

# Flexible aerosol treatment

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# Flexible aerosol treatment

- OPAC aerosol properties implemented in libRadtran
- refractive indices and size distributions used to compute (polarized) optical properties (“mie” tool)
- can be used for all solvers and atmospheric geometries
- Status at PM2: simulation of single aerosol types
  
- Progress: Aerosol types can arbitrarily mixed
- Documentation has been added to user guide

## OPAC aerosols (Hess, 1998)

- insol** Water insoluble part (mostly soil particles, some organic material)
- wassol** Water soluble part (sulfates, nitrates; also organic water soluble substances; often used to describe anthropogenic aerosol)
- soot** Absorbing black carbon
- ssam** Sea salt, accumulated mode (different modes to describe wind-speed dependant increase of amount of large particles)
- sscm** Sea salt, coarse mode
- minm** Mineral aerosol; nuclear (different modes since: increased amount of large particles for increasing turbidity)
- miam** Mineral aerosol, accumulated mode
- micm** Mineral aerosol, coarse mode
- mitr** Transported mineral aerosol (less large particles)
- suso** Sulfate aerosol (used for Antarctic aerosol and stratospheric background aerosol, not suitable for anthropogenic aerosol)

# Input file

- Options to enable OPAC aerosol:

```
# Switch on aerosol
```

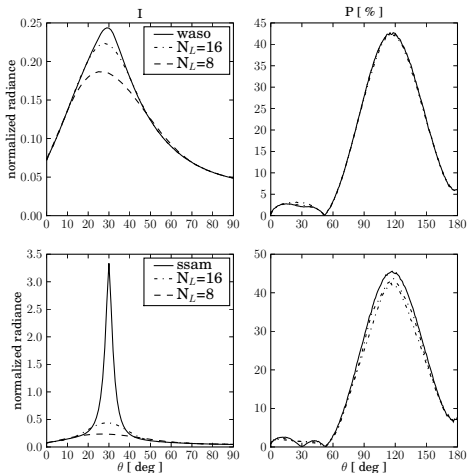
```
aerosol_default
```

```
# specify aerosol types
```

```
aerosol_species_file aer_file.dat waso soot ssam
```

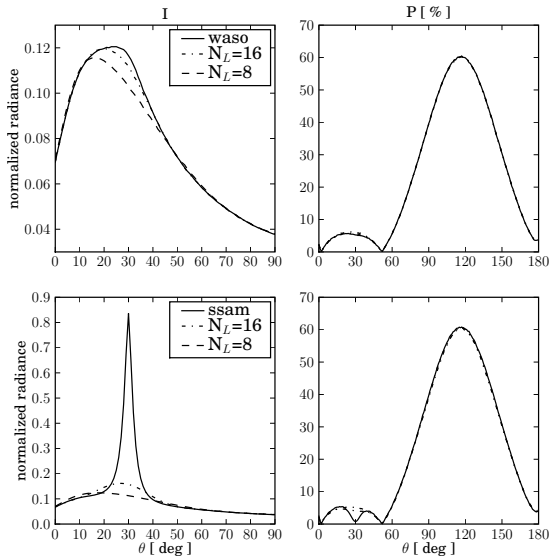
- aerosol\_species\_file.dat includes concentration profiles of the aerosol types

# Example: Aerosol calculation with MYSTIC, AOT=0.5

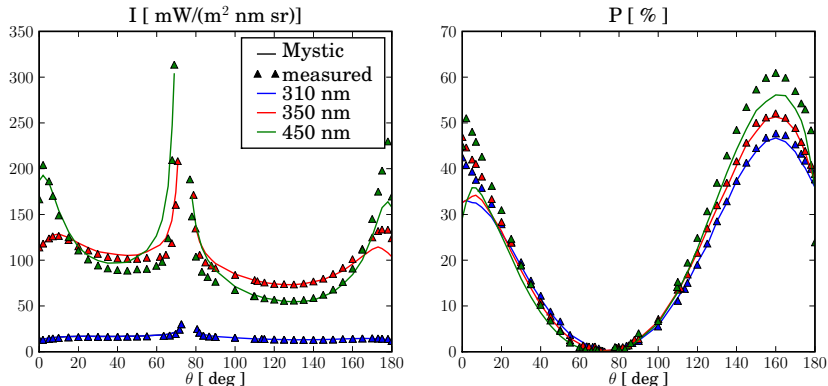


**Figure:** Intensity and degree of polarisation at 350 nm in the solar principal plane for an aerosol optical thickness of 0.5 assuming that all aerosol corresponds to one aerosol type as defined in OPAC, i.e. water soluble (WASO) and sea salt accumulated mode (SSAM).

# Example: Aerosol calculation with MYSTIC, AOT=0.05



# Comparison to UV radiance measurements



**Figure:** Intensity and degree of polarization simulated for an aerosol mixture of sea salt and water soluble particles (3 June 2005, 12:00 UTC). Clouds below the measurement site are taken into account using an effective surface albedo of 0.2. Measurements were taken by M. Blumthaler.

# Conclusions

- Implementation of OPAC aerosol types in libRadtran complete
- Mixtures of different aerosol types may be specified by the user
- OPAC aerosol can be used in combination with all solvers
- Optical properties include accurate phase matrix:
  - ⇒ accurate simulation of radiances  
(forward scattering region)
  - ⇒ polarization