Recommendations for Interpretation of "Black Carbon" Measurements

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- SAG website: **http://gaw.tropos.de/index.html**
- Comments and questions can be sent to **sag-aero@tropos.de**

Request from WMO

"Discuss and review the observations of what is called BC in order to contribute to the classification of their quality and their value in model validation"

- **Response from SAG deals with**
  - Definition of BC
  - Relationship between definition of BC and measurement methods

What is Black Carbon?

- **Defined by five essential characteristics**
  - Composition
  - Morphology
  - Volatility
  - Solubility
  - Light absorption

What is Black Carbon?

- **Carbonaceous particulate matter**
  - a high fraction of which is sp^2-bonded carbon
- **Consists of aggregates of spherules**
  - Individually, from <10 to (typically) 50 nm in diameter
- **Refractory**
- **Insoluble in water**
- **Strongly absorbs light across all visible wavelengths**
  - when freshly emitted, has a mass absorption efficiency of at least 5 $m^2\ g^{-1}$ at the mid-visible wavelength of 550 nm

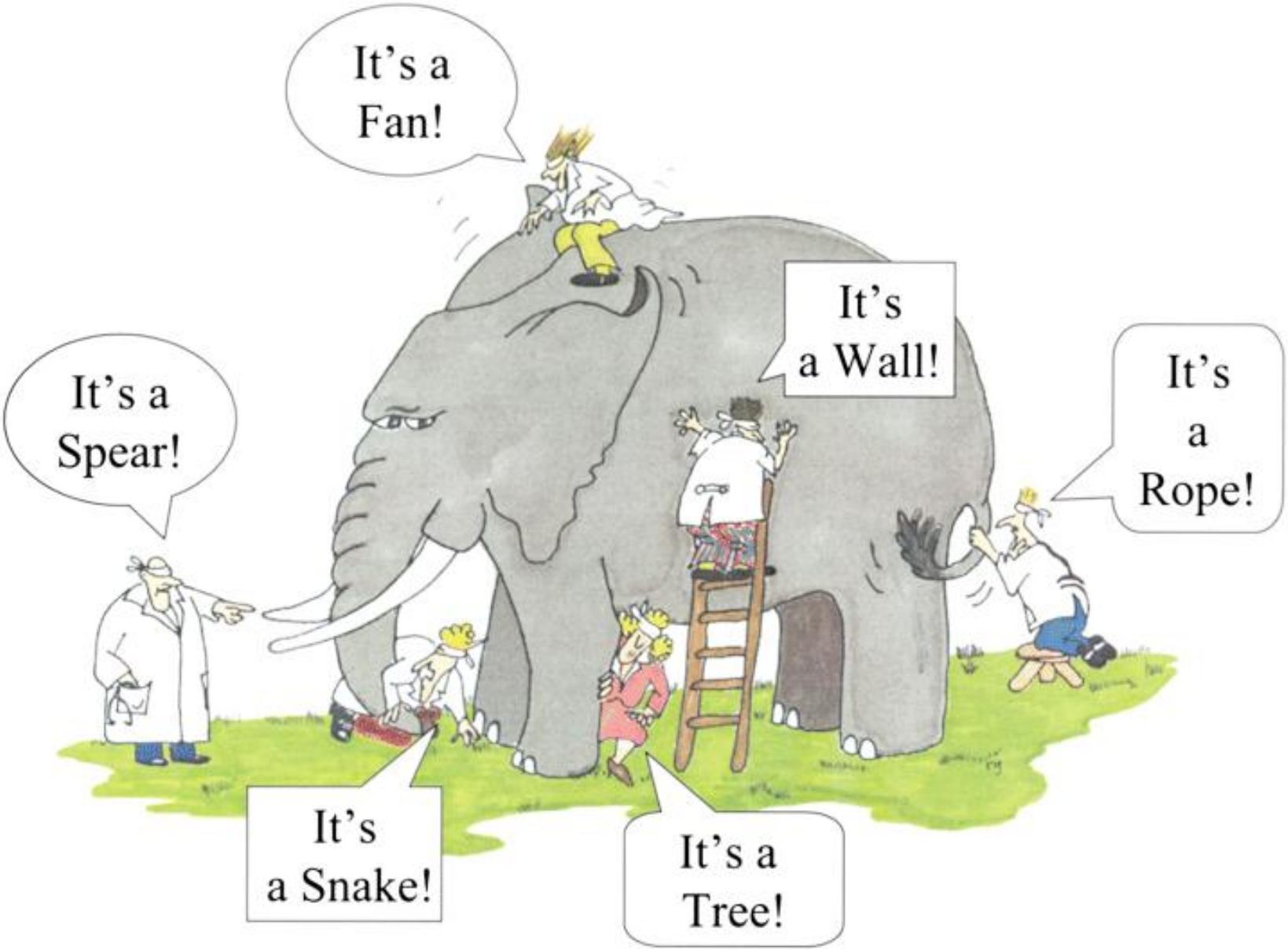
"BC" Measurement Methods

- **Light Absorption Coefficient (σ_{ap})**
  - Derived from optical methods, e.g.,
    - Filter-based (aethalometer, PSAP, MAAP, COSMOS)
    - Suspended particles (e.g., photo-acoustic, extinction minus scattering)
  - Equivalent Black Carbon (EBC)
    - derived from σ_{ap} using a mass absorption efficiency (MAE)
    - the MAE used to calculate EBC must be specified
  - BC Properties: absorption
- **Elemental Carbon (EC)**
  - Derived from measurement of CO_2 evolved from thermal or thermo-optical methods
    - e.g., IMPROVE or EUSAAR protocols
  - BC Properties: composition, refractory, (absorption)
- **Refractory Black Carbon (rBC)**
  - Derived from laser incandescence methods
  - BC Properties: composition, refractory, absorption

Recommended Terminology

- **No current method combines all five essential characteristics of BC**
- **Consequently, no current method can justifiably claim to provide a quantitative measurement of BC**
- **Recommendations**
  - Use “BC” as a qualitative term referring to any of the quantitative methods
  - the source/method of “BC” observations should be identified by using the respective terms EBC, EC, or rBC as defined above

Blind Men and the Elephant



Interpreting“BC” Measurements