Session 14

Aerosol type from satellite

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Seed talks:

Ralph Kahn / NASA: aerosol type climatology
Lucia Mona / CNR: aerosol typing concepts

Aerosol Typing
Main Points 2014

- **Nomenclature**: AOD/AOT, components/particles – mixtures
- Overall **qualitative categorization** by size distribution, absorption (including spectral dependance?), shape
- Some **similarity** among different approaches (e.g. MISR / SPRINTAS & Aerosol_cci)
- Should also report when AOD or aerosol type is unknown, and/or provide **pdfs of all mixtures that pass** the algorithm acceptance criteria
- A **review** of aerosol typing schemes will be made
- Might aim for a **Multi-sensor** merged „Level 4“ aerosol type product

Aerosol Typing
Further Notes 2014

- Information content is largely dependant on ***retrieval conditions***
- For good reason ***different retrievals adopt different aerosol type granularity*** (linked to information content)
- Might aim to ***harmonize nomenclature***, but not approaches
- Clear ***communication*** needed
  - ***Limitations*** of aerosol type retrievals/derivation/interpretation
  - Quantitative ***definitions*** of components
  - Avoid unnessasarily ***confusing nomenclature***
  - Satellites observe ***optical properties***
  - Passive retrievals obtain ***„column-effective“ type***
  - Identify ***actual retrieved quantities*** vs. *a priori* input
  - Models could be used to contrain aerosol types in retrievals where many mixtures pass the acceptance criteria
- ***Different users require different aerosol type information*** (e.g., climate vs. air quality)
- ***Additional user needs*** mentioned – direct/derived

  Fine mode, absorption, dust
  Smoke, dust, pollution
  Plume origin, height, ...
  Anthropogenic, dust/salt, submicron dust
  Aerosol-cloud interaction proxys

Side Meeting Notes 2014

- Best communication / use of ***Aerosol Type*** information in satellites
  - Aerosol type is necessarily ***more qualitative than AOD***, depends on dataset and retrieval conditions. Comparing retrieved aerosol type with models needs further exploration.
  - ***Mapping between model species (chemical state) and satellite optical types (with their uncertainties)*** is as much an art as a science. So it is not clear what the most sensible approach to using this information from satellites is. Maybe optical properties rather than attempting to assign a categorical type? The mapping step could be done in collaboration of satellite and model experts.
  - Some comparisons could be facilitated by ***satellite simulators***, as these can give more control over some species and optical/type mappings
  - ***Possible test***: Can we consistently ***identify dust-dominated areas*** with satellites and models (and other aerosol types: smoke-dominated, pollution-dominated, sea salt-dominated, volcanic ash-dominated)
  - ***AERONET can be a link*** as some studies are attempting to convert AERONET inversions into combinations of specific components (take into account assumptions / associated uncertainties of sky scan retrievals from AERONET).

Seed *questions*

Which information on aerosol type is helpful for users?

- initial focus on AEROCOM modelers
- most uncertain aerosol type information in modeling
- validation of aerosol type information
- integration of satellite and model information on aerosol type

Can we agree on a common principle for nomenclature(s)?

- optical retrieval properties vs. source-related properties
- comprehensive inventory of definitions in use
    - (active + passive / satellite, ground, model)
- translation between different sets of aerosol types