g. emissions from race horses in UK, cats and dogs, etc.)

"Wild" fires are mainly man-made:
~95% of the fires in the Mediterranean countries and ~87%[1] in the boreal region of Russia are started by people.

[1]D. Mollicone, H. D. Eva, F. Achard: Human role in Russian wild fires. NATURE, Vol 440, 23 March 2006

What do NatAir consider as „natural events“ contributing to PM pollution?

NatAir consider only „natural events“ which have a connection to Europe :

- **Volcanoes**
- **Sea salt**
- **Primary biological aerosol particles (?)**
- **Wind blown dust (?)**
- **Saharan dust events**
- **Secondary aerosol precursors (NH3, SO2, NOx, VOC, DMS)**

Considered sources and pollutants

Sources	Pollutants
Natural and seminatural vegetation	NMVOC
Biomass burning and forest fires	NO_x, PM10, PM2.5, CO, VOC`s
NO from soils (natural, agricultural)	NO
Primary Biological Aerosol Particles	PM10, PM2.5
Wild animals, Humans and Pets	CH_4, NH_3, NMVOC
Anoxic soil processes (wetlands)	CH_4
Natural seepages (micro- and macroseepages)	CH_4
Wind blown dust	PM10, PM2.5
Volcanoes	SO_x
Lightning	NO_x
Sea salt	PM10, PM2.5
Coastal zones	DMS

Conclusion and Outlook

- **The Focus of NatAir is the „natural background“ of air pollution**
- **NatAir will provide systematic descriptions how to assess emissions of natural sources (input for use in AEIGB - Discussions at TF meeting Oct. 30 – Nov. 2)**
- **NatAir will release figures on emission quantities on a 10x10 km² grid over Europe (NatAir project meeting Oct. 23/24)**
- **We expect the NatAir results to contribute to the development of improved air pollution control strategies in Europe**

Contact:

- **Prof. Dr.-Ing. Rainer Friedrich:** ***rf@ier.uni-stuttgart.de***
- **Dr.-Ing. Jochen Theloke:** ***jt@ier.uni-stuttgart.de***
- ***http://natair.ier.uni-stuttgart.de***

Thank you for your attention!