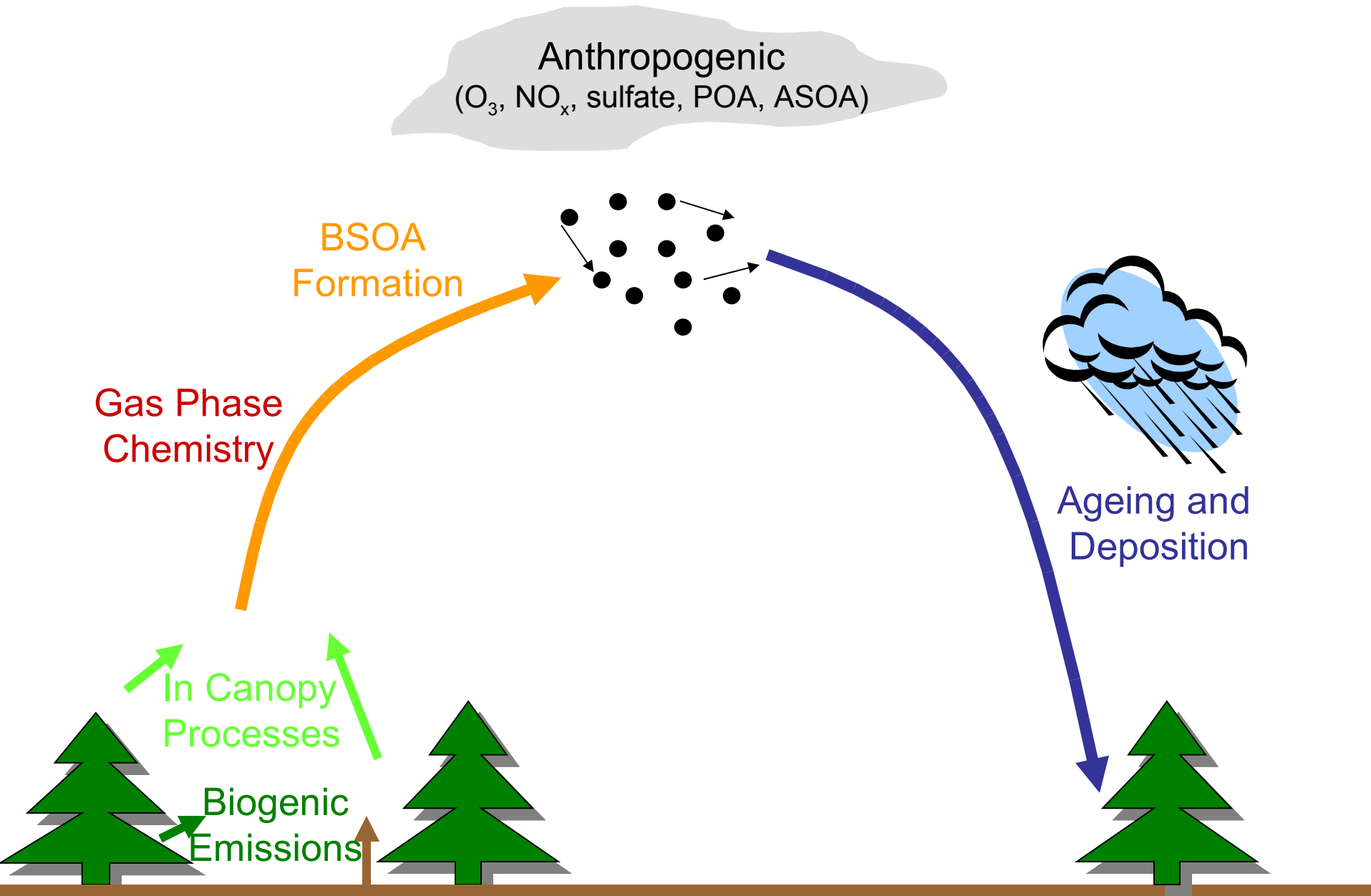


# **ANTHROPOGENIC INFLUENCES ON BSOA**

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# ANTHROPOGENIC INFLUENCES ON BSOA



# Anthropogenic vs Biogenic

- How much BSOA is formed without Anthropogenic aerosols, precursors
- Why are Blue mountains blue? Why are Smokey mountains smokey?

# Biogenic Emissions

- What do we know?
  - not much
- What do we need to know?
  - a lot

# Biogenic Emissions

- What is emitted?
  - Chemical speciation?
  - Temporal variation in emissions?
    - seasonality?
    - what are the controlling factors?
  - up-scaling enclosure vs. flux emissions
  - impact of oxidants, acid deposition, CO<sub>2</sub>, on emissions
  - Plant physiology impacts on emissions?
  - Primary particle emission?
    - size
    - composition
    - removal mechanism for condensing particles?
  - Forest soil NO and VOC emissions
    - how much? what?
- What are the most efficient SOA producers from forests?

# In canopy processes

- Fluxes
  - how much actually makes it out of the canopy?
    - oxidation products?
    - gas-phase? particle phase?
    - eg. do products of highly reactive sesquiterpenes make it out of the canopy?
- Mixing in canopy chemistry (canopy dynamics, controlling processes)
- Deposition processes
- O<sub>3</sub> deposition
  - does it happen on leaf? inside?
  - how does it control the emissions?
  - What does it mean for the emission of oxidation products?
- Day time NO<sub>3</sub> chemistry in forest canopy
  - chemical mechanism
  - product partitioning into particles
- General challenges of canopy measurements
  - gradients through canopy?

# Chemistry and BSOA Formation

- Effect of  $\text{NO}_x$  on SOA efficiency
  - low and high  $\text{NO}_x$  effects on product formation
- Seed particle composition
  - how much does this effect the partitioning
- Acidity of existing aerosols
  - mixed chemistry and repartitioning of gas/aerosol phase
  - oligomer formation
- $\text{NO}_3$  oxidation of emissions
  - how much? when? daytime canopy chemistry?
- Anthropogenic influences on the oxidizing capacity of the atmosphere and pre-existing aerosol concentrations
  - “party theory”: more SOA with more organic aerosol
  - biogenic organic aerosol there because of the existing anthropogenic aerosol (primary and secondary).

# Aerosol Ageing and Deposition

- Oxidation of aerosols
  - effects of aerosol (optical, physical, chemical) properties
  - effect of partitioning
- Deposition
  - need to know composition (molecular weight)
  - effects of deposition on canopy processes
    - ecological effects



# Measurement challenges

- Need better analytical tools
- Better marker compounds?
  - OOA not SOA?
- Measurement of organo-nitrates in aerosols and gas phase
- Organo-sulfates?
  - How to measure?
  - total sulfate emissions?
  - type of sulfur compounds ( $\text{SO}_2$  from anthropogenic sources versus DMS from oceans)

# Proposed stuff to do

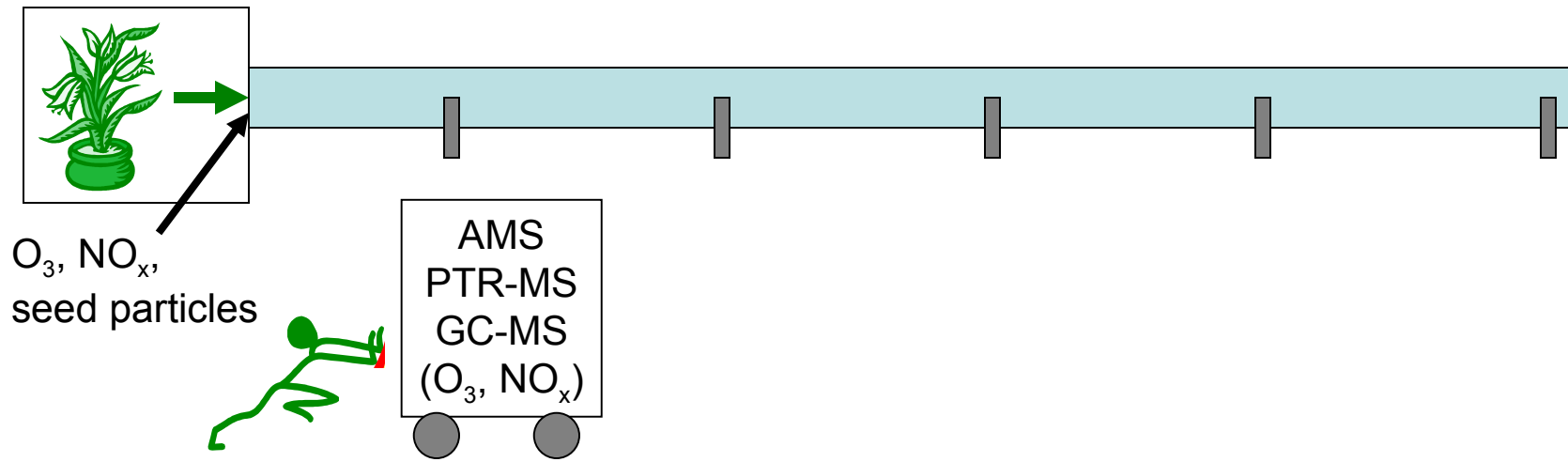
- Measurements in the southern hemisphere
  - aerosol composition
  - gas-phase precursors
  - Australia and Brazil (target different anthropogenic influences)
  - South Pacific
  - Look at influence of Biomass Burning emissions on BSOA



- Within canopy measurements and model
  - profiles of emissions, concentrations, chemistry, deposition, transport
  - $\text{NO}_3$  chemistry
  - Light attenuation and effects on emissions and chemistry

# MORE Proposed stuff to do

- Plug Flow Reactor Experiments
  - feed with real plant emissions or Pinesol or ....



- Ecosystem chamber
- Carbon<sup>14</sup> measurements
  - combine with measurements of marker compounds and other measurements
  - need long-term measurements in multiple locations- both hemispheres
- Chamber experiments for multiple plants
  - BIOSPHERE

