GODDARD SPACE FLIGHT CENTER

# Atmospheric correction discussion

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# Reminder

Ultimate goal of atmospheric correction discussion is to move towards an understanding of the impact of uncertainties in the correction

- Develop a set of recommended approaches to ensure better comparability between different groups
  - Permit development of new methods
  - Create a common starting point for all groups
- Areas for best practices are
  - Radiative transfer code
  - Input parameterization
  - Measurement approaches
  - Instrumentation
  - Retrieval methods

# Radiative transfer code

## Efforts for last 30 years have examined radiative transfer codes

- Code comparisons show favorable results when given identical inputs
- Still of interest to repeat the radiative transfer code comparison
- Difference is to evaluate processing approaches rather than the codes themselves
  - Use Tuz Golu campaign data to create a ***standard input data set***
  - Use the standard data set to predict at-sensor radiance
  - Compare the at-sensor radiances

# Standard data set

Also require a standard data set to allow groups to evaluate their processing approaches

- Web access to standard input and result from an established group using these inputs
  - Good tool for groups initiating new field programs
  - Good tool for groups implementing a new radiative transfer approach
- Rely on an artificial data set
  - Allows coupling of aerosol optical depth and surface reflectance
  - Can limit impacts from input parameterization
- Risk is that it drives users towards simply matching the standard results

# Standard data set

## Base input data set on a clean aerosol over a moderately bright surface

- Low aerosol absorption reduces impact of aerosol composition selection
- Modest aerosol loading (0.1 at 550 nm)
- Spectral reflectance constant with wavelength
- 45 degree view angle (no ambiguity on elevation versus zenith)
- 60-degree solar zenith angle (large difference in radiance if elevation versus zenith angle confusion)
- Lambertian surface
- Radiance output at 1-nm intervals

# Atmospheric parameterization

## List of parameters that will be reported include consistently derived multiple formats

- Spectral optical depth (total, component)
- Aerosol optical depth at 550 nm
- Angstrom coefficient (also known as power law exponent)
- Junge parameter
- Surface pressure
- Column water vapor amount
- Column ozone amount
- Aerosol type (colloquial model as well as real and imaginary index of refraction, minimum/maximum radius)
- View-sun geometry
- Surface height
- Sensor height

# Sensitivity analysis

## Combine the two standard data sets with recommended sensitivity studies to evaluate uncertainties from atmospheric correction

- Tuz Golu data set limits number participants to simplify comparison
- Artificial standard data set expands participants but helps to ensure input parameterization effects are limited
- Trade between insight gained and number of radiative transfer calculations
- Sensitivity studies concentrate on impact from
  - Atmospheric parameterization
  - Atmospheric uncertainties
  - Surface reflectance
  - Ignore lambertian vs. non-lambertian for now
- Gives insight into errors with largest impact on results
- Sensitivity is site dependent
  - Surface reflectance value
  - Aerosol composition

# Summary for this IVOS

## Toulouse meeting and yesterday's discussions give a path forward for developing best practices for atmospheric correction

- Radiative transfer code intercomparison
  - Simplify Tuz Golu comparison of at-sensor radiance by limiting number of data sets
  - Standard input data set for "training"
- Guidance on sensitivity analyses will help groups understand significant differences from standard output
- Compiling results leads to a set of best practices
  - Processing schemes
  - Input parameterization
  - Recommended measurement approaches
- Reduction of Type B errors in radiative transfer predictions must await more accurate imaging sensors