HF Radar Clutter Boundary Functional Requirements

UPOS-A53-13

07 November 2001

By
Linda M. Hasselbarth

Version 1.0

TABLE OF CONTENTS

1 Overview

1.1 *Statement of Purpose*

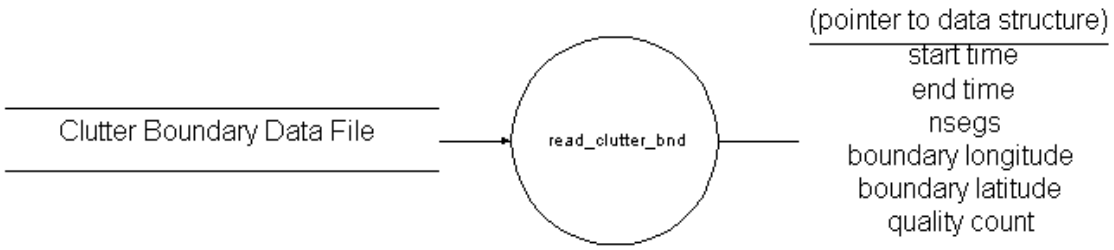
The primary purpose of the HF-Radar Communication/Propagation software is to provide to AFWA an ASCII data file containing information about the location of the Clutter Boundary and the capability to read this data file. The HF-Radar Communications/Propagation Clutter Boundary project provides a real-time determination of where high latitude ionospheric clutter is likely to be present. It determines the location using real-time data from the SuperDARN radars. The Clutter Boundary is determined directly from the measurement of convection velocity and backscattered power in the input radar data.

1.2 *Summary of Architecture*

When the HF-Radar Communications/Propagation Cluuter Boundary process is executed it returns a pointer the data structure containing information about the location of the Clutter Boundary. Listed below is the format of the data structure returned:

File Type	Name	Description
time_t	st, et	Start and end times
int	nsegs	Number of segments
double	lon	Starting lon position of segment
double	lat	Starting lat position of segment
double	quality	Quality flag for segment

The following shows a diagram of the architure and data flow:



2 Read Clutter Boundary Data

2.1 Functional Requirements

2.1.1 The software shall read the contents of the clutter boundary data file.

2.2 Interface Requirements

Input Interfaces
2.2.1 The process shall ingest the clutter boundary data file. Listed below is the file format:

Record #	# of items	Description of items
1	12	Time stamp; start year, month, day, hour, minute, second; end year, month, day, hour, minute, second
2	1	Number of blocks (always 1)
3	2	Number of data records in the block, number of items in each data record. For this file there are always 73 data records with 3 values for each record.
4	3	Name of each of the three values: The first value is the boundary longitude, the second value is the boundary latitude and the third value is the quality. The coordinatte system is geographic.
5	3	Units for each data item. The longitude and latitude are in degrees. The quality is in count.
6	3	Value type. All three data values are Float.
7-79	3	Longitude, latitude and quality of the boundary. The data values are always separated by blanks so they can be read in free format.

The following is a sample data file:

```
2001 4 12 14 18 0 2001 4 12 14 20 0
3
73 3
  bnd_lon    bnd_lat    quality
  degrees    degrees      count
    float      float      float
  0.00000    79.2842    0.00000
```

5.00000	79.6258	0.00000
10.0000	79.9077	0.00000
15.0000	80.1214	0.00000
20.0000	80.2603	0.00000
25.0000	80.3202	0.00000
30.0000	80.3095	1.00000
35.0000	80.2524	1.00000
40.0000	80.1511	1.00000
45.0000	80.0071	1.00000
50.0000	79.8229	1.00000
55.0000	79.6018	1.00000
60.0000	79.3475	1.00000
65.0000	79.0644	1.00000
70.0000	78.7572	0.00000
75.0000	78.4313	0.00000
80.0000	78.0922	0.00000
85.0000	77.7457	0.00000
90.0000	77.3978	0.00000
95.0000	77.0544	0.00000
100.000	76.7213	0.00000
105.000	76.4044	0.00000
110.000	76.1090	0.00000
115.000	75.8401	0.00000
120.000	75.6024	0.00000
125.000	75.3999	0.00000
130.000	75.2361	0.00000
135.000	75.1138	0.00000
140.000	75.0351	0.00000
145.000	75.0013	0.00000
150.000	75.0000	0.00000
155.000	75.0000	0.00000
160.000	75.0000	0.00000
165.000	75.0000	0.00000
170.000	75.0000	0.00000
175.000	75.0000	0.00000
180.000	75.0000	0.00000
185.000	75.0000	0.00000
190.000	75.0000	0.00000
195.000	75.0000	0.00000
200.000	75.0000	0.00000
205.000	75.0000	0.00000
210.000	75.0000	0.00000
215.000	75.0000	0.00000
220.000	75.0000	0.00000

225.000	75.0000	0.00000
230.000	75.0000	0.00000
235.000	75.0000	0.00000
240.000	75.0000	0.00000
245.000	75.0000	0.00000
250.000	75.0000	0.00000
255.000	75.0000	0.00000
260.000	75.0000	0.00000
265.000	75.0000	0.00000
270.000	75.0000	0.00000
275.000	75.0000	0.00000
280.000	75.0000	0.00000
285.000	75.0000	0.00000
290.000	75.0000	0.00000
295.000	75.0000	0.00000
300.000	75.0232	0.00000
305.000	75.1243	0.00000
310.000	75.3024	0.00000
315.000	75.5521	1.00000
320.000	75.8660	1.00000
325.000	76.2344	1.00000
330.000	76.6462	1.00000
335.000	77.0888	2.00000
340.000	77.5488	2.00000
345.000	78.0122	2.00000
350.000	78.4650	2.00000
355.000	78.8933	0.00000
360.000	79.2842	0.00000

Output Interfaces

2.2.1 The process shall return a pointer for the file structure containing the latest Clutter Boundary information.

User Interfaces

None

2.3 Operational Requirements

2.3.1 The process shall run under the Solaris operating system on a Sun computer.

2.3.2 The process shall begin execution upon direction from the read routine.

3 References

Baker, K.B., and S. Wing, A new magnetic coordinate system for conjugate studies at high latitudes, *J. Geophis. Res*., 94(A7), 9139-9144, 1989.

Heppner, J.P., and N.C.Maynard, Empirical high-latitude electirc field modesl, *J. Geophys. Res*., 92, 4467, 1987.

Walker, A.D.M., R.A. Greenwald, and K.B. Baker, Determination of the fluctuation level of ionospheric irregularities from radar backscatter measurements, *Radio Sci*., 22, 689-705, 1987.

Appendix A - Acronyms and Abbreviations

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 The Johns Hopkins University
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
DCL	Digital Command Language
DII	Defense Information Infrastructure
DMSP	Defense Meteorological Satellite Program
ECMWF	European Centre 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
GMT	Generic Mapping Tools
GOLD	Geophysical On-Line Data
GRIB	Gridded Binary
HLBL	High Latitude Boundary Layer
INTERMAGNET	International Real-time Magnetic observatory Network
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
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
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