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VALIDATION OF ATMOSPHERIC CHEMISTRY/AEROSOLS MODEL COUPLED TO REGIONAL CLIMATE MODEL IN HIGH RESOLUTION

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# Outline

Motivation (previous study on SE Asia, QUANTIFY, resolution issue in complex terrain) CECILIA Project Project couples First results RegCM-CAMx (1991 - 2000)Conclusions

Anthropogenic Aerosols over East Asia (Giorgi et al. 2002) Summer cooling has been observed in recent decades over many regions of East Asia.

- At the same time, anthropogenic sulfate and fossil fuel soot emissions have drastically increased due to the economic development of the region.
- This study investigates the impact of sulfur and soot emissions from fossil fuel burning on the regional climate of East Asia.
  - Intercomparison of 5-year simulations (1993-1997) with and without aerosol effects.

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# Temperature difference between between the periods 1981-1998 and 1951-1980.







### **Project information**



Priority thematic areas: 1.1.6.3.I.3.2 Duration: 1 June 2006 - 31 May 2009 Budget: 2.750 k EUR Number of partners: 16 Number of participating countries: 12 Coordinator: Charles University, Prague, T. Halenka



http://www.cecilia-eu.org







**Motivation** 







## **Foreseen domains (10 km)**



#### WP7

#### **Objectives**

Exploitation of the sensitivity of air-pollution levels to potential climate change based on data analysis of long simulations of offline chemistry air quality models (AQM) driven by Regional Climate Models (RCMs) for present climate and for future projections.

- Comparison of air-pollution levels simulated by online and offline regional air-quality models during certain episodes of the present climate.
- Estimation of the key species exceedances of the EU limits for the protection of human health, vegetation and ecosystems as well as WHO guidelines for present climate and for future projections.



### Goals

To study the impact of climate change on air quality To study the contribution of air composition change to climate change impact To estimate the importance of bigger urban and idustrial areas in

local scale by high resolution modelling



## **Coupling and chemistry**

- meteorological fields generated by RegCM3
- drive CAMx transport and dry/wet deposition
- preprocessor utility developed for transforming RegCM fields to CAMx input fields and formats
- problems with the emission inventories available, at this stage emissions from EMEP 50 km x 50 km database interpolated.
- testing VOC speciation technique, biogenic emissions of isopren and monoterpenes calculated as a function of 2m temperature, global radiation and landuse by Guenther et al. (1993,1994).
- boundary conditions from RegCM CAMx @ 50km (ENSEMBLES, Krueger, Zanis),
- CB-IV chemistry mechanism is used (Gery et al.,1989).





#### **RegCM – CAMx 10x10 km (1991-2000)**





# RegCM – CAMx (O<sub>3</sub>, AOT40)



April-September: forestry impacts

May-July: agriculture impacts



# **Comparison with measurement (NO<sub>2</sub>)**



# **Comparison with measurement (SO<sub>2</sub>)**



## **Comparison with measurement (O<sub>3</sub>)**



time [years]

Ozone 30-day running average at Košetice 1991 - 2000



time [years]

Ozone 30-day running average at Illmitz 1991 - 2000



time [years]

# **Comparison with measurement (O<sub>3</sub> daily maxima)**



Ozone 30-day running average daily maxima at Košetice 1991 - 2000



time [years]

axima Ozone 30-day running average daily maxima at Illmitz 1991 - 2000



Ozone 30-day running average daily maxima at Stará Lesná 1991 - 2000



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#### **Daily variability of O<sub>3</sub>, 2000 average**



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# Sensitivity experiment for precipitation and cloud water



# Outlooks

Further validation of 10 years time slices for CECILIA (control) Looking for posibilities of emission resolution increase further application in QUANTIFY and **CECILIA** (climate scenario, effective emission indices) Feedback – two way on-line coupling ANTIFY

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THANKS FOR YOUR ATTENTION