

Subject: Re: Snow Re: Vegetation in CRTM

From: "Quanhua (Mark) Liu" <Quanhua.Liu@noaa.gov>

Date: Mon, 03 Aug 2009 12:05:22 -0400

To: Ronald.Vogel@noaa.gov

CC: Michiko Masutani <Michiko.Masutani@noaa.gov>, Jack Woollen <Jack.Woollen@noaa.gov>, David Groff <David.Groff@noaa.gov>

Ron,

I just read your email. The logical code you wrote is adequate for the CRTM. The IR emissivity in the CRTM right now doesn't depend on the snow depth, nor ice thickness. For the MW, you may use the satellite measured BT to determine the snow and ice emissivity.

Regards,

Quanhua

Ronald.Vogel@noaa.gov said the following on 8/2/2009 4:03 PM:

Hi Quanhua,

Here is how I use snow in my CRTM applications. Do you have other advice for Michiko?

From Weizhong Zheng's code (based on GSI code), snow is determined when snow depth (mm) > 0.1

Snow water equivalent (SWE from ECMWF) needs to be changed to snow depth. Multiply by conversion factor 5 for old snow, and 10 for fresh snow.

snow depth (m) = SWE * 5 <-conversion factor for old snow

snow depth (mm) = snow depth (m) * 1000.

For points where snow depth (mm) > 0.1, assign CRTM snow like this:

```
Surface(iprofile)%Snow_Type = 13
```

or

```
Surface(iprofile)%Snow_Type = CRUST_SNOW
```

(the 2 assignments mean the same thing)

This selects the 'old snow' emissivity spectrum, which is adequate for IR sensors. Snow emissivity doesn't vary between 'old snow' and 'fresh snow' in mid-to-thermal IR (does vary in NIR however), so the 2 choices of 'old snow' or 'fresh snow' don't make much difference for IR sensors (> 3.7 um). NOTE: 'old snow' and 'fresh snow' are the only choices currently available in CRTM for IR (i.e. Snow_Type = 13 or 14).

The above applies for IR sensors, but we have never really figured out how the snow depth threshold impacts the accuracy of CRTM TOA calculation (for IR). Rather, I include snow-covered land in my CRTM calculations, but then remove it in my statistics (since currently I'm more interested in non-snow-covered land than snow-covered land).

Also, I'm not sure if Michiko is more interested in IR or MW.

The above might be adequate for Michiko. Any other suggestions?

Ron

----- Original Message -----

From: Michiko Masutani <Michiko.Masutani@noaa.gov>

Date: Friday, July 31, 2009 6:27 pm

Subject: Snow Re: Vegetation in CRTM

Mark and Ron

I realize CRTM handle various type of snow.
CRTM handle various type of snow in 24 surface type

!	1.	water	2.	old snow	3.	
		fresh snow				
!	4.	compacted soil	5.	tilled soil	6.	sand
!	7.	rock	8.	irrigated low vegetation	9.	
		meadow				
		grass				
!	10.	scrub	11.	broadleaf forest	12.	
		pine forest				
!	13.	tundra	14.	grass soil	15.	
		broadleaf pine forest				
!	16.	grass scrub	17.	oil grass	18.	
		urban				
		concrete				
!	19.	pine brush	20.	broadleaf brush	21.	
		wet soil				
!	22.	scrub soil	23.	broadleaf 70-pine 30	24.	
		new ice				
!						

ECMWF model has six snow related values.
2 kpds=032 Snow albedo [(0-1)]
3 kpds=033 Snow density [kg m**3]
5 kpds=044 Snow evaporation [m of water]
6 kpds=045 Snowmelt [m of water]
16 kpds=141 Snow depth [m of water equiv
19 kpds=144 Snowfall (convective + strat

I assume there is a standard way to convert these values to surface type.
Michiko

Michiko Masutani wrote:

Ron:
Thank you very much.
Michiko

Ronald.Vogel@noaa.gov wrote:

Hi Michiko,

Yes, I will provide you with a match of ECMWF vegetation

information to

CRTM land types. However, with the low and high types (plus cover fraction) contained in ECMWF model data, it is not so straightforward. Likely, it will require a simple algorithm, something like this:

if cover_low_veg > 0.8, then low_type matches to CRTM type_X
else high_type matches to CRTM type_Y

I will look at it in detail over the weekend and respond to you

with the

match-ups next week.

Ron

----- Original Message -----

From: Michiko Masutani <Michiko.Masutani@noaa.gov>

Date: Friday, July 31, 2009 2:25 pm

Subject: Vegetation in CRTM

Ron:

I am trying to simulate radiance data from ECMWF model data. In ECMWF model Vegetation is represented by 4 climatological parameters: vegetation cover of low vegetation, vegetation

cover of

high vegetation, low vegetation type and high vegetation type.

I

have attached the description of H and L vegetation.

In CRTM I found following definition. I wonder if you can help

me

to interpret ECMWF model information to CRTM.
Michiko

! PUBLIC PARAMETERS:

! 1) The type of land surface using in the

Surface%Land_Type

field:!

!	Land type	Parameter Name

--

!	Invalid	INVALID_LAND
!	Compacted soil	COMPACTED_SOIL
!	Tilled soil	TILLED_SOIL
!	Sand	SAND
!	Rock	ROCK
!	Irrigated low vegetation	

IRRIGATED_LOW_VEGETATION>>> !

Meadow grass

MEADOW_GRASS

!	Scrub	SCRUB
!	Broadleaf forest	BROADLEAF_FOREST
!	Pine forest	PINE_FOREST
!	Tundra	TUNDRA
!	Grass soil	GRASS_SOIL
!	Broadleaf-pine forest	BROADLEAF_PINE_FOREST
!	Grass scrub	GRASS_SCRUB
!	Oil grass	OIL_GRASS
!	Urban concrete	URBAN_CONCRETE
!	Pine brush	PINE_BRUSH
!	Broadleaf brush	BROADLEAF_BRUSH

Wet soil	WET_SOIL
Scrub soil	SCRUB_SOIL
Broadleaf(70)-Pine(30)	BROADLEAF70_PINE30

2) The type of water surface using in the

Surface%Water_Type

field:

Water type	Parameter Name
Invalid	INVALID_WATER
Sea water	SEA_WATER
Fresh water	FRESH_WATER

3) The type of snow surface using in the

Surface%Snow_Type

field:!

Snow type	Parameter Name
Invalid	INVALID_SNOW
Wet snow	WET_SNOW
Grass after snow	GRASS_AFTER_SNOW
Powder snow	POWDER_SNOW
RS snow(A)	RS_SNOW_A
RS snow(B)	RS_SNOW_B
RS snow(C)	RS_SNOW_C
RS snow(D)	RS_SNOW_D
RS snow(E)	RS_SNOW_E
Thin Crust snow	THIN_CRUST_SNOW
Thick crust snow	THICK_CRUST_SNOW
Shallow snow	SHALLOW_SNOW
Deep snow	DEEP_SNOW
Crust snow	CRUST_SNOW
Medium snow	MEDIUM_SNOW
Bottom crust snow(A)	BOTTOM_CRUST_SNOW_A
Bottom crust snow(B)	BOTTOM_CRUST_SNOW_B

4) The type of ice surface using in the

Surface%Ice_Type

field:!

Ice type	Parameter Name
Invalid	INVALID_ICE
Fresh ice	FRESH_ICE
First year sea ice	FIRST_YEAR_SEA_ICE
Multiple year sea ice	MULTI_YEAR_SEA_ICE
Ice floe	ICE_FLOE
Ice ridge	ICE_RIDGE

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