Surface Dust Flux Model User's Guide

Version 1.1

UPOS-BC3-03

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1. INTRODUCTION

1.1 Overview

This document describes the Surface Dust Flux modeling software package. The model uses forecasted surface winds to estimate the rate at which ground level dust is being produced from source areas within a mesoscale theater. Surface dust fluxes vary in desert regions from 10 – 100 μgm/m^2-s for small to moderate fluxes, and 500 to 2000 μgm/m^2-s or more under dust storm conditions.

The model uses MM5 forecasted wind fields, soil moisture and estimated precipitation as input. Surface dust flux is calculated at each MM5 model grid location (~45 km intervals) in the mesoscale theater. The flux is calculated using forecasted 10 meter winds and the dust source database and model developed by Dr. Paul Ginoux at NASA GSFC/GIT.

The dust model can make forecasts for 2 MM5 mesoscale regions covering Northern Africa and the Middle East (T9z) and Southwest Asia (T4y). The surface dust fluxes are displayed as regional maps with color overlays showing dust fluxes in μgm/m^2-s. The user should note that this model does not forecast the transport of dust in the atmosphere. It only makes a prediction of the rate at which dust is generated at the surface.

1.2 Document Purpose

The purpose of this document is to provide the operator with a description of the software components and to describe the options available to the user.

2. Operation

2.1 Editable Parameters

The setup file **dust_setup.txt** manages the location of the input data and output products for the Surface Dust Flux Model process. (A sample dust_setup.txt can be found in Appendix D.) It provides the locations of the input and output for each process. Listed below are the variables setup in the file as well as their purpose. These values can be altered if desired using any UNIX compatible editor. ***NOTE:*** For the Surface Dust Flux Model software, Version 1.1, the values of *dir_out* and *data_dir* should point to the same directory path.

Logical	Purpose
dir_in	Directory path to store the MM5 input data files.
dir_out	Directory path to store the output Mesoscale maps.
data_dir	Directory path to store intermediate files.

3. Operation Description

3.1 Processing

The user can invoke the software by issuing the following command:

SFDM_startup

This command will compile the Surface Dust Flux Model software and bring up a GUI interface. For initial runs of the software, enter in the directory path and file name if necessary. (***NOTE:*** The user must hit return for the values to be accepted.) Appendix B contains an example of the GUI interface.

3.1.1 Generating Multiple Image Files Using the "00-48 HRS or "00-72 HRS" Options

The user chooses the hours to process by using the pull down menu "*MM5 Extract"*. This will process the MM5 data ***and*** it will generate Mesoscale map images. If the user chooses "00-48 HRS" or "00-72 HRS", a Mesoscale map image will be generated at 3 hour intervals for the duration of the time window chosen. (***Note:*** By default the "Dust Size" is "Total".) As these images are generated, they will be displayed on the screen and written to the output directory specified in *dust_setup.txt*. To verify that the data processing is complete, check the terminal window for the "*Processing Complete*" message.

3.1.2 Generating a Single Image File Using the "This File" Option

The user chooses the hours to process by using the pull down menu "*MM5 Extract"*. This will process the MM5 data ***and*** it will generate a Mesoscale map image. If the user chooses "This File", ***only one*** Mesoscale map image will be displayed to the screen and written to the output directory specified in *dust_setup.txt*. (***Note:*** By default the "Dust Size" is "Total".)To verify that the data processing is complete, check the terminal window for the "*Processing Complete*" message.

3.1.3 Altering the Dust Size

To produce a Mesoscale map with a dust size other than “Total”, the user must first have executed one of the steps outlined in sections 2.1.1 or 2.1.2. Then the user chooses a new dust size from the “DUST SIZE” menu. Finally, the user clicks on the “*RUN SURFACE DUST FLUX*” button. ***NOTE***: This will generate only ***one*** image based on the file currently listed in the “MM5 File” field.

3.2 Outputs

3.2.1 Images

When the Surface Dust Flux Model process is executed it outputs Mesoscale maps overlaid with the dust surface flux in ugm/m2-s. This output is displayed to the screen and written to the output directory specified in *dust_setup.txt*. Appendix C contains an example of the final Surface Dust Flux Model output file.

3.2.2 Movies

Another option is for the user to make a .res movie file of the .gif images residing in the temporary processing directory. To make a movie, the user clicks on the “*ANAYLSIS”* button and chooses the “*MOVIE”* option. The .gif images are made into a .res file that is displayed in an IDL popup movie viewer. ***NOTE:*** *At least two images must have been generated before a movie can be made and* ***all*** *.gif images in the output directory specified in dust_setup.txt will be used to generate the movie.*

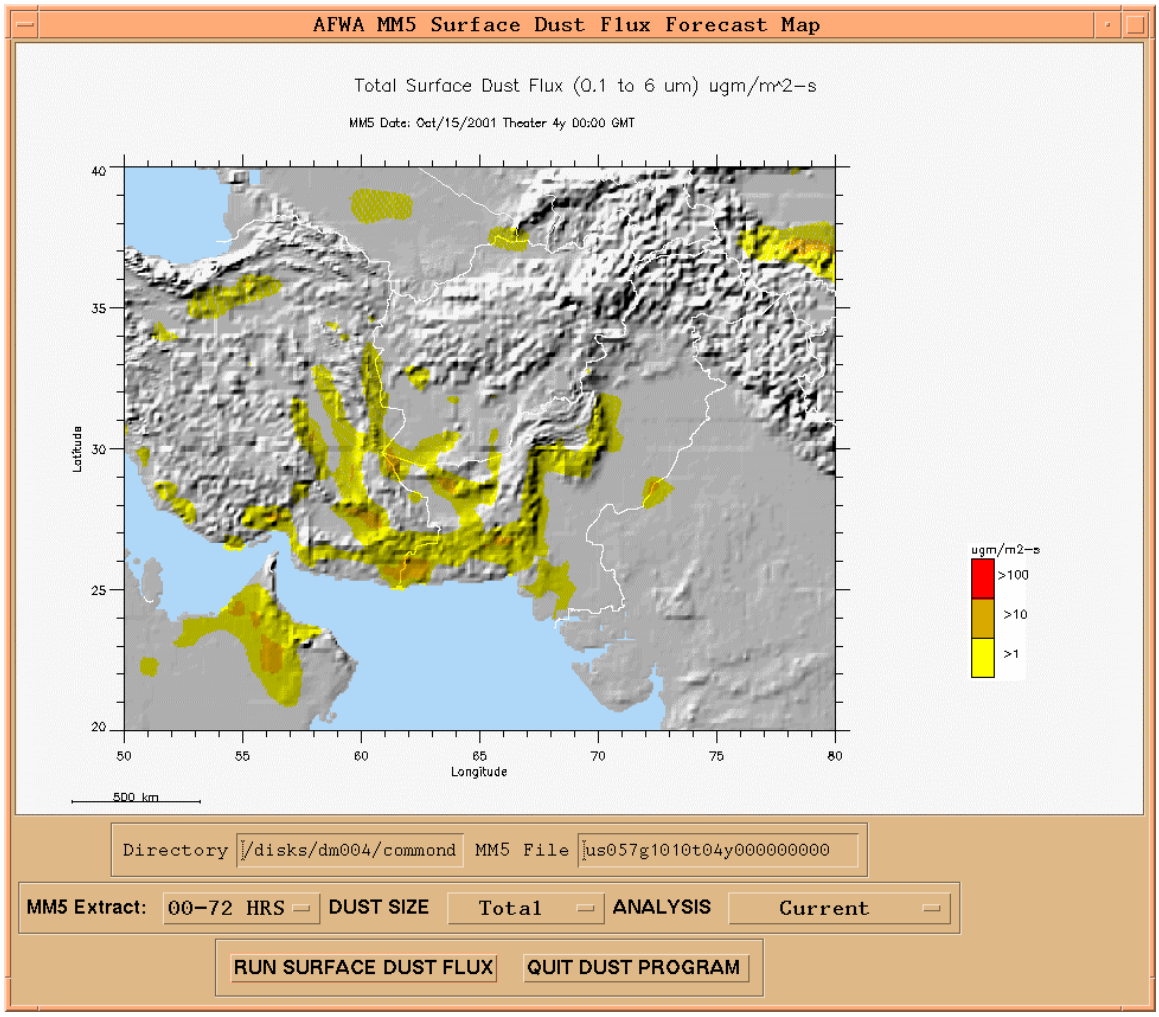
A. ACROYNMS AND ABBREVIATIONS

AACGM	Attitude Adjusted Corrected Geomagnetic
AFCCC	Air Force Combat Climatology Center
AFOSR	Air Force Office of Scientific Research
AFRL	Air Force Research Laboratory
AFSCN	Air Force Satellite Control Network
AFSPACECOM	Air Force Space Command
AFSWC	Air Force Space Weather Center
AFWA	Air Force Weather Agency
AFWIN	Air Force Weather Information Network
AF/XOW	Air Force Director of Weather
APL	Applied Physics Laboratory of Johns Hopkins University
ASCII	American Standard Code for Information Interchange
ASPAM	Atmospheric Slant Path Analysis Model
AVHRR	Advanced Very High Resolution Radiometer
AVN	Aviation Model
AVO	Alaska Volcano Observatory
BATS	Biosphere-Atmosphere Transfer Scheme
CLASS	Canadian Land Surface Scheme
COE	Common Operating Environment
DII	Defense Information Infrastructure
DMSP	Defense Meteorological Satellite Program
ECMWF	European Center for Medium-Range Weather Forecasts
FNMOC	Fleet Numerical Meteorology and Oceanography Center
FSL	Forecast Systems Laboratory
FTP	File Transfer Protocol
GI	Geophysical Institute
GIF	Graphic Interchange Format
GIT	Georgia Institute of Technology
GMT	Generic Mapping Tools
GOLD	Geophysical On-Line Data
GRIB	Gridded Binary
GSFC	Goddard Space Flight Center
HLBL	High Latitude Boundary Layer
IDL	Interactive Data Language
IMF	Interplanetary Magnetic Field
JHU	Johns Hopkins University
LAN	Local Area Network
LAPS	Local Analysis and Prediction System
LSM	Land Surface Model
MM5	Fifth Generation Mesoscale Model
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research

NCEP	National Centers for Environmental Prediction
netCDF	Network Common Data Form
NGDC	National Geophysical Data Center
NGM	Nested Grid Forecast Model
NOGAPS	Navy Operational Global Atmospheric Prediction System
NWP	Numerical Weather Prediction
OWS	Operational Weather Squadron
PACE	Poloar Anglo-American Conjugate Experiment
PBL	Planetary Boundary Layer
PCA	Polar Cap Absorption
PFRR	Poker Flat Research Range
SABER	Sounding of the Atmosphere using Broadband Emission Radiometry
SD	Space Department of the Applied Physics Laboratory
SDP	Software Development Plan
SEC	Space Environment Center
SEE	Solar EUV Experiment
SEON	Solar Electro-optical Observing Network
SFOC	Spaceflight Operations Center
STP	Solar Terrestrial Physics
SWOC	Space Weather Operations Center (Offutt)
SWXS	Space Weather Squadron
Tcl	Tool Command Language
Tk	Toolkit
Tix	Tk Interface Extension
UAF	University of Alaska, Fairbanks
UCAR	University Corporation for Atmospheric Research
UPOS	University Partnering for Operational Support
WDC	World Data Center
WF	Weather Flight
WMO	World Meteorological Organization
XDR	External Data Representation

B. SURFACE DUST FLUX MODEL GUI INTERFACE

C. SURFACE DUST FLUX MODEL OUTPUT



D. SAMPLE dust_setup.txt FILE

```
*-----  dust_setup.txt = Dust setup file  ----------
*    R. Sterner, 2001 Oct 11

     flag = 0          ; Has this file been customized?

     dir_in   = /disks/dm004/commondata/mm5/
     dir_out  = temporary/
     data_dir = temporary/
```