INTERNATIONAL CONFERENCE ON MOUNTAINS AND CLIMATE CHANGE

SLCP (e.g., BC) – A Near Term Opportunity to Deal with Health and Climate Change

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# ABC Program has helped establish SLCP opportunities

Brown Cloud Masking= -1.5 (+-50%) W/m\*\*2 BC acts like CO2 with about 50% of forcing as CO2, but with a much shorter atmospheric lifetime.



-salt & NO<sub>3</sub>

2%

NH₄<sup>+</sup>

Traps sunlight and heats the air

Reflects sunlight and cool

26%

# Reducing the Impacts of Aerosols have Important Implications for Air Quality and Climate (*but road is bumpy*)



+ Decrease PM2.5 and tropospheric ozone

+ Decrease BC faster than Sulfate

(scattering) aerosol



#### High Altitude Regions are impacted by Aerosols from Different Sources Annual Average 2008/09)



# **Central Asia Observatory**



#### KYRGYZ REPUBLIC

New ABC Site for Aerosols and Radiation – EPA Funding





Trajectories of long range transport at height 3500 m over sea level



# **Meteorology Fairly Well Predicted**



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# PM2.5 (and AOD & BC) Fairly Well Predicted





#### Which Source Regions/Sectors Contribute to PM2.5 in High Central Asia



#### What Source Regions/Sectors Contribute to BC in High Central Asia



#### What Source Regions/Sectors Contribute to BC at Pyramid Site?



### What are the Opportunities to Reduce PM2.5 and BC in the Region by 2030?





#### What are the Opportunities to Reduce PM2.5 and BC in the Region by 2030?







High Summit

# **Backup Slides**



Regional Perspectives are Needed AND BC (and SLCP) Processes are Complex and contain various Uncertainties



Bond et al., JGR, 2013

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**Result for Global Temperature Change: CO<sub>2</sub> and SLCF Measures are Complementary Strategies** 



## Impact of the Measures on Health, Crop yields and Climate





Annually avoided premature deaths (millions)



Annually avoided crop yield losses (total maize, rice, soybean and wheat, millions tonnes)

mit 17

#### Atmospheric Absorption is Underpredicted







# **Emission Estimates Remain Uncertain**















New approaches - global aerosol direct radiative forcing sensitivities from every sector & region using adjoints



Calculated very efficiently with the **GEOS-Chem adjoint** (Henze et al., 2007) + **LIDORT** (Spurr 2002) Summit Henze et al., ES&T, in press 2012 New approaches - global aerosol direct radiative forcing sensitivities from every sector & region using adjoints



## **RF** efficiencies

EPA Star Grant

Henze et al., ES&T, in press 2012



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Transport and Deposition Processes in The Himalaya Region Have Important Implications for Water and Food Security

ABC Nepal Climate Observatory (NCO-P)

- •Remote site in Himalayan region
- 5079 m asl
- •27.9 N, 86.7 E
- Complex topography



S. Fuzzi and team







