

**Subject:** Re: Snow Re: Vegetation in CRTM

**From:** Ronald.Vogel@noaa.gov

**Date:** Sun, 02 Aug 2009 16:03:14 -0400

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

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

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](mailto: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  
!

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-----  
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](mailto: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](mailto: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 og 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

