Soot or Black Carbon in the Atmosphere

Introduction to the Workshop on Measurement Methods and Perspectives

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What is Soot?

- Soot is carbon particles resulting from the incomplete combustion of hydrocarbons.
- Its color is black, therefore its called “Black Carbon”
- Soot contains polycyclic aromatic hydrocarbons (PAHs) and heavy metals.
- Fresh soot particles might be surface reactive

Black Carbon and Human Health

- The size of BC particles is around 0.1 µm, small enough to cross cell walls
- BC is not water soluble and thus remains as particles in the lung
- Black carbon (BC) itself is neither a toxic nor a carcinogen.
- PAHs and heavy metals might be however toxic and thus may cause diseases

→ We need to know how soot particles act in the human's body

Black Carbon and Climate

- BC absorbs solar light and warms the atmosphere
- Its contribution to global warming is much higher than previously thought
- BC's impact on the climate is larger than that of methane and roughly two-thirds that of carbon dioxide[1]

→ we need here to know the wavelength-dependent particle light absorption coefficient

[1]Bond, T. C. et al. (2012)

Sources of Black Carbon

- Diesel emissions, domestic heating, and agricultural waste fires are major sources of black carbon in industrialized countries
- In the developing world, the soot comes from sources such as burning of biomass for cooking and heat.
- We have to put much more effort into a reducing black carbon emission and pollution

Methods to determine ?

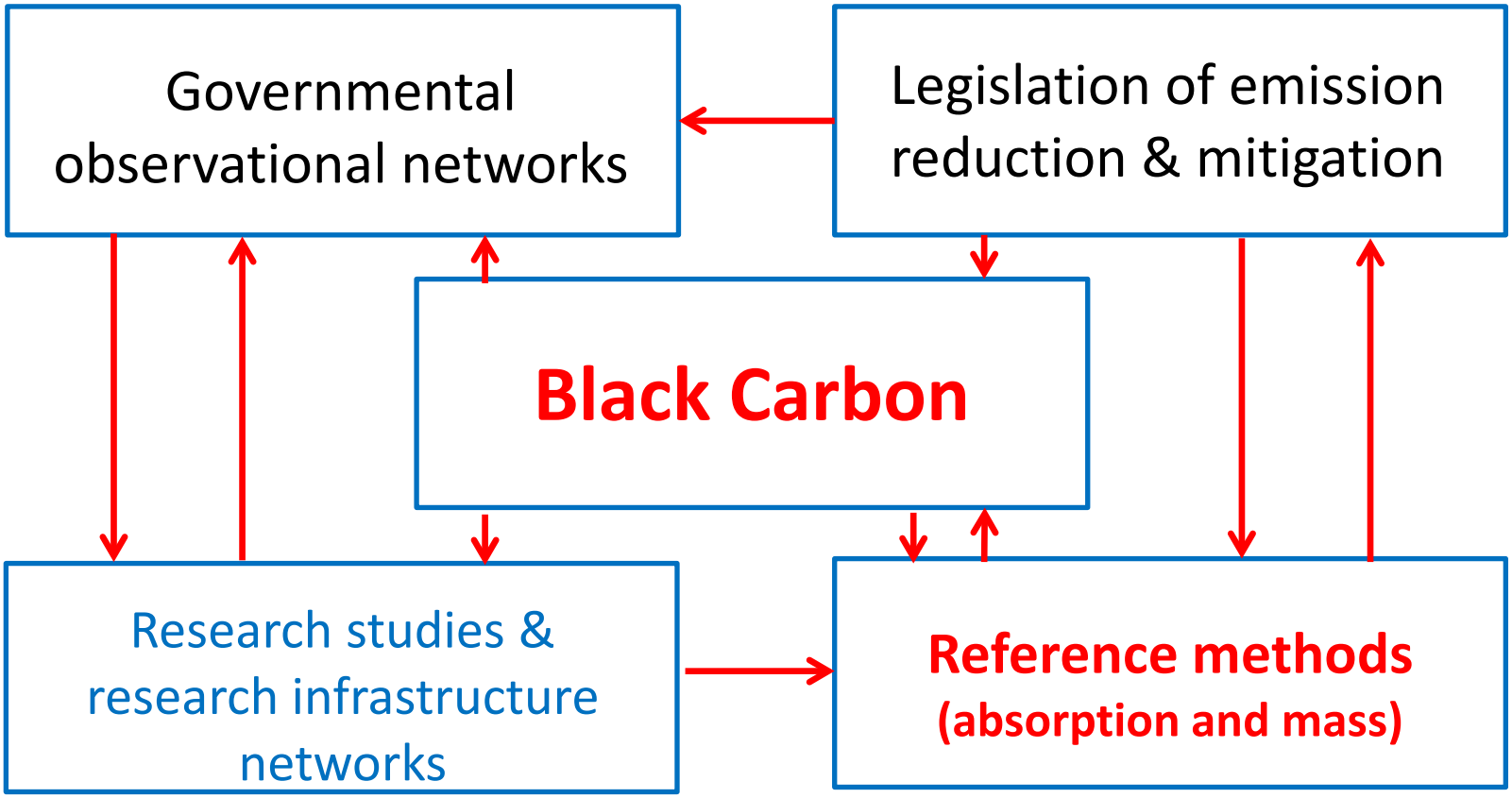
There are several methods to determine soot.

- Due to light attenuation through a filter →equivalent BC (& light absorption)
- Due to thermal desorption (volatility) → elemental carbon, EC
- Due to Raman spectroscopy → graphitic carbon
- Due to Laser-induced incandescence → refractory carbon

What are the Question?

- Which message should we give authorities and policy makers?
- What are the future needs in term of climate or health-relevant measurements
- How can we define reference methods to determine particle light absorption and “soot” mass concentrations

Observational Strategy for Black Carbon



Thank you very much

and I hope you will enjoy our workshop