Environment Canada Environnement Canada

Canada

FRAM Workshop
Observations Working Group

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Discussion chair: Ismail Gultepe

Prediction of visibility restrictions

- Models need to improve:
  - Droplet number concentrations (prognostic equations?)
  - Liquid water content
  - Handling of aerosols and their behavour
  - Especially problematic in 3-d models; 1-d models have better-developed schemes
  - Parameterization of visibility restriction in precipitation

Droplet size spectra

- More measurements needed
  - Represent various field experiments e.g. continental versus marine
  - Need to sample different conditions
    - Different sources of condensation nuclei and different fog formation mechanisms give droplet spectra of different character
- Use the data gained from further field experiments to help NWP fine-tune assumptions about size distributions, visibility restrictions in precipitation
- *In situ* measurements can also be used to calibrate/validate satellite retrieval algorithms

Aerosol type and composition

- Aerosol particle composition plays a role in droplet size distribution, extinction
  - Need to have better sampling of aerosols
  - Make better use of existing air quality sampling networks

Nowcasting

- Instrument set-up for nowcasting visibility
  - RH, temperature
  - Visibility measurements
  - Video cameras with image processing capability (either on-board or downstream)
  - Temporal resolution as high as possible (1 min)
  - Further instruments also helpful, but may be cost-prohibitive
- Satellite data has many applications (slide follows)
- Need to improve integration of model output and observations for nowcasting decision support

Operational visibility observations

- Adding visibility instruments to Climate Reference Network stations a cost-effective way to enhance *in situ* observations

Remote sensing (1)

- Satellite information can be used in conjunction with *in situ* data to infer the extent of fog and/or stratus
- Trend information (time development) also useful for nowcasting applications
- Brightness differences can also give indications about tendency for dissipation
- Spectral analysis can give indications of phase of cloud/droplet particles
- Higher cloud layers modulate energy budget of stratus/fog layers
- Satellite data useful for validation of models, forecasts

Remote sensing (2)

- Satellite-derived SST important for predicting fog/stratus formation/dissipation/propagation in marine and near-shore areas
- GOES-R will offer calibrated visible channels, increasing the utility of this data for fog/stratus applications
- GOES-R will also offer better information on aerosols and cloud microphysics (cloud phase, particle size) at cloud-top

Future field programs

- Goals to collect data for:
  - Validating model simulations
  - Satellite data retrievals
  - Visibility restrictions caused by precipitation
  - Variability in fog in various time and space scales
  - Nowcasting applications
  - Parameterization development