

Comparing and Contrasting Personal Exposure to Particulate Matter: The Confederated Tribes of the Umatilla Indian Reservation and China

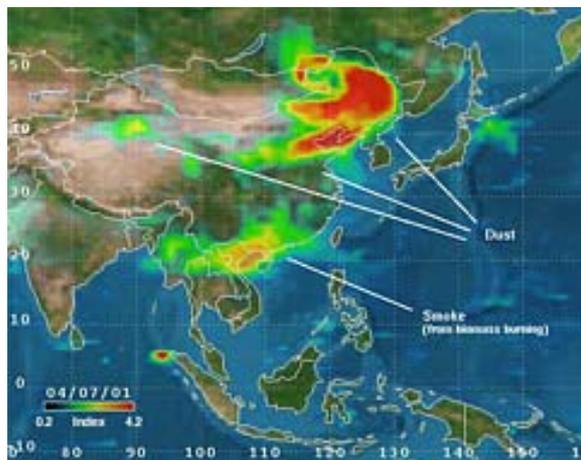
SRP Annual Meeting
November 10, 2010

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Corvallis, OR

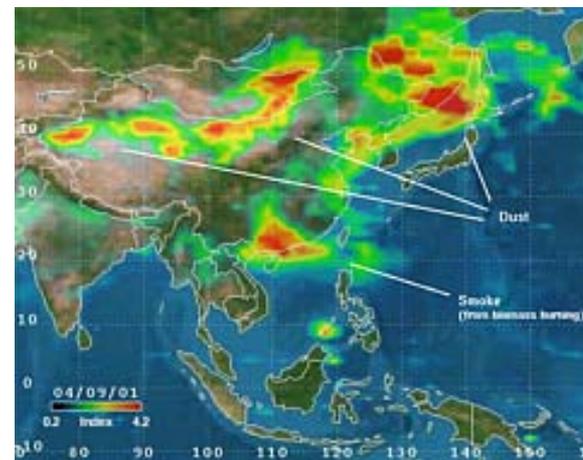


Asian Dust Storm Event: April 2001

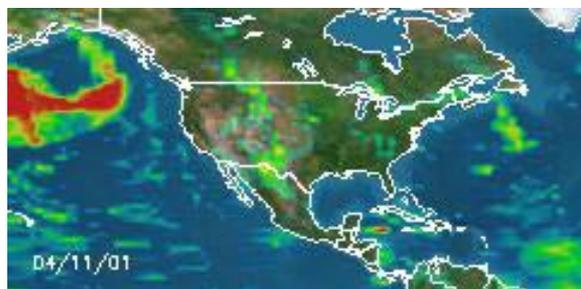
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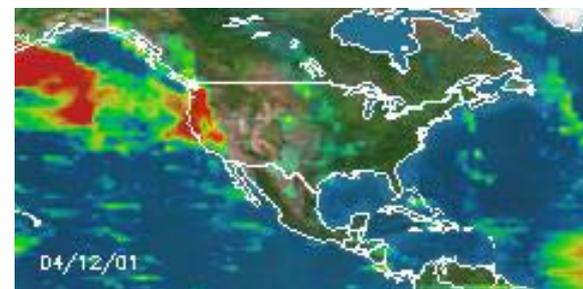
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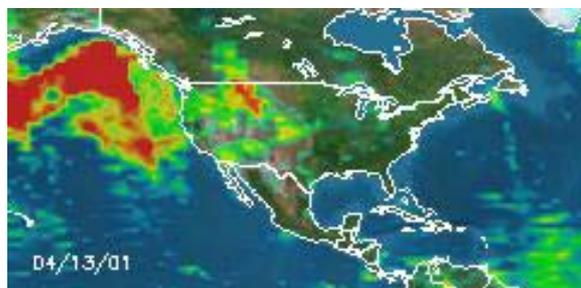
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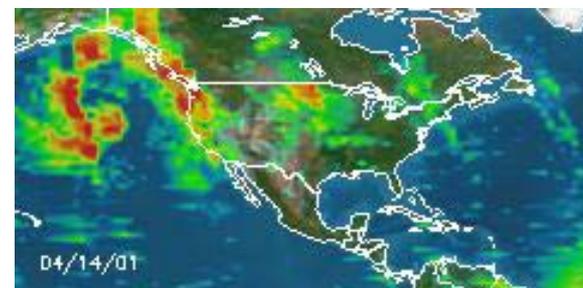
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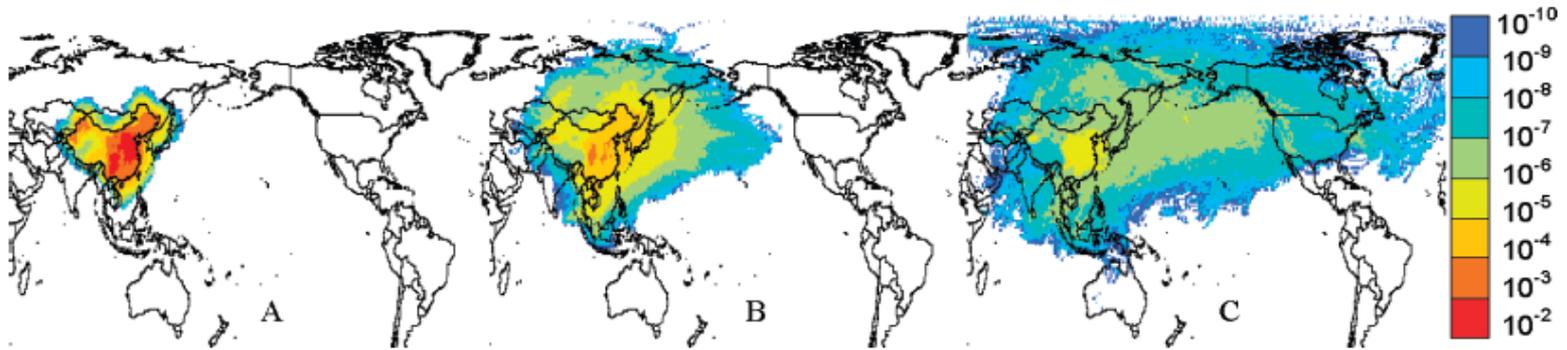


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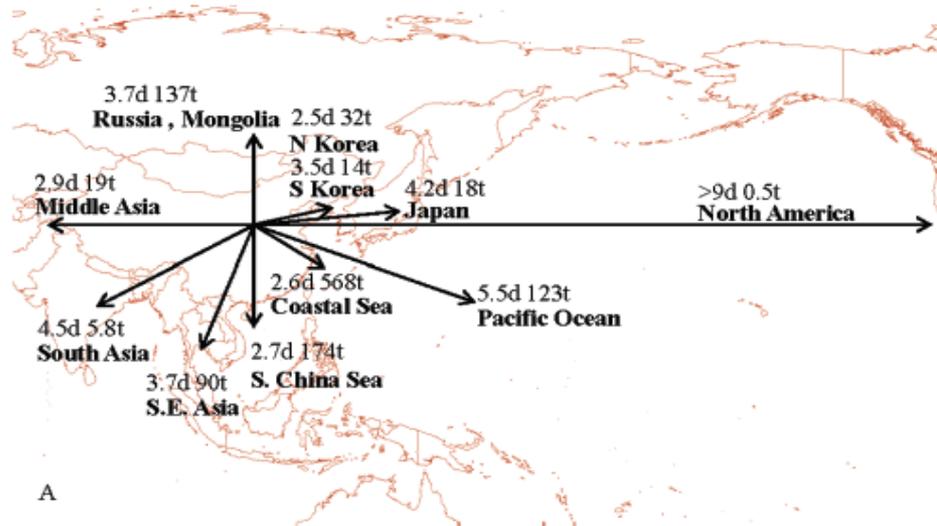


[NASA TOMS]

PAH Emissions and Outflow from China



Pyrene
Annual Mean
2001



PAH Emissions and Outflow from China

#1 China = 114,000 tons/year
(22% of World's PAH emissions)

#2 India = 90,000 tons/year

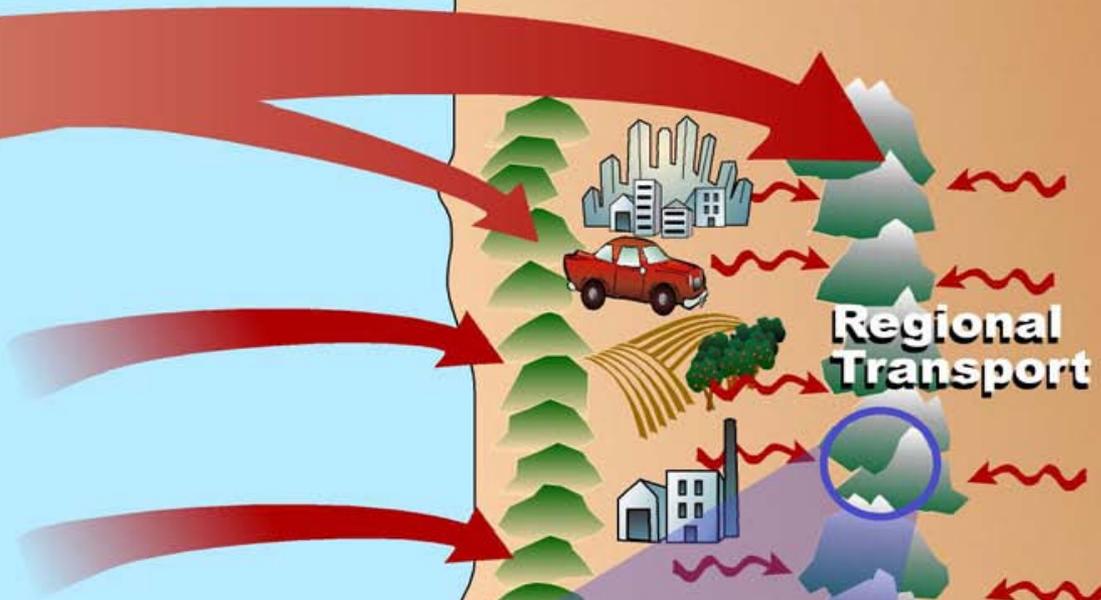
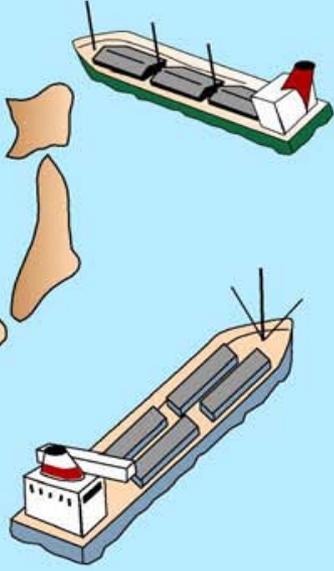
#3 U.S. = 32,000 tons/year

Pyrene
Ann
200

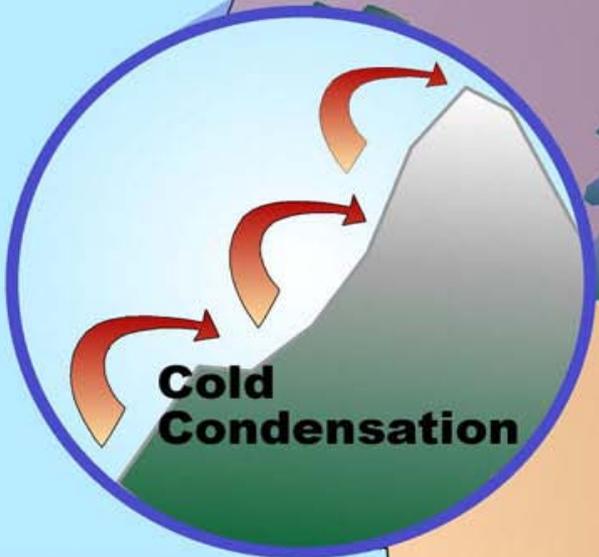
Lung cancer is 4th and 5th leading cause
of death in Chinese men and women

PAH emissions are increasing in
developing countries

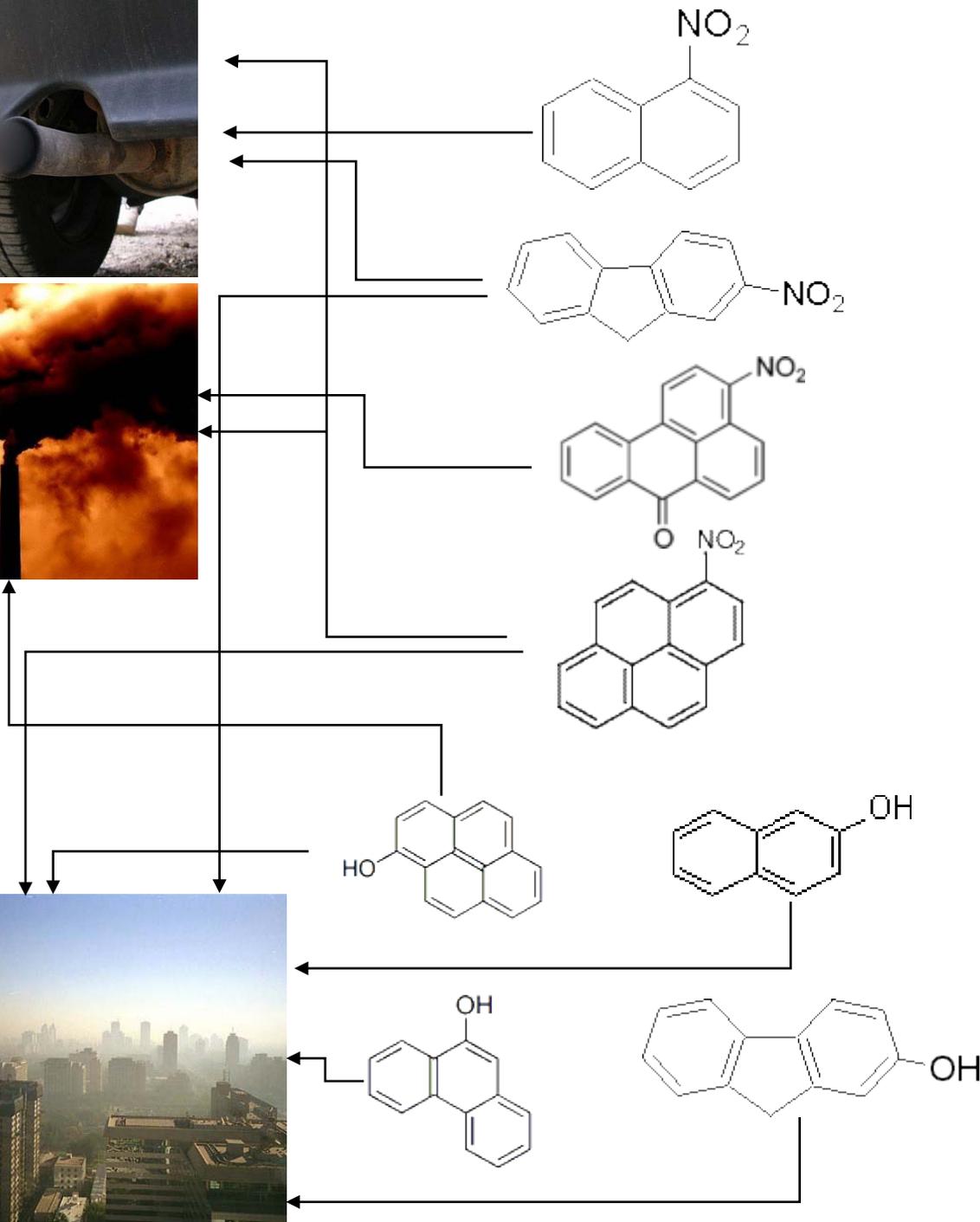
Long Range Transport

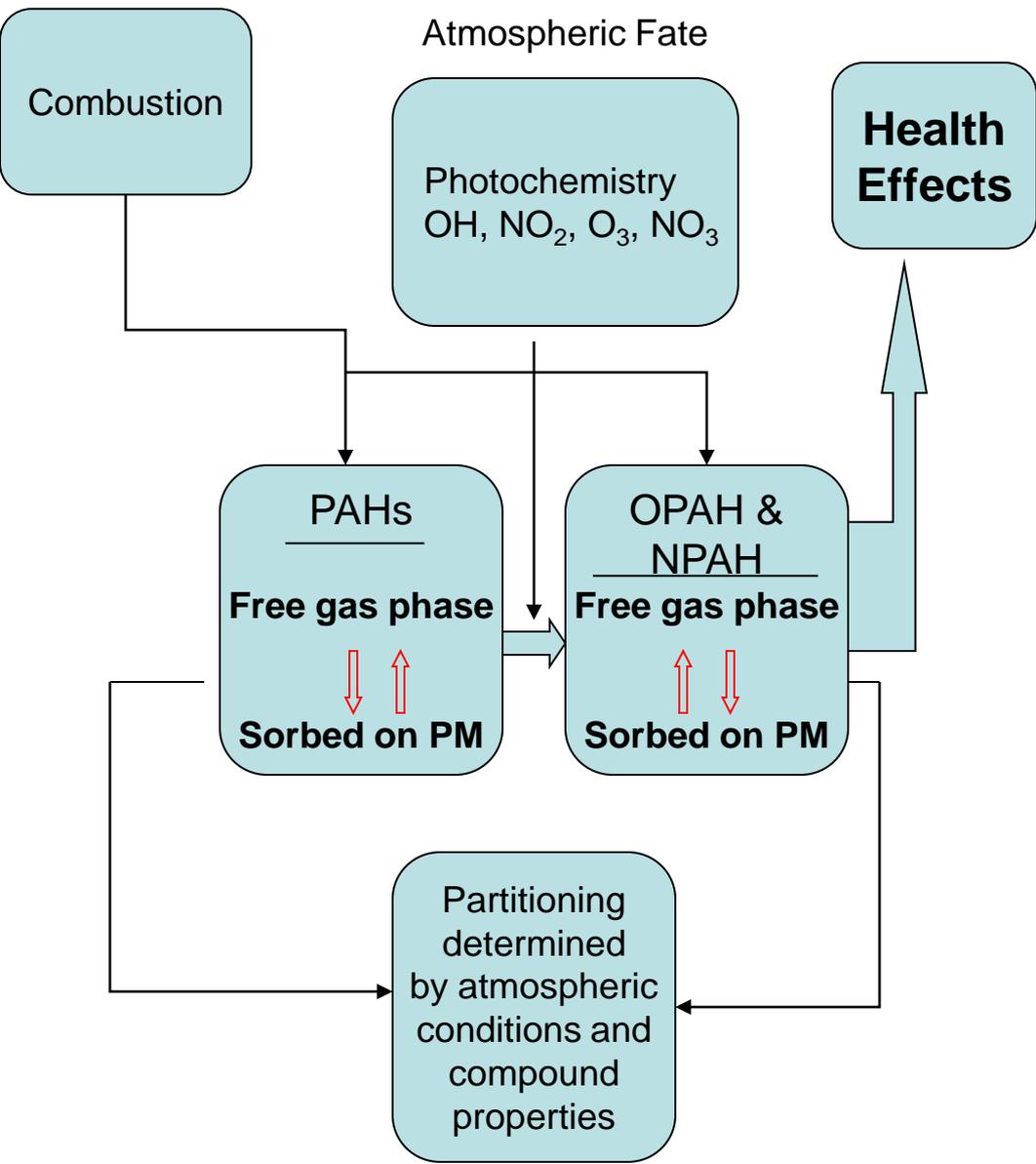


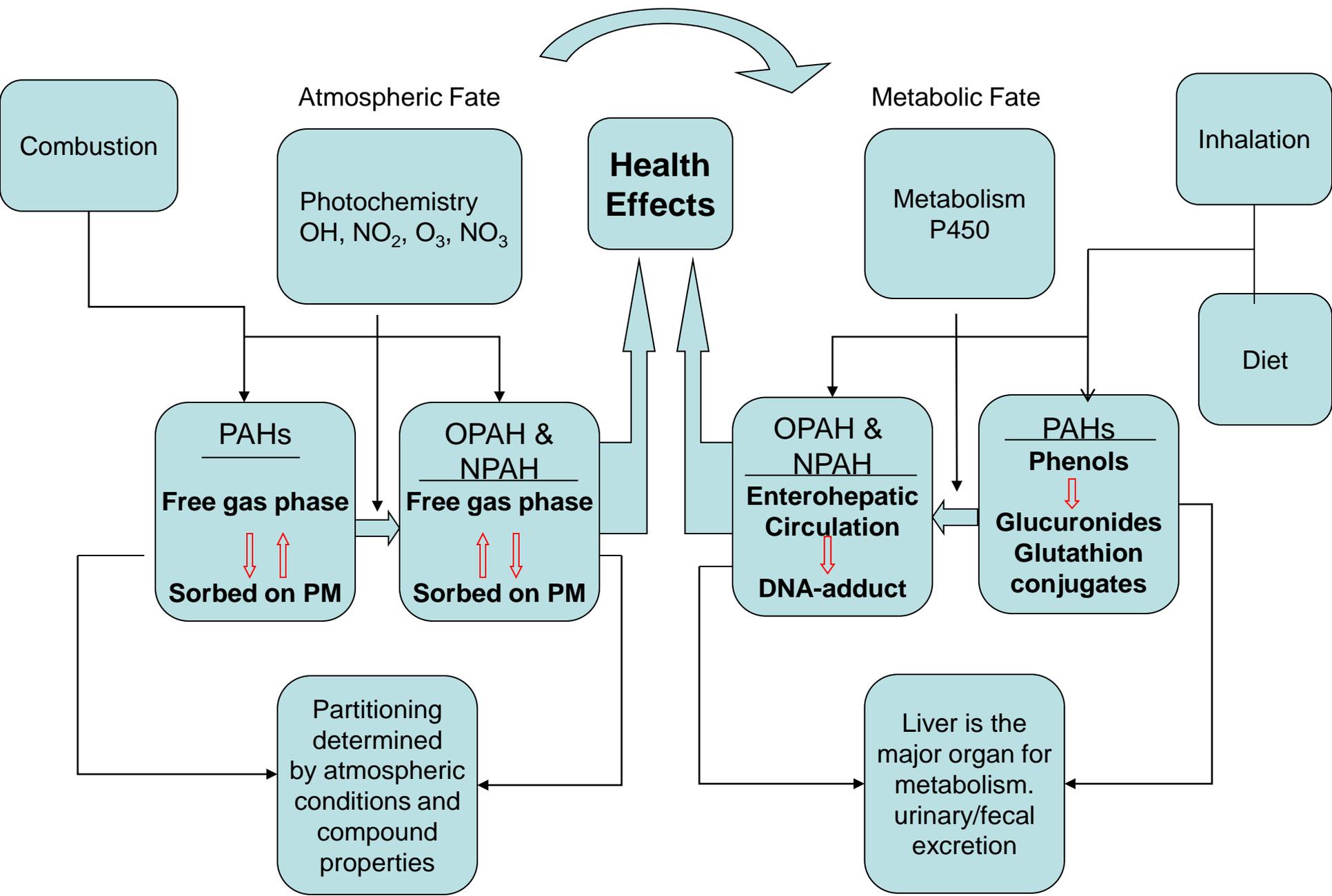
Regional Transport

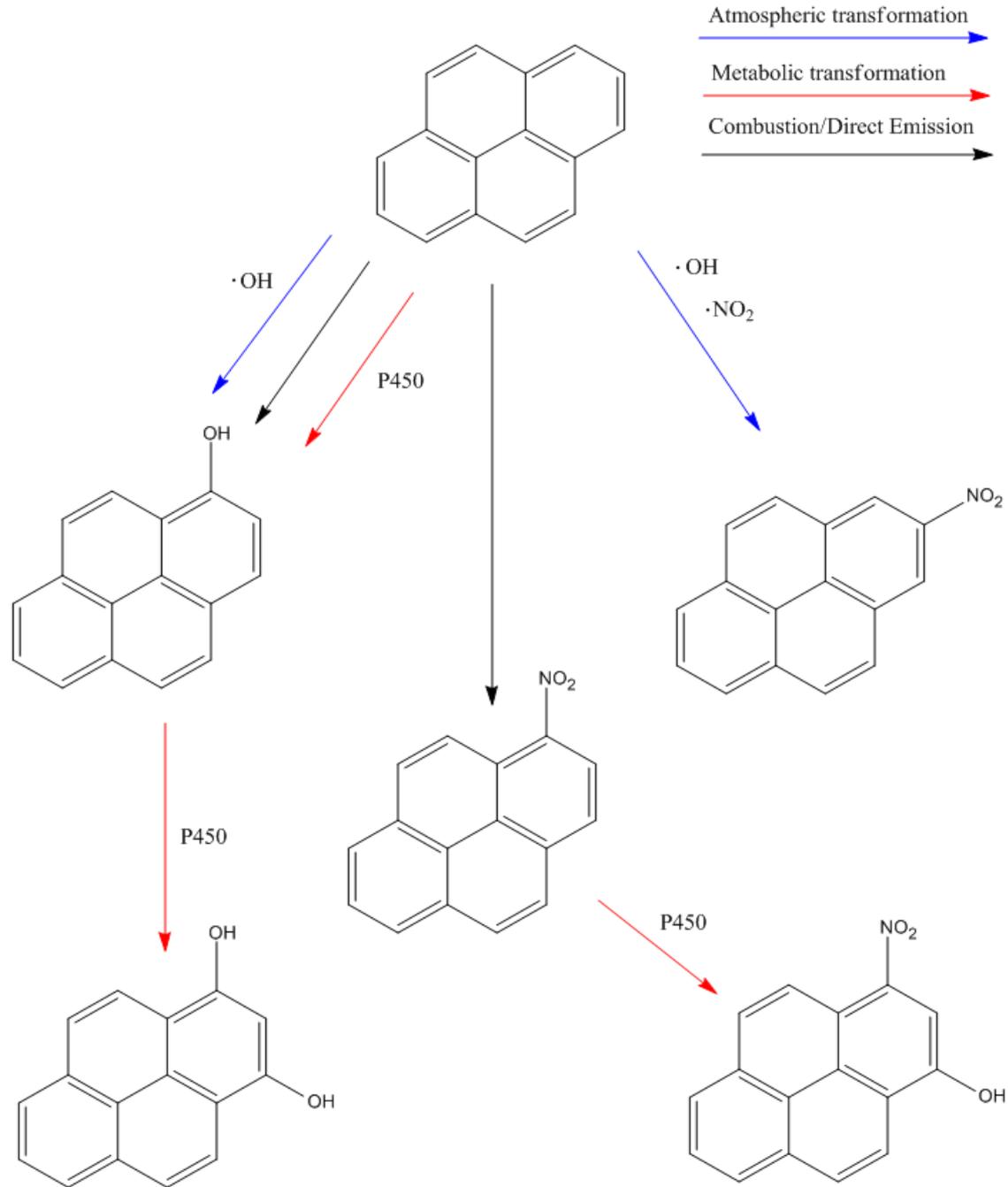


Cold Condensation









American Indian PAH Exposure

- PAHs are common toxins in Superfund sites that American Indians may be exposed to.
- Potential for PAH exposure through subsistence practices (including food smoking).
- Cancer is the second leading cause of death among American Indians over the age of 45.
- Age adjusted lung cancer death rate has increased 184% since 1975.

Hypotheses

1. Highly mutagenic nitro and oxy-PAHs are formed on Asian particulate matter in transit to the U.S. West Coast due to atmospheric aging and this results in a measurable increase in the mutagenicity of PM in the western U.S.
2. Chinese and American Indian populations experience high exposures to PAHs, but to different environmental PAH mixtures that result from different combustion sources.

Specific Aims

1. Measure the PM-bound PAH composition and exposure to nonsmoking Chinese and American Indian men and women.
2. Measure the effect of atmospheric aging on the PAH composition of Asian PM *in situ* to the U.S. west coast and in the laboratory.
3. Determine the relative mutagenicity of the different forms of PM.

Personal PAH Exposure - China



Personal PAH Exposure - China



Personal PAH Exposure - CTUIR



Sampling Strategy for CTUIR

- Determine the relative importance of PAH exposure due to long-range transport and regional transport in ambient air.
- One regionally representative site for sampling size fractionated PM: $>PM_{10}$, $PM_{2.5-10}$, and $<PM_{2.5}$
- Short-term satellite sites to characterize local PAH sources: truck stop, railroad, etc.

Sampling Strategy for CTUIR

- Determine the personal exposure to PAHs.
- Personal air sampling for PAH bound to PM (PM_{2.5})
- Smoke house activities
- Simultaneous daily activity diary (including diet)
- Collection of urine and analysis of PAH metabolites

Field Studies

Beijing, China



Okinawa, Japan



Portland, Oregon



CTUIR

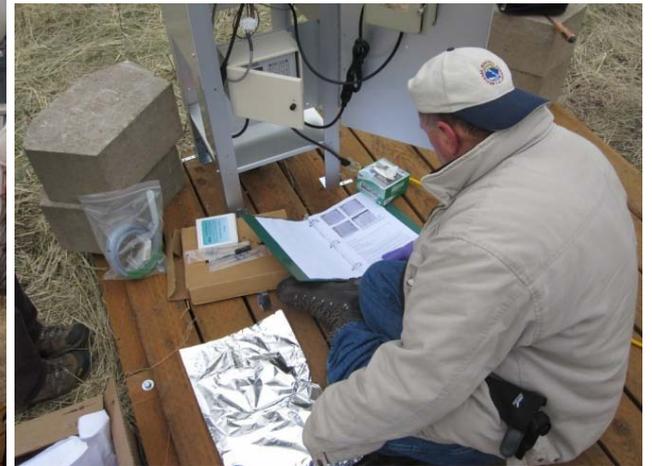


Mt. Bachelor, Oregon



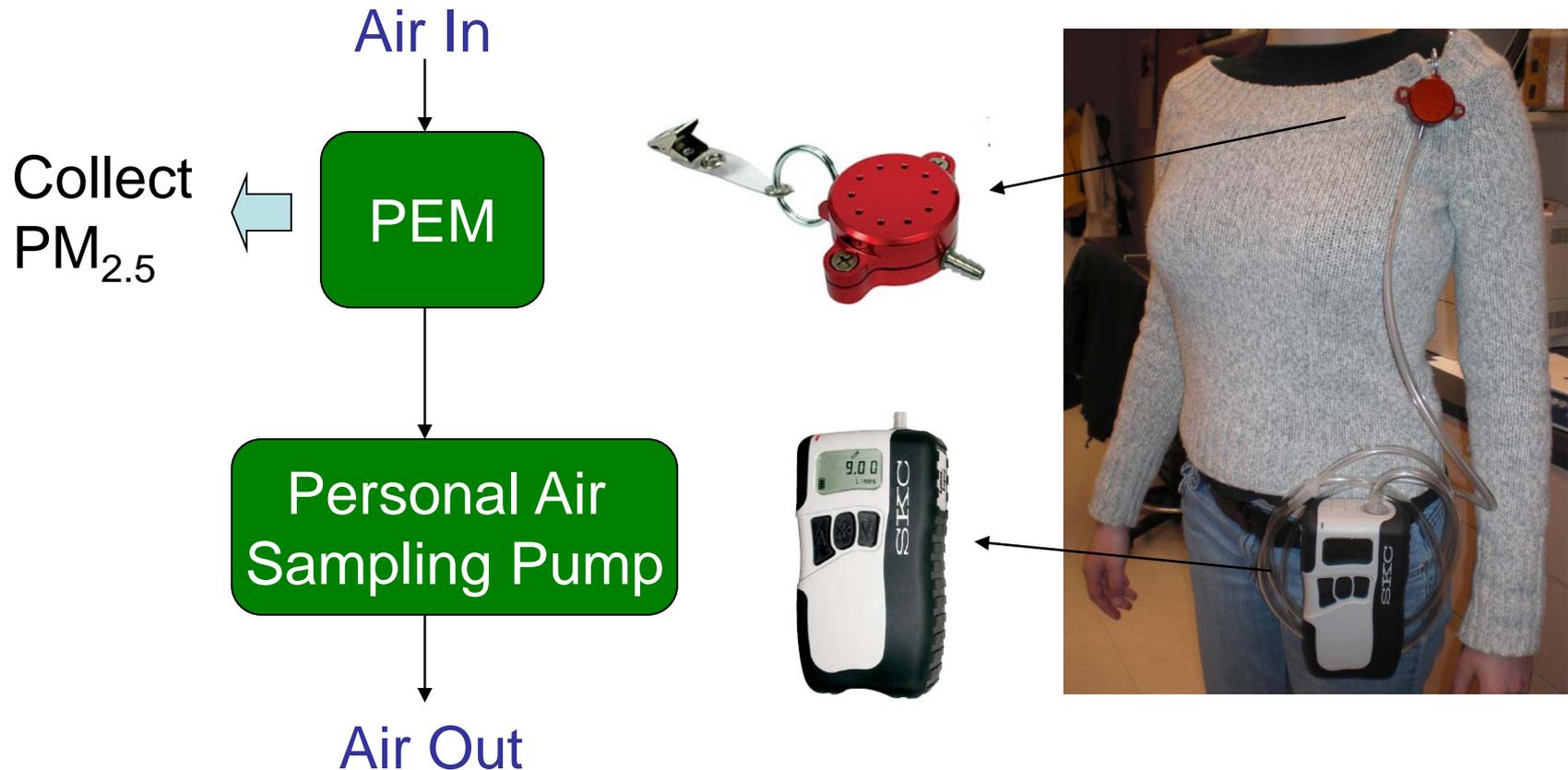
2010

CTUIR Ambient Air Monitoring Site



Personal Air Sampler

- Personal Environmental Monitor (PEM) + Leland Legacy Personal Air Sampling Pump



Conclusions

- New partnerships were formed that benefit everyone involved
- Research complements the entire scientific program
- Students gain experience not only in science but in cross cultural partnerships

Acknowledgements



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