SARB CRS Aerosols

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CERES Science Team Meeting

SARB Working Group

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Aerosol Input Sources

I) MODIS Instantaneous Product

CERES SSFA based on MOD04_L2

-Ocean& most land, Clear sky, Multiple wavelength AOT

II) Stowe/Ignatov Instantaneous Product

CERES SSF - Oceans , Clear sky

III) Collins/Rasch MATCH Aerosol Assimilation

-Chemical Transport model, AVHRR retrieval, 6 Hourly

Global , All sky, Optical Depth for multiple aerosol types

IV) MODIS Daily

Time interpolated from MOD08_D3

- Ocean& most land, All sky, Multiple wavelength AOT

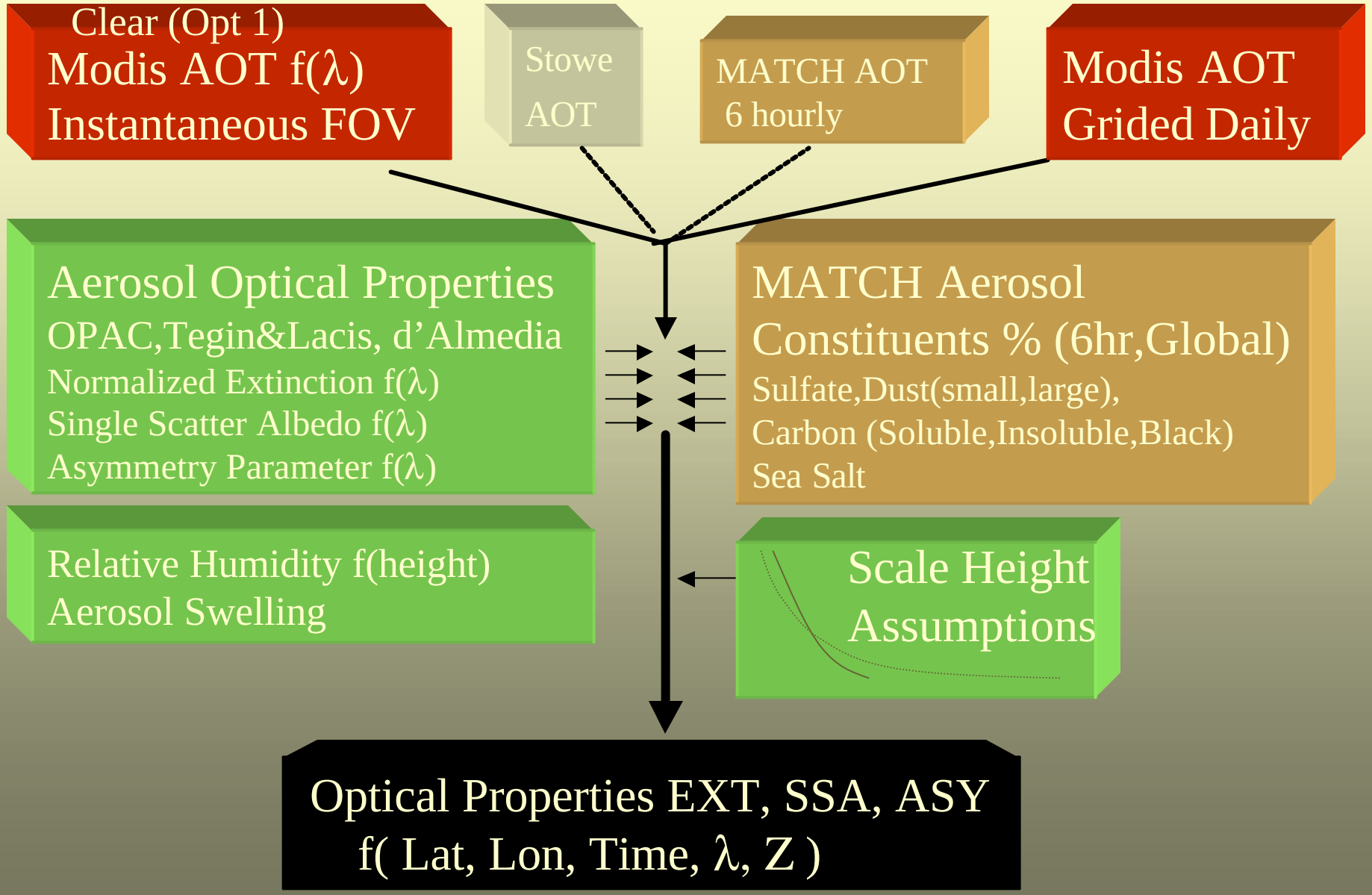
V) GFDL Aerosol Climatology

-Monthly , Global , Multiple constituents

Aerosol Source Characteristics

Source	Modis	Stowe	Modis	Match	GFDL
Temporal	Instant FOV	Instant FOV	Daily GRID	6 Hr-trmm Daily-terra GRID	Monthly Climat.
Coverage	Ocean Land	Ocean	Ocean Land	Ocean Land Desert	Ocean Land Desert
Wavelengths	7 Ocean 3 Land	1 0.63um	7 Ocean 3 Land	1 0.63um	1 0.55um
Aerosol Constituents	Some		Some	7 Groups	5 Groups

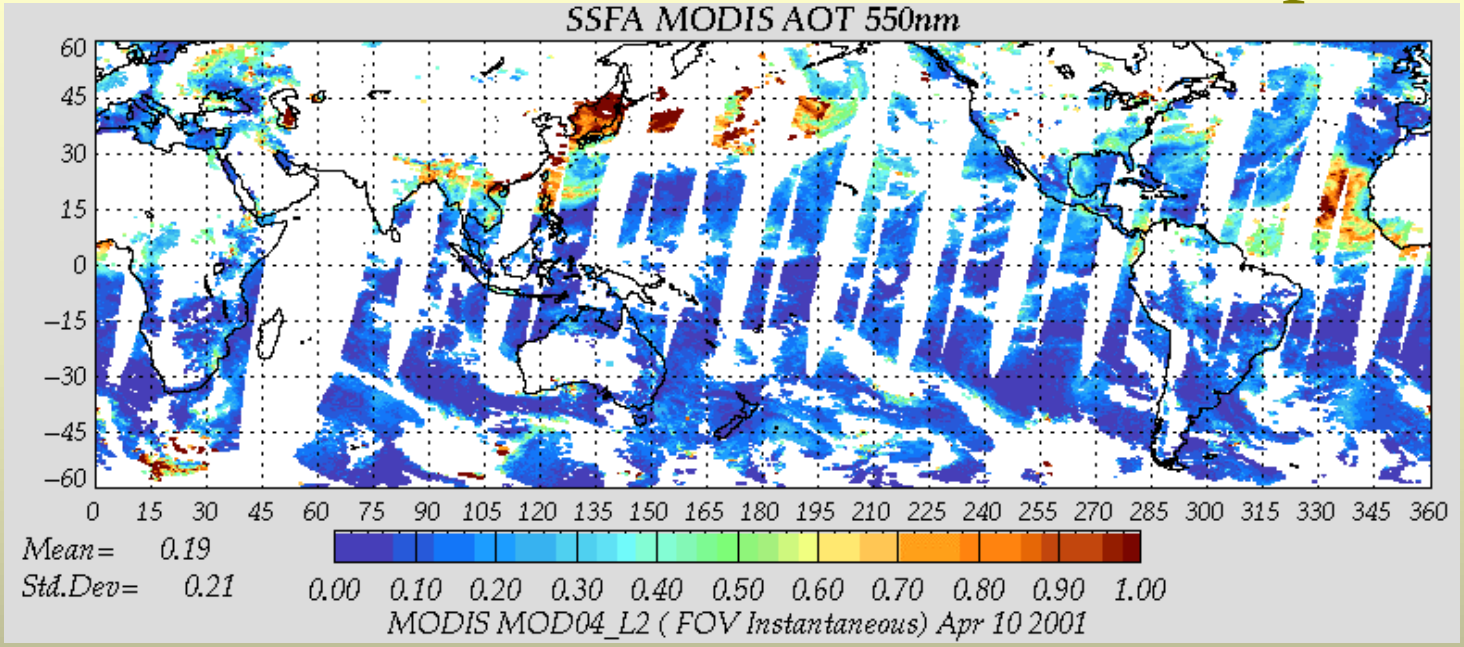
Aerosol Usage for Terra

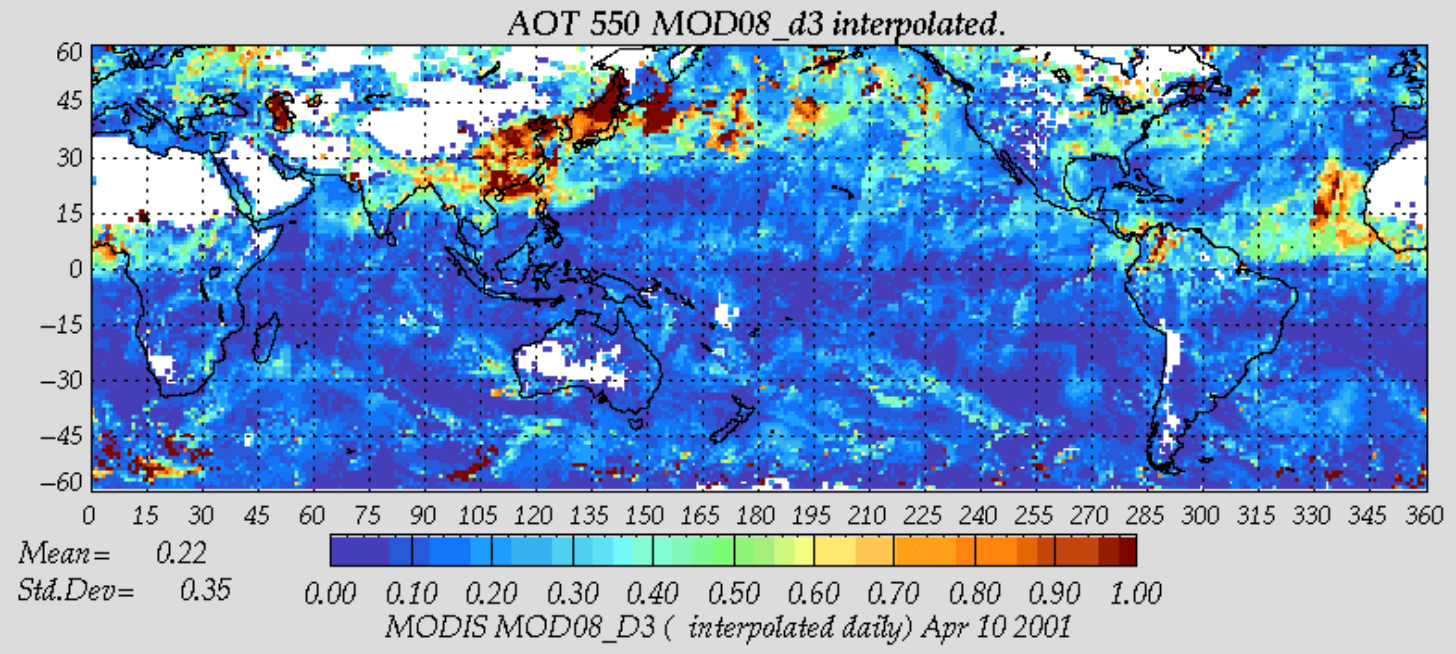


Modis Aerosols

- Instantaneous product [Clear Sky]
  - Convolved with Ceres FOV
    - Ocean (0.47 ,0.55 ,0.66 ,0.86, 1.24, 1.64 ,2.13)
    - Land (0.47 , 0.55, 0.66)
      - Log (τ) / Log(λ) interpolation to 7 wavelengths
- Grid (1x1deg) Product [Cloudy Sky]
  - Daily
  - Same wavelengths as FOV product
  - Interpolated to fill missing days

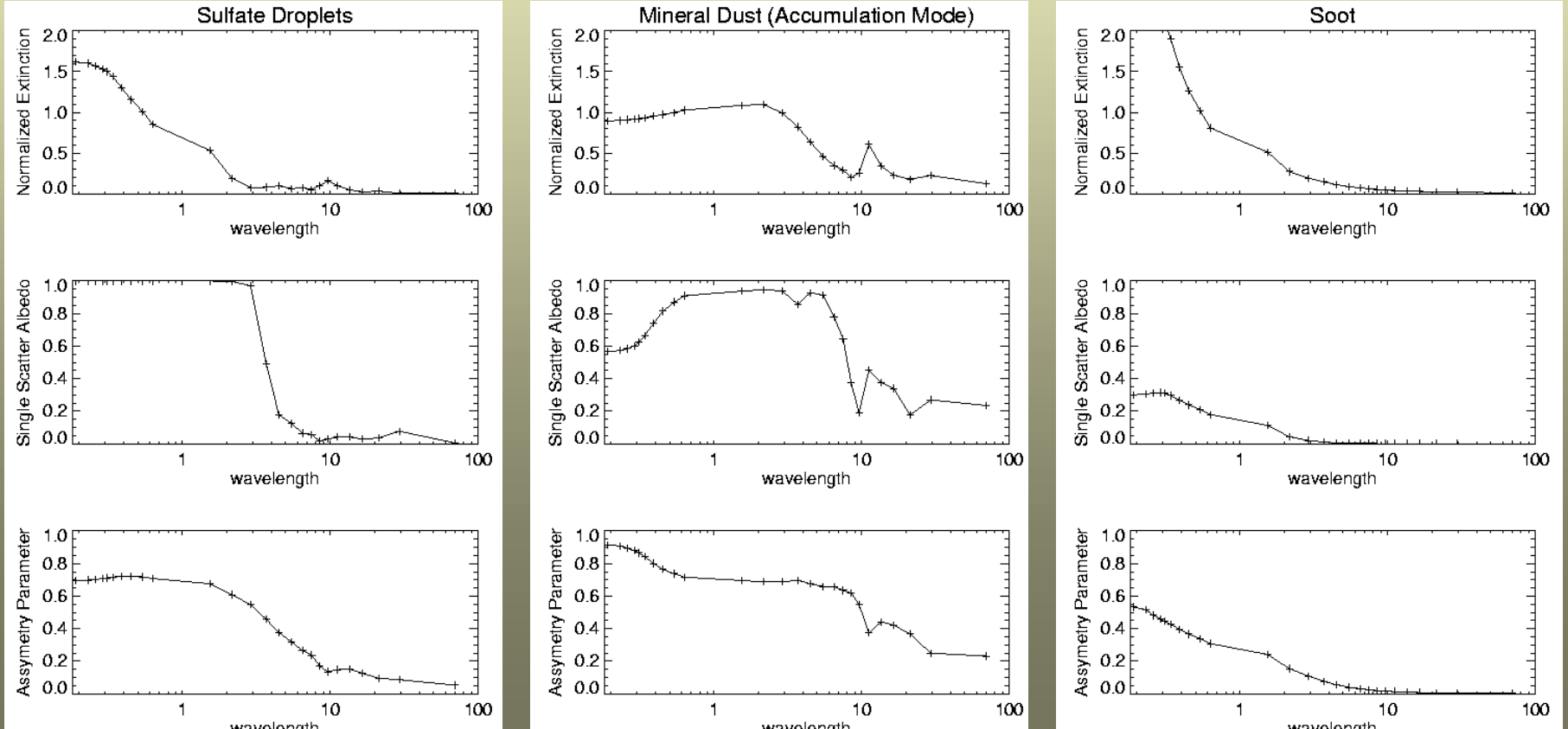
Modis Aerosol Product Examples





Aerosol Optical Properties

- Collins/Rasch Aerosol Constituents matched to Optical Property inputs (SSA,ASY)
- 18 Aerosol types are available in Fu-Liou code
- Wavelength dependent (Extinction ,Single Scatter Albedo, Asymmetry Parameter
  - 3 from d' Almedia (Continental, Maritime, Urban)
  - 5 from Tegen & Lacis (Mineral Dusts)
  - 9 from OPAC (Sulfate, Soot)

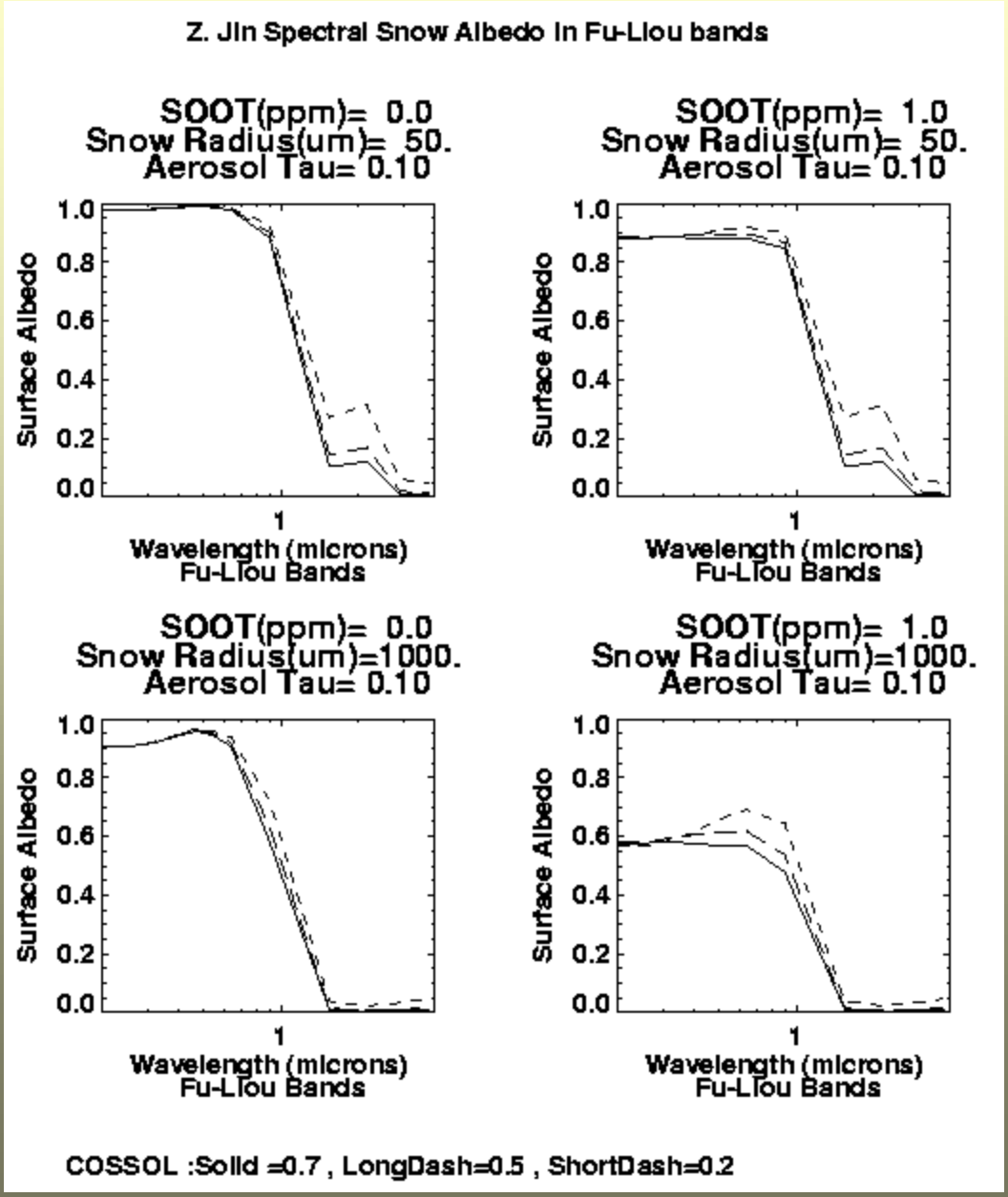


Snow & Ice Surface Albedo for TERRA

- SCENE TYPE CLASSIFICATION (determines spectral shape)
  - IGBP TYPES and Snow /Ice Maps
    - IGBP types (1-18) Static land cover types : Permanent Snow/Ice (Type 15)
    - Seasonal Snow from Weekly Grided NCEP/NSIDC (Type 19)
    - Sea Ice from Weekly Grided NCEP/NSIDC (Type 20)
  - Imager based Clear sky Snow/Ice fractional coverage
    - This instantaneous information will override scene type maps (not so in TRMM ED2b)

- Broadband Surface Albedo Determination
  - Clear Sky
    - Toa based using CERES TOA ALBEDO,CosSol, PW, AOT, O3, Surface Elevation
  - Cloudy Sky
    - { Option 1} Broadband Surface Albedo Retrieval
      - TOA based using CERES TOA ALBEDO, CosSol, Cloud (Fraction, Optical Depth)
    - {Option 2 } Surface Albedo History Monthly Map (10 minute grid)
      - Monthly minimum surface albedo , at best solar geometry to overhead sun
      - Corrected to diffuse angle of cloudy skies
- Tuning
  - Larger uncertainty assigned to Snow and Ice Surfaces than other Land surfaces

Spectral Surface Albedo

- SARB Fu-Liou Code uses 15 bands in Shortwave
  - Need Spectral input assumptions
- Based on Radiative Transfer model of Z. Jin
- Spectral Albedo shape is modified to maintain consistency with the retrieved Broadband Surface Albedo.
- Spectral Surface Albedo look up table is function of:
  - Snow
    - Wavelength, CosSol , Optical Depth
    - Grain Size(Old,New), Soot (Clean,Dirty)
  - Ice
    - Wavelength, CosSol , Optical Depth
    - TBD …Ice density, Ice type

Z.Jin Snow Spectral Albedo