Albedo Toolbox Reference

Dan D. V. Bhanderi, M.Sc.E.E., Ph.D.
Aalborg University
Department of Electronic Systems, Automation and Control

August 11, 2008

File Overview

albedo.m Calculation of albedo for a given satellite and Sun constellation and specified reflectivity data. The satellite and Sun vectors must be given in Cartesian ECEF coordinates in meters.

```
a = albedo(sat, sun, refl [,type])
```

albedo_altitude.m Calculate subsolar albedo between two altitudes (above earth) at specified position. The altitudes must be given in meters and the position in radians.

```
result = albedo_altitude(az, pa, alt1, alt2, refl, ...
                         n [,type])
```

albedo_csun.m Calculate albedo array for constant sunlight (instantanious albedo) for all satellite positions at given altitude. The altitude must be given in meters and the Sun position in spherical ECEF coordinates.

```
a = albedo_csun(altitude, sunsph, refl [,type])
```

albedo_full.m Calculate albedo array for 100% sunlight (zenith) at all satellite positions at a given altitude. The resulting albedo is the maximum albedo for all satellite positions. Altitude must be given in meters.

```
a = albedo_full(altitude, refl)
```

albedo_lib.mdl Simulink interface library to m-files. The library contains three blocks:

Earth Albedo Simulation Calculcates the Earth albedo from satellite and Sun positions and time. The time input is used to search the reflecitivity library for daile reflectivity data.

Earth Albedo Model Calculcates the Earth albedo from satellite and Sun positions and static reflectivity data.

Perpendicular Equivalent Projects all incoming Earth albedo irradiances onto a normal to the exposed surface. The scalar result is the norm of an equivalent perpendicular incident irradiance.

albedo_path.m Returns the path of the Albedo Toolbox.

```
pathstr = albedo_path
```

albedo_wrapper.m Simulink wrapper function.

```
a = albedo_wrapper(sat, sun, param, redfac ...
                   [, refllib])
```

double_plot_albedo.m Plot albedo data on subplot with dual view.

```
double_plot_alb(a)
```

double_plot_refl.m Plot REFL data on subplot with dual view.

```
double_plot_refl(refl)
```

earth_mean_refl.m Calculate mean Earth reflectivity of REFL data. Each data point is weighed with respect to the cell area of the associated cell.

```
total_refl = earth_mean_refl(refl)
```

earthfov.m Field of view on earth from a satellite position. The satellite position must be given in spherical ECEF coordinates.

```
result = earthfov(satsph, refl [, type])
```

import_refl_dir.m Imports TOMS reflectivity data to the Earth Albedo Toolbox. REFL files with suffix '.txt' are converted using refl2mat, and the statistics are calculated using MEAN_REFL and STD_REFL, and saved in the directory.

```
import_refl_dir(refldir)
```

load_refl.m Reads REFL MAT file and automatically scans the refl_data directory, after current dir, in the Albedo Toolbox installation directory.

```
refl = load_refl(date_str)
```

mask.m Make masked array from two equal arrays.

```
result = mask(refl_data,mask,contrast)
```

mean_refl.m Calculate mean of REFL data in MAT files.

```
[mean_val, mean_lat] = mean_refl(files)
```

plot_alb.m Plot albedo data.

```
plot_alp(albedo [,type})
```

plot_refl.m Plot REFL data.

```
plot_refl(refl_parm [, type [, colorbar]])
```

read_refl.m Reads EP/TOMS REFL data from file into an array. The return value is a REFL struct. See 'help refl_struct' for details.

```
refl = read_refl(reflfile)
```

refl2mat.m Convert TOMS reflectivity data to MAT file.

```
refl2mat(filename [, outdir])
```

refl_struct.m Create REFL struct from parameters. The struct contains the following fields:

- data (reflectivity data)
- start_time (Julian Date of start time)
- stop_time (Julian Date of stop time)
- type (String specifying data description, e.g. Raw or Mean)

```
refl = refl_struct(data,start_time,stop_time,type)
```

replace_nan.m Replaces NaN values with annual mean or specified reflectivity data.

```
new_refl = replace_nan(main_refl [, param])
```

resisze_refl.m Resize REFL struct data.

```
newrefl = resize_refl(oldrefl,redfac)
```

slblocks.m Definition of Simulink Albedo Toolbox block library.

ss_proj.m Projects all cell albedo contributions onto the solar cell normal in ECEF. This value is equivalent to the total perpendicular irradiance reaching the solar cell.

```
P = ss_proj(re,n,a)
```

std_refl.m Calculate standard deviation of REFL data in MAT files.

```
[std_val, std_lat] = std_refl(files, mean_val, ...
                              mean_lat)
```