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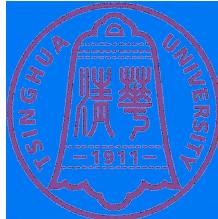
# BC Control Strategies in Transportation Sector in China

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London, Jan. 6, 2009

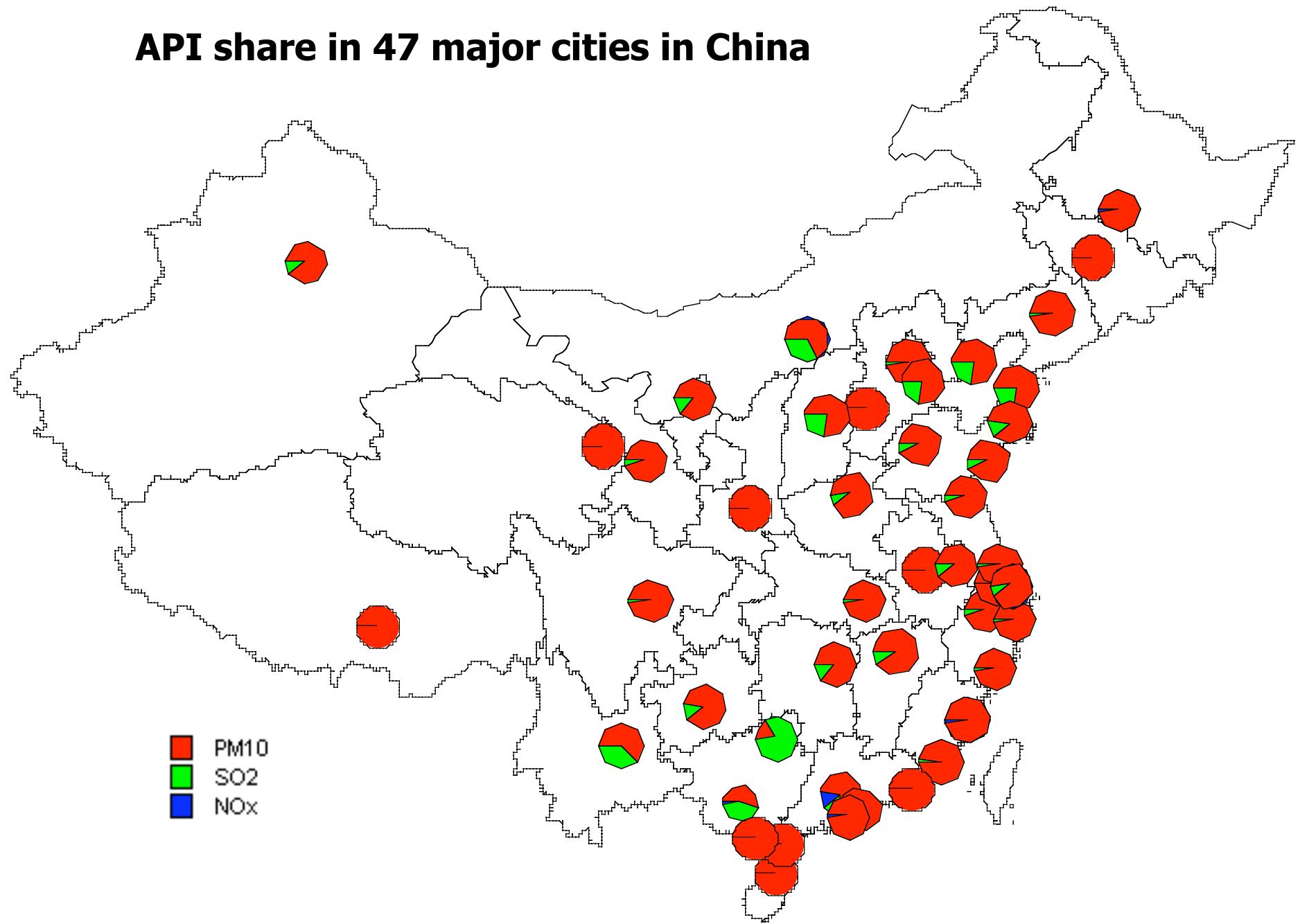


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# Background Emissions Observation Control Strategies

## API share in 47 major cities in China

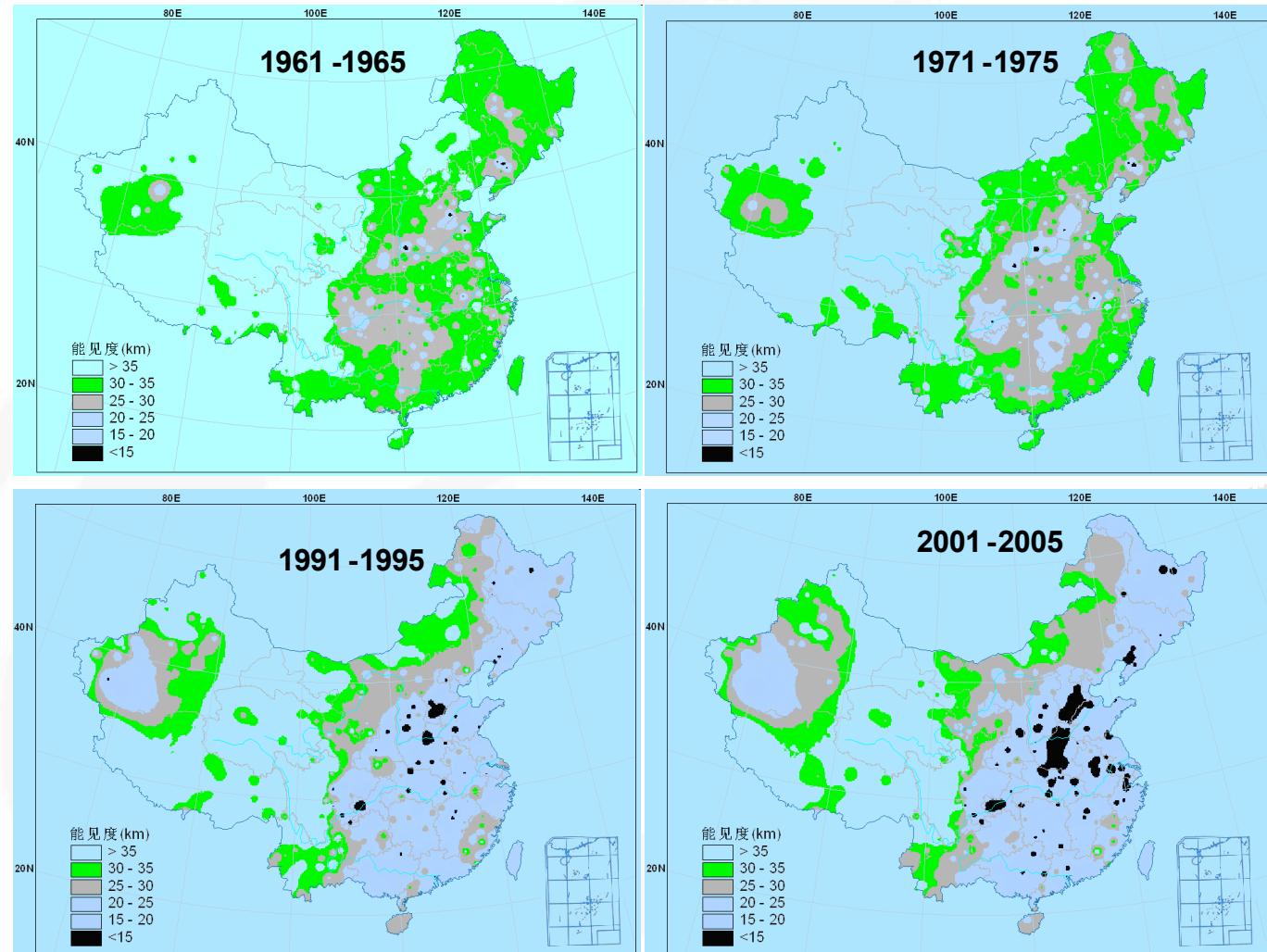


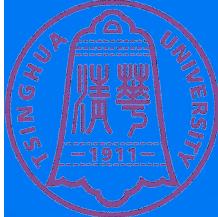
# Fine Particular Air Pollution At Urban and Regional Levels



API及卫星遥感图像均表明，颗粒物污染已成为我国城市群区域复合大气污染的显著特征

# Regional Haze





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# Background Emissions Observation Control Strategies

# Estimation of historical BC & OC emissions

- Step 1: Estimate historical PM emissions
  - Technology based methodology
  - 1990 ~ 2005
  - Considering indigenous emission sources
  - Take impact of technology improvement into account
    - Promotion of advanced and new technology
    - Implementation of stricter emission standard
- Step 2: Calculate BC and OC emissions
  - Based on estimated  $\text{PM}_{2.5}$  emissions
  - Using fraction of BC/OC in  $\text{PM}_{2.5}$  emissions

# Emission test for different coal boilers and stoves



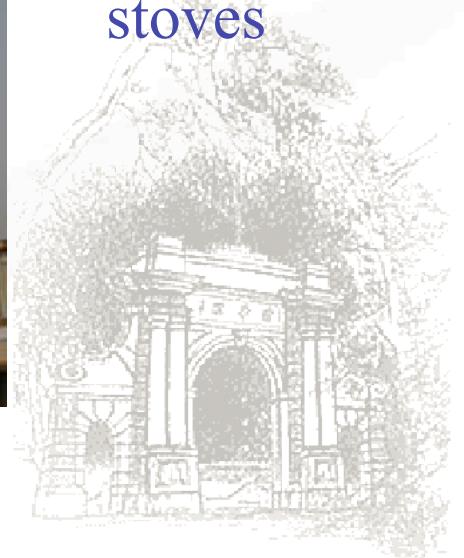
Coal fire power station



Residential coal boiler



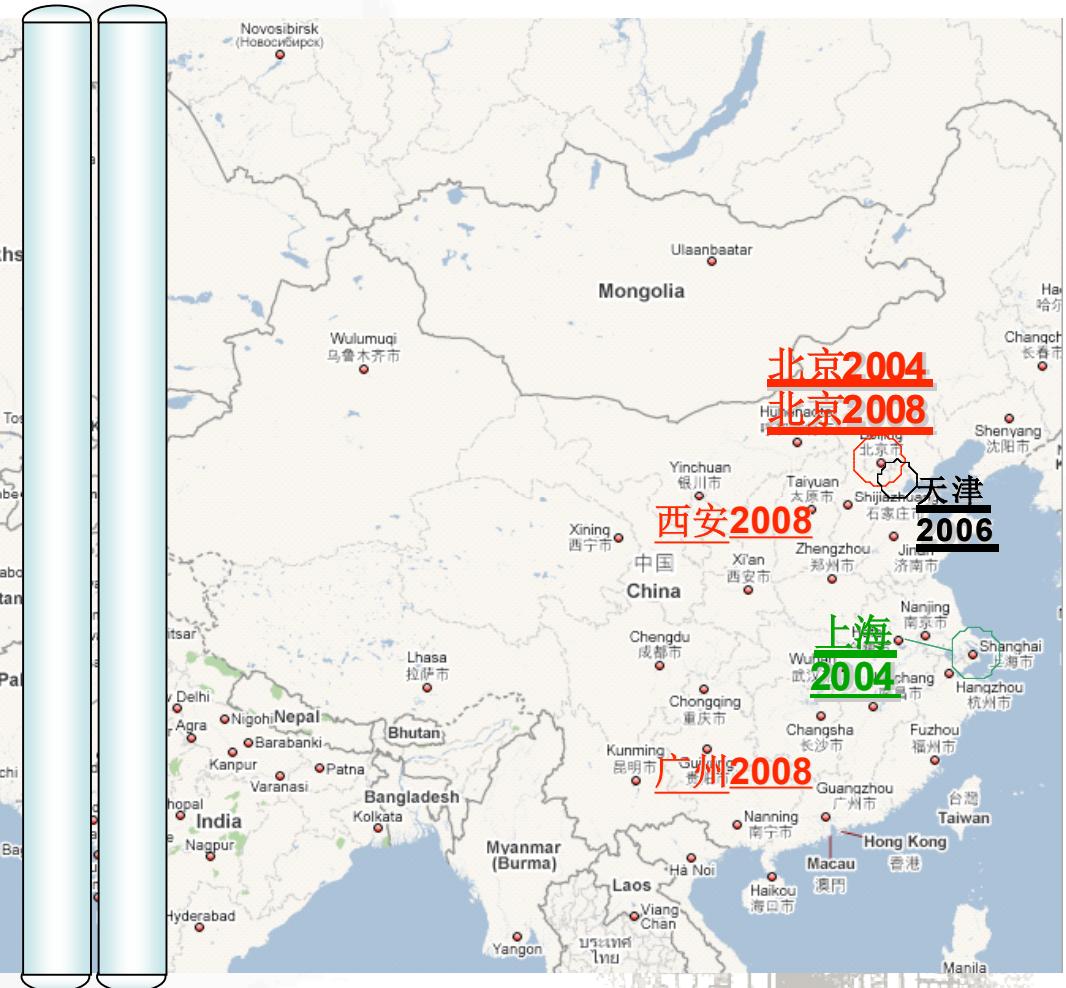
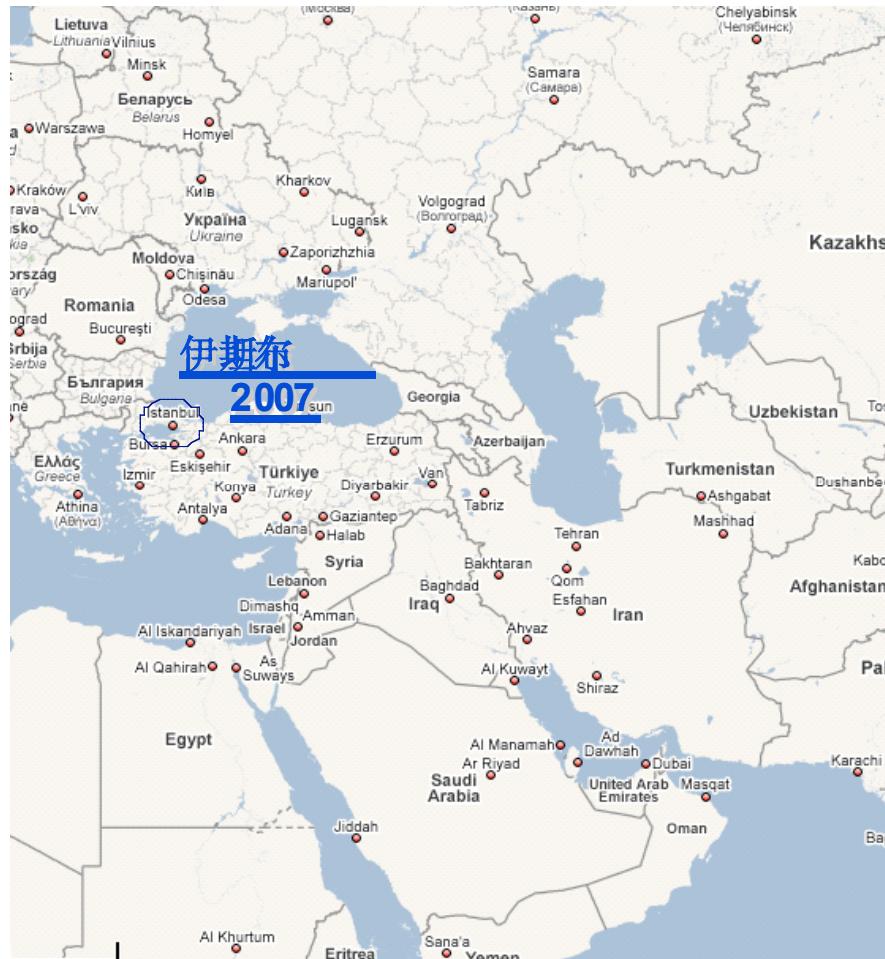
Residential coal stoves



# Test: emissions from different residential bio-fuel stoves and biomass open burning



# On-road Test in six cities



# Test routes



**Beijing  
LDDV  
21.8km**



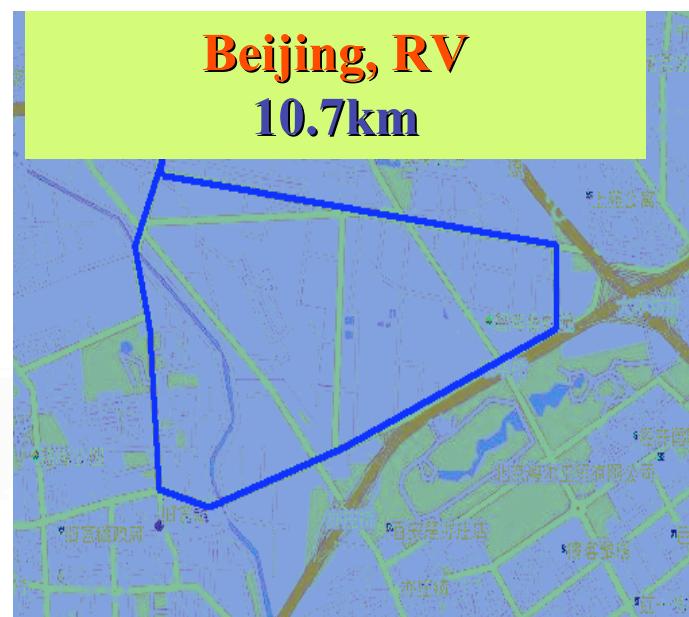
**Beijing, M/HDDV27.8km**



**Xi'an,  
HDDV  
23.4km**



**Beijing, RV  
10.7km**

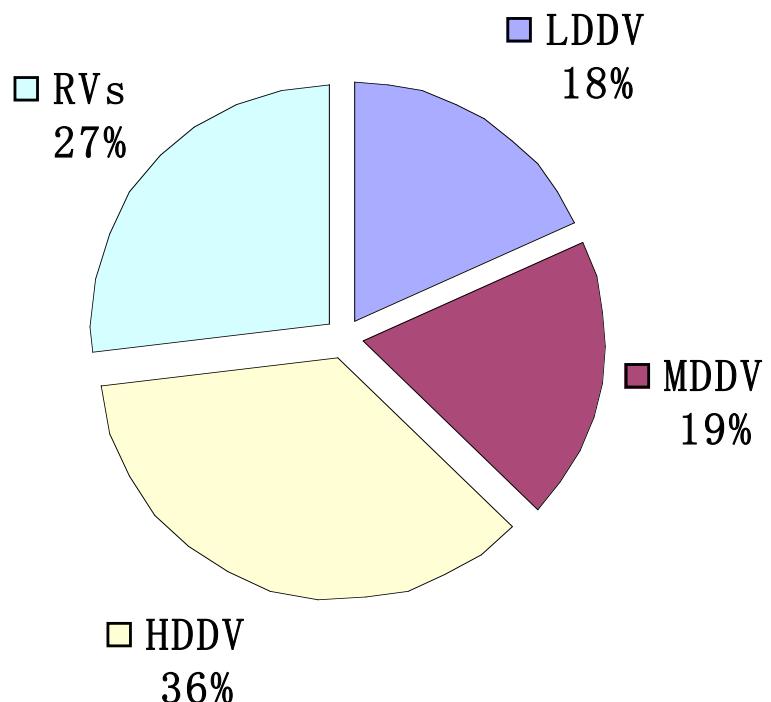


# Test vehicle



# BC Emissions from diesel vehicle in China

- BC emission factor
  - Basing on testing in China
- BC Emission
  - In 2006, totally 56.7 thousand tons BC were discharged by diesel vehicle in China.

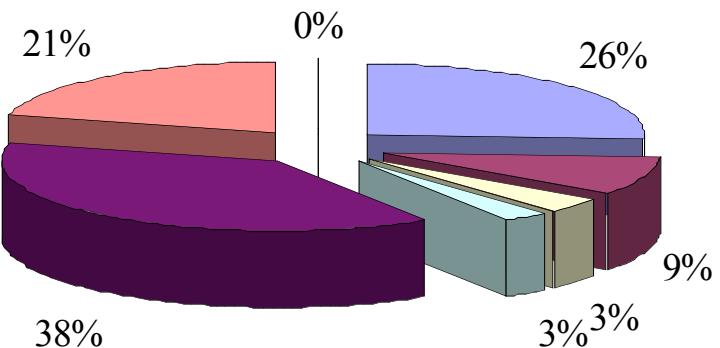
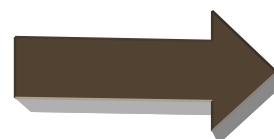
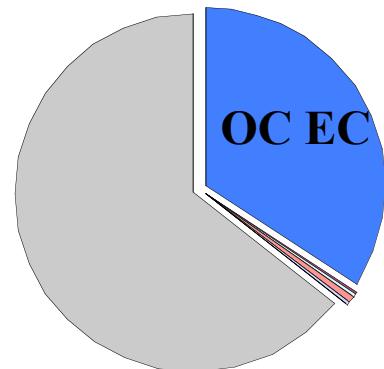


BC emission share by diesel vehicle type

# EC/OC in PM<sub>2.5</sub> from Diesel Vehicle

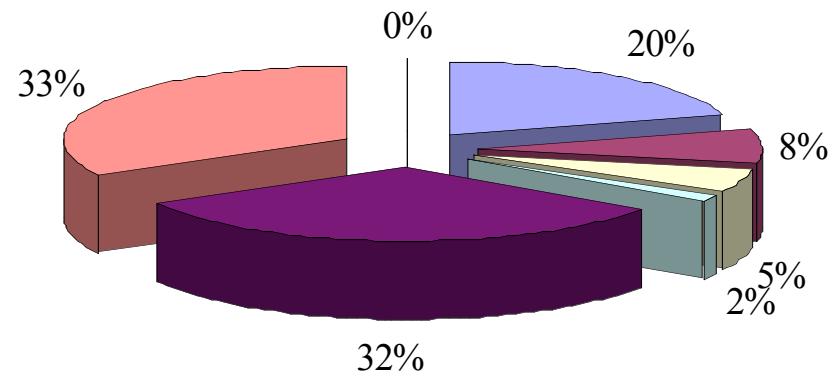
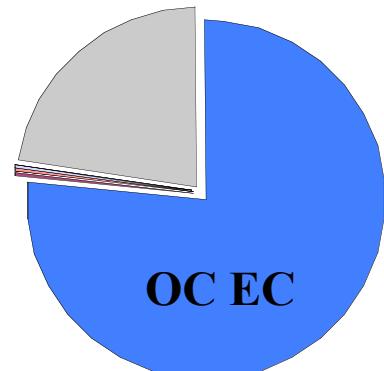
■ TC  
■ F  
■ Cl  
■ NO2  
■ NO3  
■ SO4  
■ Na  
■ NH4  
■ K  
■ Mg  
■ Ca  
■ other

**S- 500ppm**



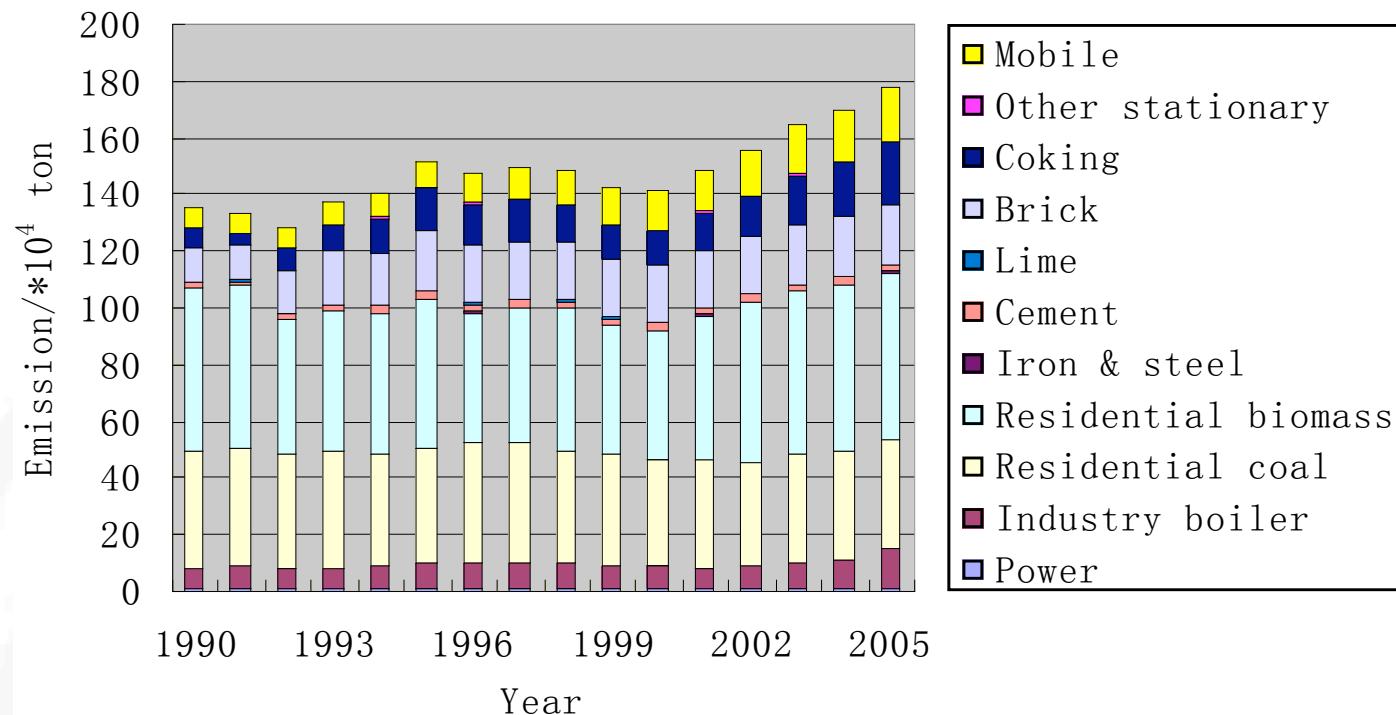
■ OC1 ■ OC2 ■ OC3 ■ OC4 ■ EC1 ■ EC2 ■ EC3

**S-300ppm**



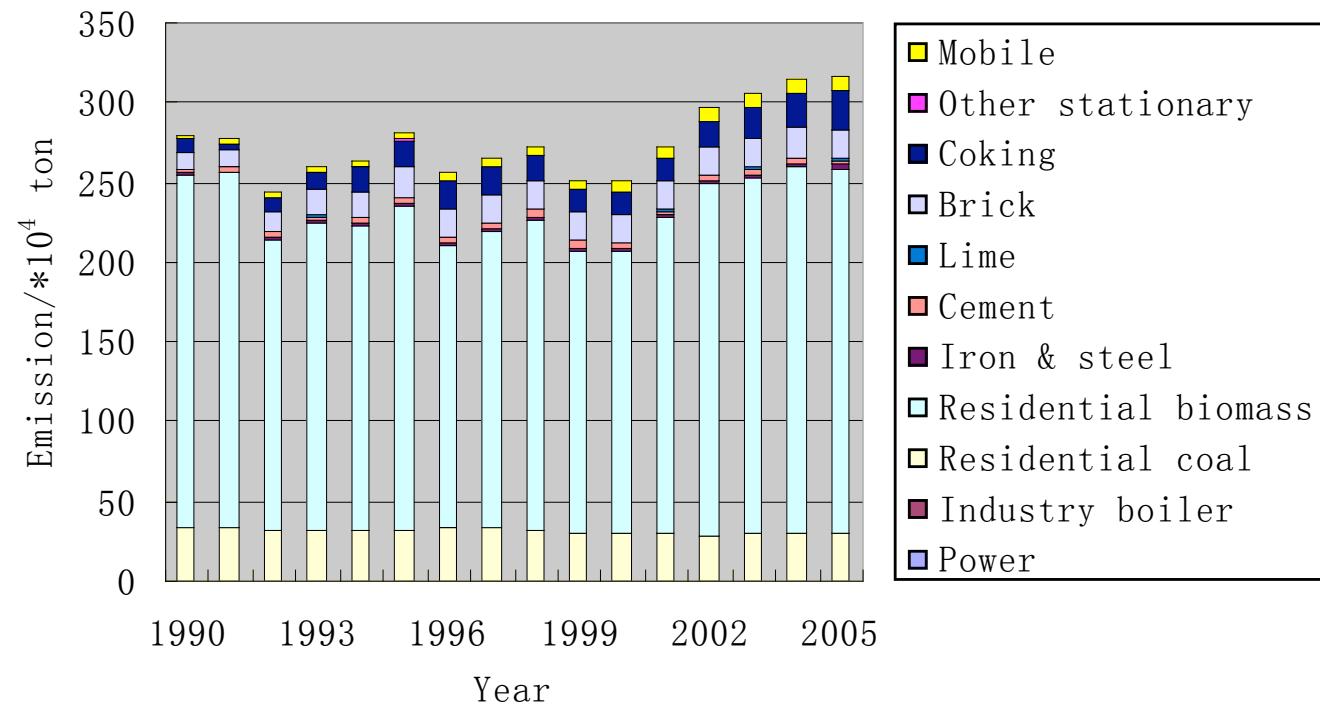
■ OC1 ■ OC2 ■ OC3 ■ OC4 ■ EC1 ■ EC2 ■ EC3

# Emissions by sector: BC



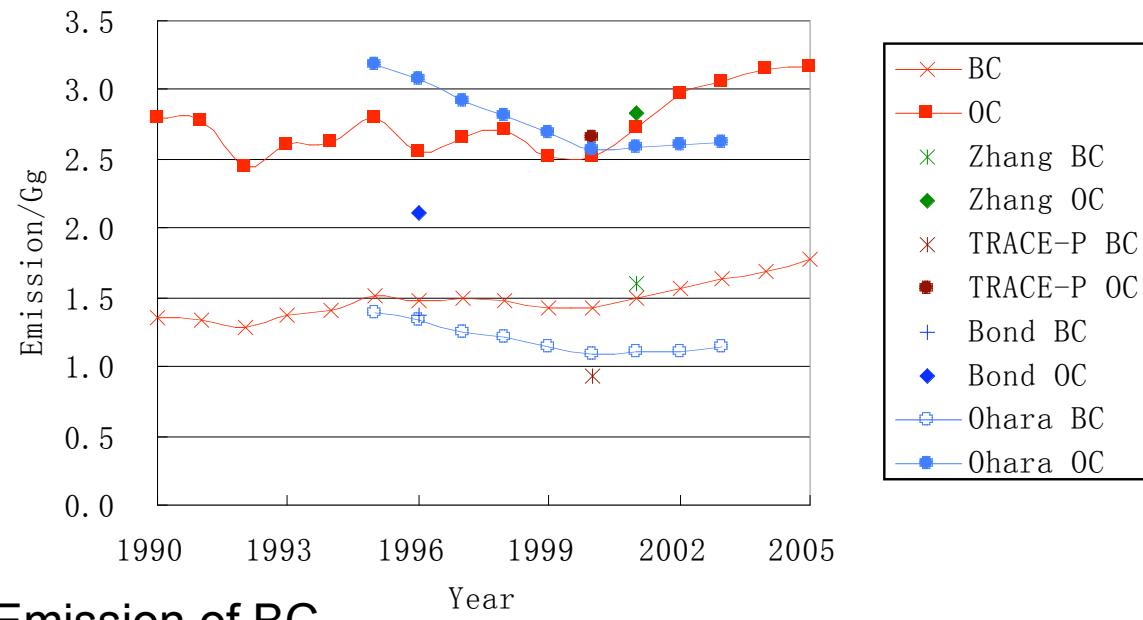
- Emission share
  - Residential: 55%~65%
  - Industry: 25%~33%
  - Mobile: 5%~11%

# Emissions by sector: OC



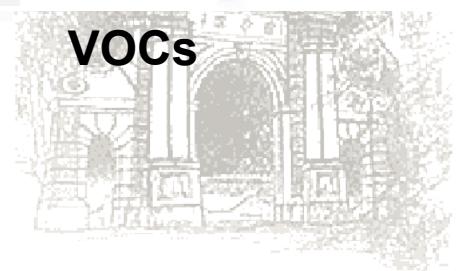
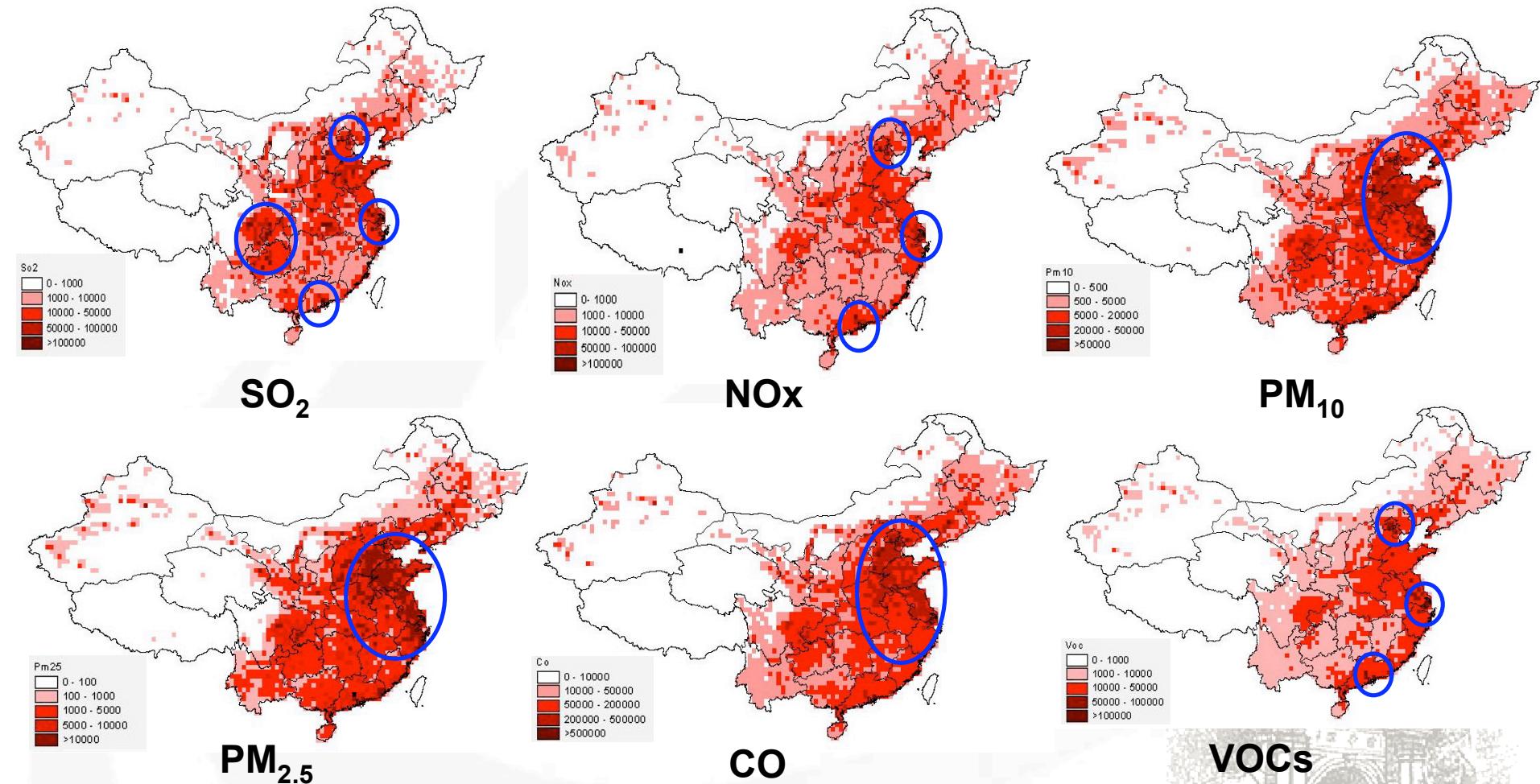
- Emission share
  - Residential: 80%~90%
  - Industry: 8%~18%
  - Mobile: 2%~3%

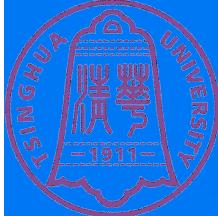
# Comparison with other study



- Emission of BC
  - Higher than results from TRACE-P, Bond, and Ohara
  - Difference mainly lies in: coking, brick industry and non-road vehicle

# China's Air Emissions in 2005



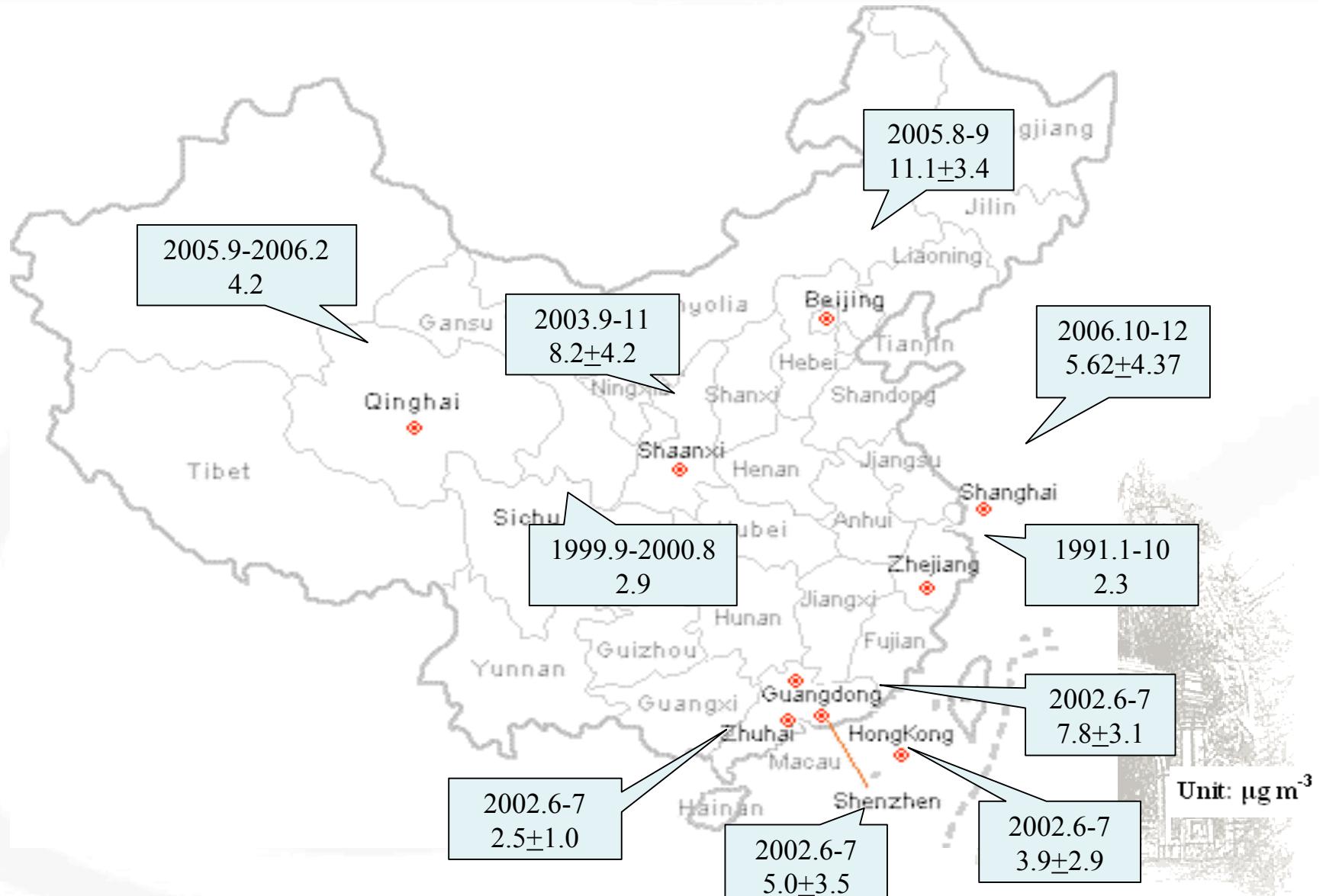


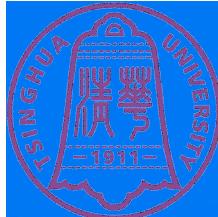
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# Background Emissions Observation Control Strategies

# Regions of BC observations covered by previous studies in China



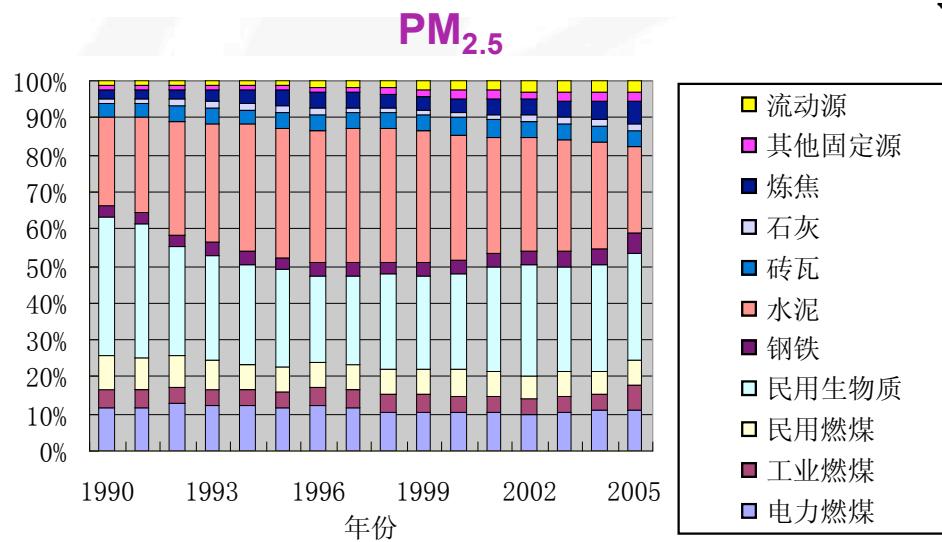
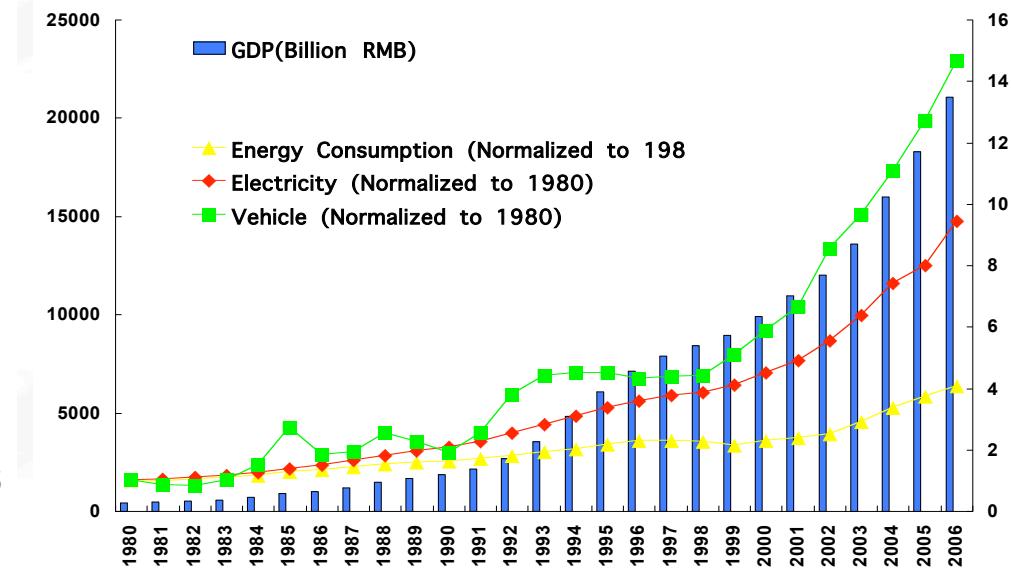
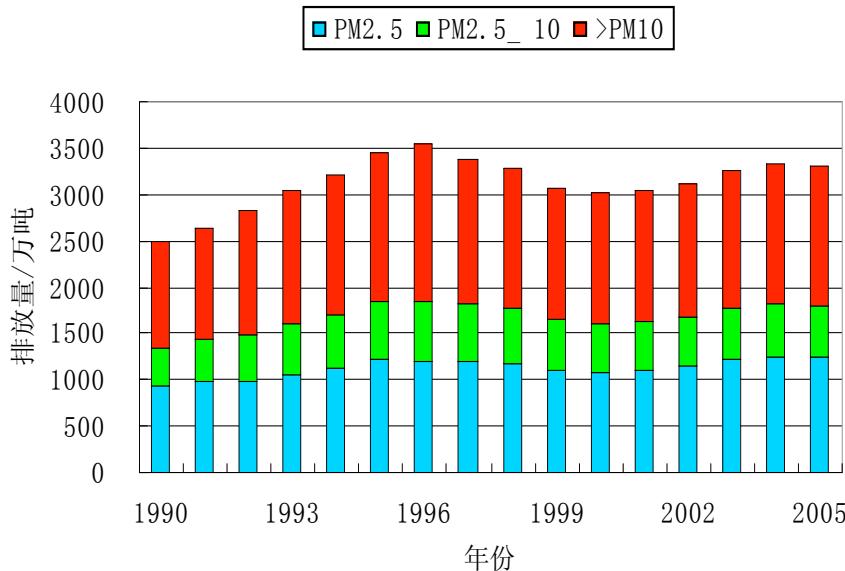


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# Background Emissions Observation Control Strategies

# Historical trend of PM emission in China: 1990-2005



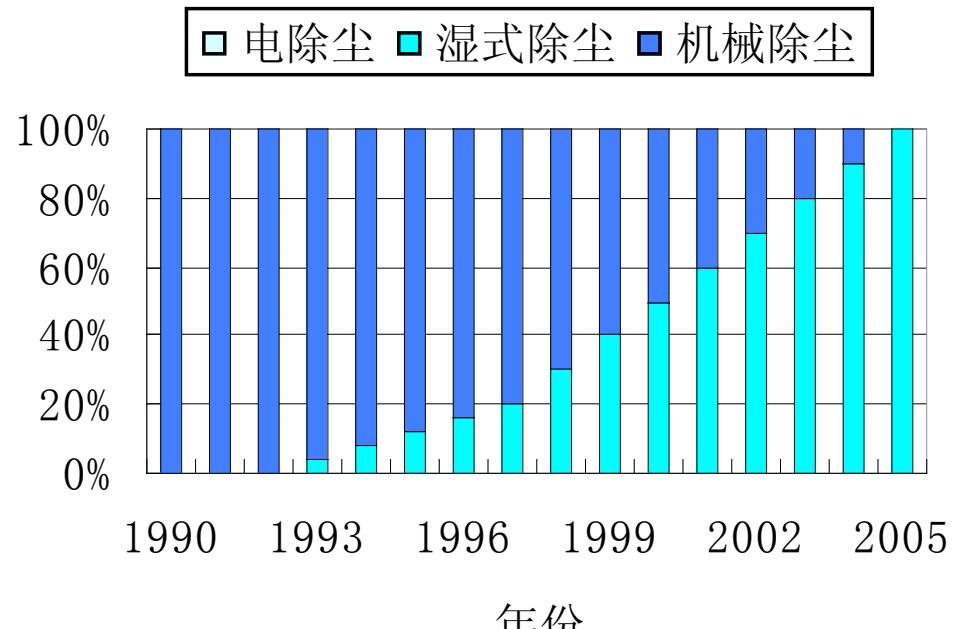
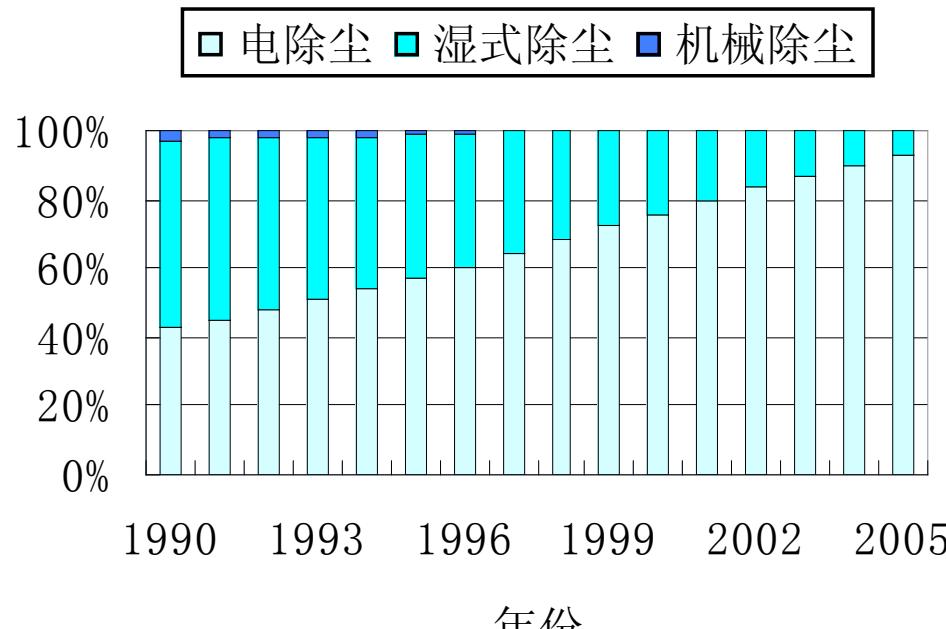
# PM emission standards for stationary combustors



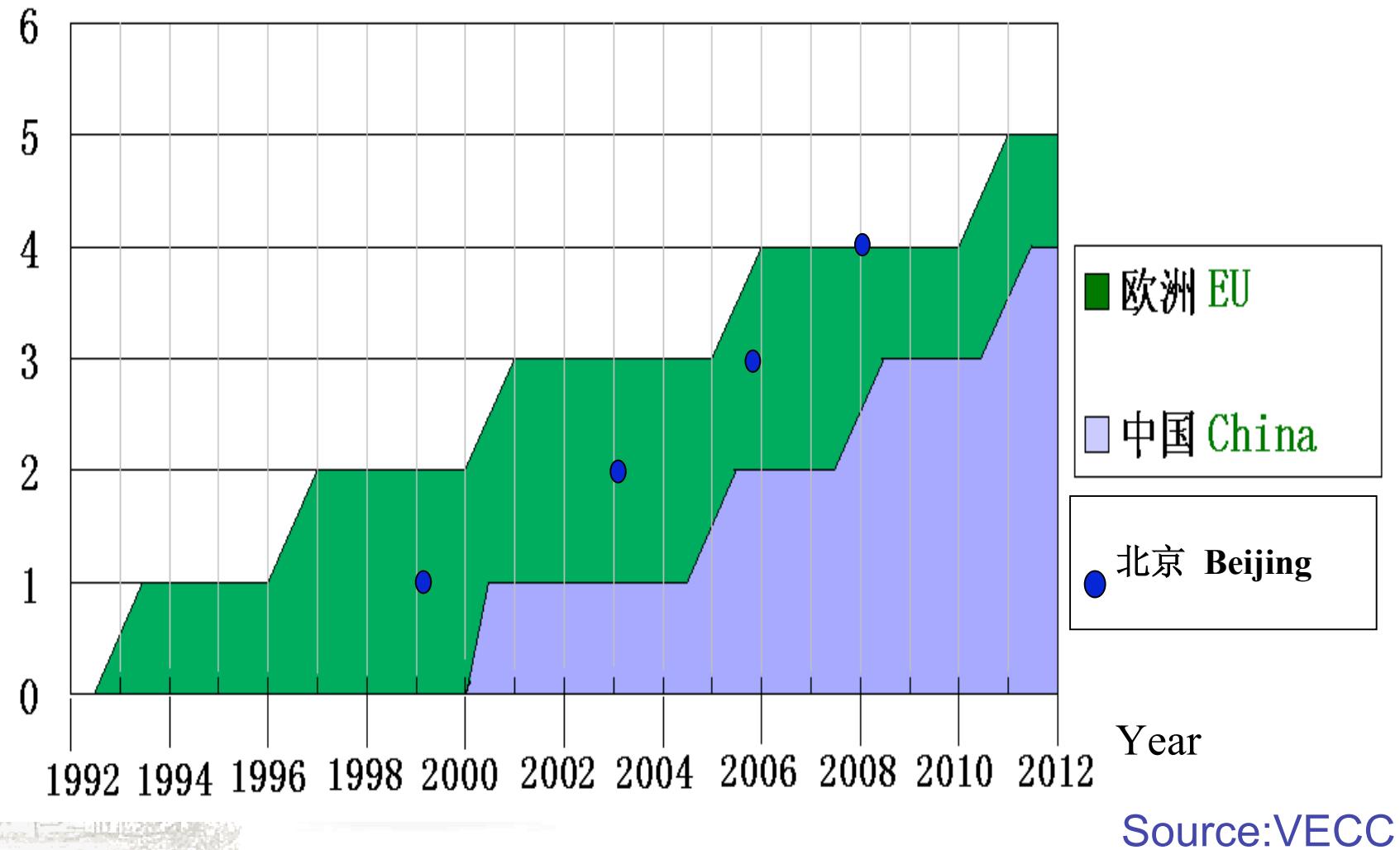
《火电厂大气污染物排放标准》  
我国新建、扩建、改建锅炉烟尘  
排放限值

《锅炉大气污染物排放标准》  
北京新建、扩建、改建锅炉烟尘  
排放限值

# Upgrade PM control devices

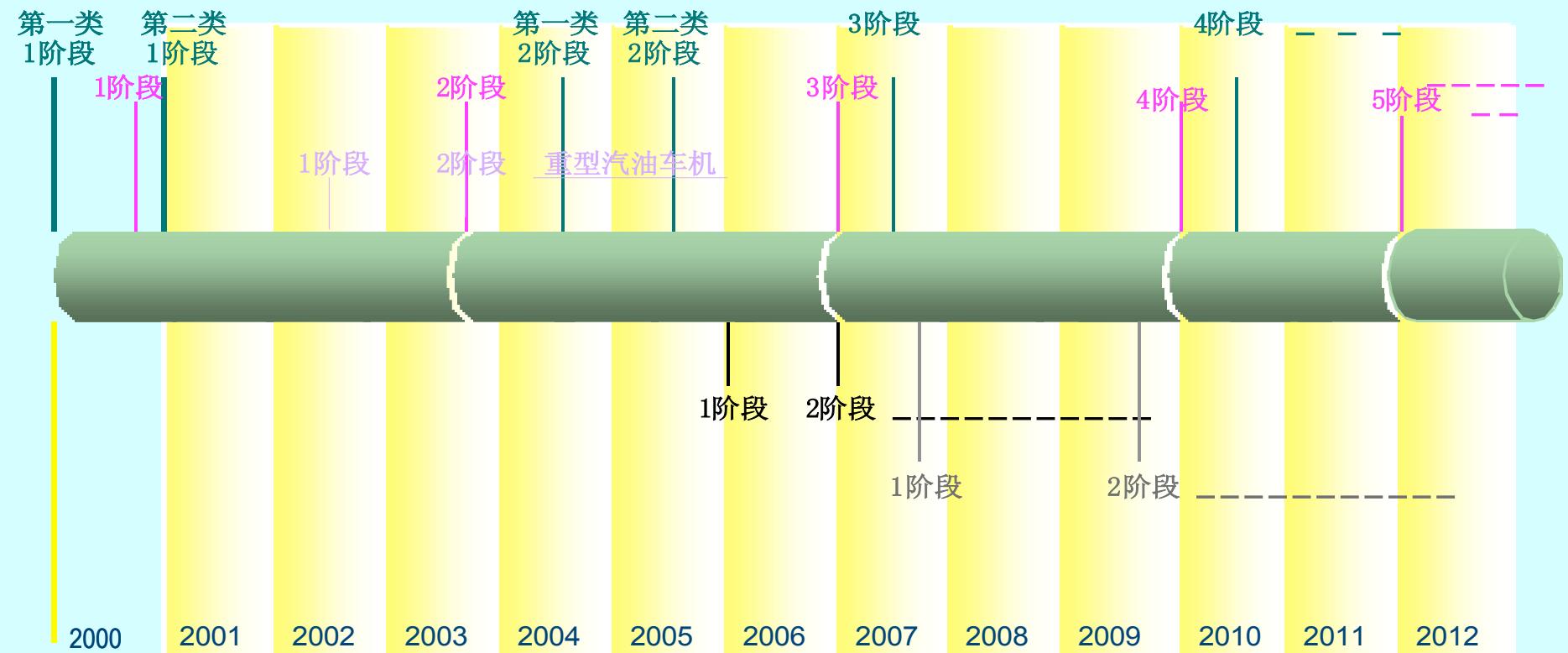


# Historical Trends of Emission Standards



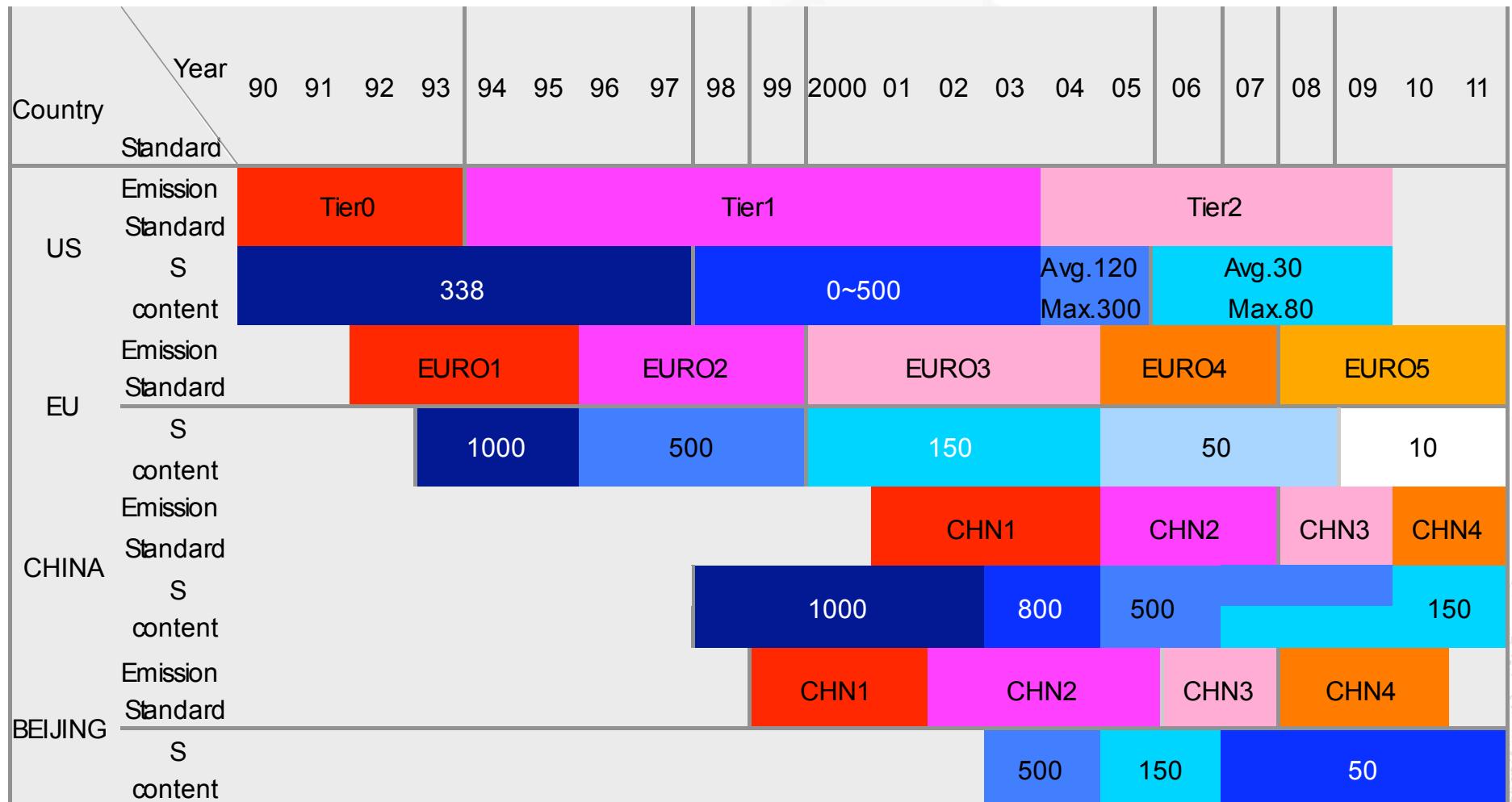
# Timetable for standard enforcement

## 标准时间进程

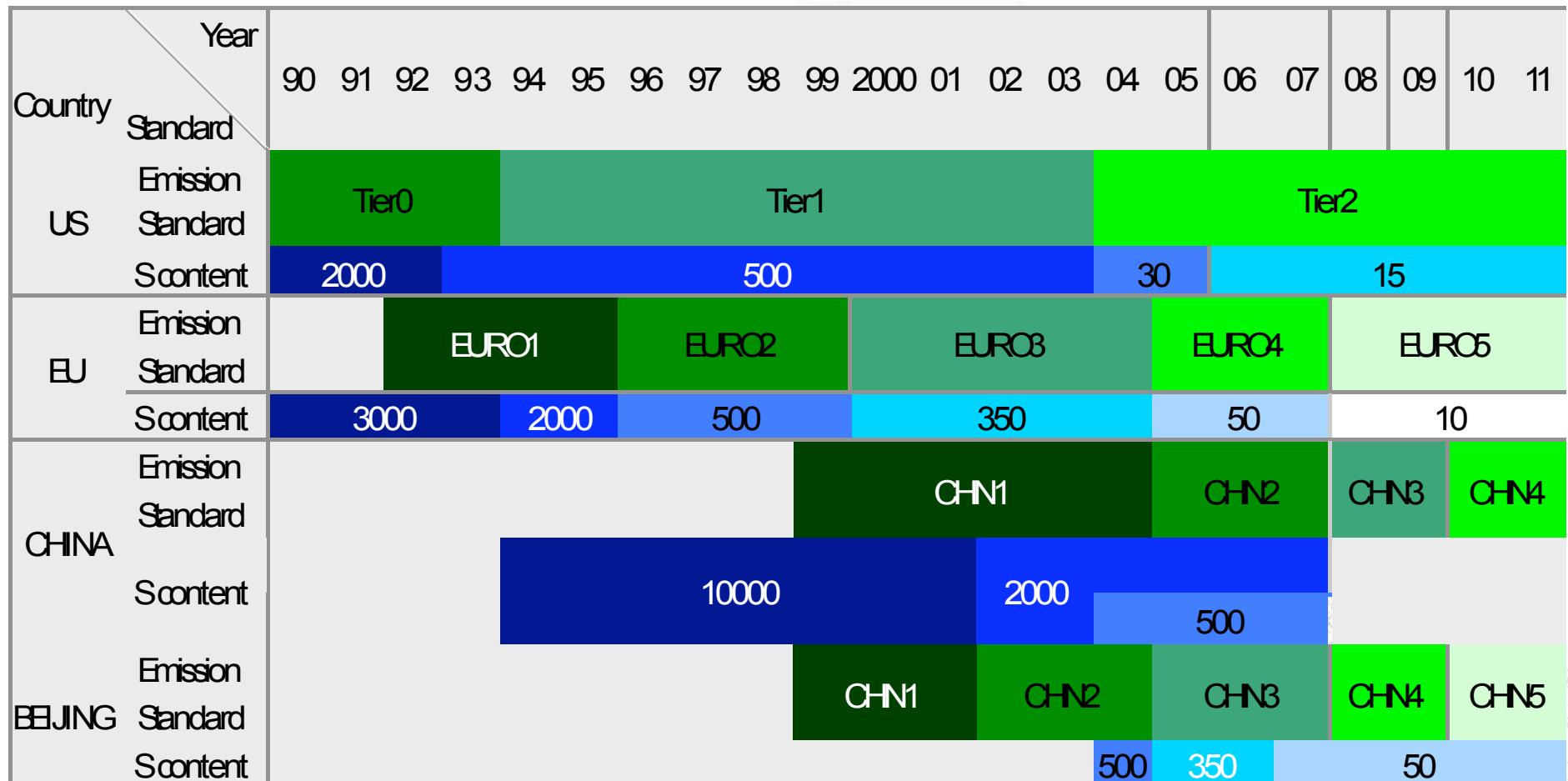


Source:VECC

# Fuel quality: Gasoline



# Fuel quality: diesel



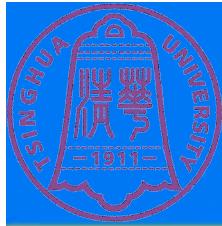
# Controlling super emitter

- Enforcement of Scrapping
- Limitation of usage
- Economical incentives



# Vehicular emission reductions during Olympic Game

		HC	CO	NOx	PM <sub>10</sub>
Yellow ID vehicle control	Daily (tons)	85.9	526.5	56.8	5.3
	%	23%	18%	20%	34%
Order/even	Daily (tons)	172.7	1409.1	96.7	4.8
	%	47%	47%	34%	30%
Official car control	Daily (tons)	45.4	373.7	33.9	1.8
	%	12%	12%	12%	11%
Special vehicle	Daily (tons)	0.8	7.5	1.5	0.2
All measures	Daily (tons)	206.3	1699.5	129.0	8.2
	%	56%	57%	46%	52%



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Thanks!