Data format of ISS-IMAP's VISI_loc file

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2017-4-1

VISI_loc is the location data file for Visible-light and Infrared Spectrum Imager (VISI) instrument of the ISS-Ionosphere, Mesosphere, upper Atmosphere, and Plasmasphere mapping (ISS-IMAP) mission. It contains the information of the coordinates of the location where each VISI pixel observed, and location of the International Space Station (ISS). The altitudes of the emission layer of the airglow/aurora and background are fixed.

1 File name

One VISI_loc file contains the location data for one consecutive observation of VISI in the same observational mode. Nomenclature of VISI_loc file is as follows:

IMP_VI_$YYYY$–MM–DD–$hhmmss$_MOD_loc.nc

$YYYY$: Year of the observation start time in UT
MM: Month of the observation start time in UT
DD: Day of the observation start time in UT
$hhmmss$: Hour, Minute and Second of the observation start time in UT
MOD: Observational mode of VISI

For example, name of VISI_loc file for the observation in P07 mode, which started at 13:40:05UT on December 14 in 2012 is:

IMP_VI_2012–12–14–134005_P07_loc.nc

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2 Data file format

VISI_loc is in the format of netCDF (Network Common Data Format) version 4/HDF (Hierarchical Data Format) version 5.

3 Data

3.1 Attributes

Several attributes are defined in VISI_loc file. “MISSION" is the identifier of the mission. It is set as "ISS-IMAP" for all of the ISS-IMAP data. “DATA" is the identifier of the data type. It is set as "VISI Location (loc)" for all of the VISI_loc files. “Version" is the version number of the VISI_loc data. “CONTACT" is the e-mail address of the contact persons on the VISI_loc files.

Table 1. Example values of attributes in VISI_loc

Attribute	Example value
MISSION	“ISS-IMAP"
DATA	“VISI Location (loc)"
Version	1.0
CONTACT	“tsakanoi@pparc.gp.tohoku.ac.jp saitoua@kugi.kyoto-u.ac.jp"

3.2 Dimensions

Several dimensions are defined in VISI_loc file. “DIM_FB" is the number of Field-of-view (FOV) of VISI. Because VISI has two FOVs, the forward FOV and the backward FOV, it is set as “2" for all of the VISI observation. “Num_Height" is the number of the height of the emission layers. It is set as 4 for most of VISI_loc files. It is corresponding to three heights of the emission layers of three airglow/aurora wavelength, and one ground-level. “NUM_PIX" is the number of pixels for one FOV and one swath. This corresponds to the number of the image pixels perpendicular to the ISS trajectory. “NUM_SWATH" is the number of the swath along the ISS trajectory. The observed data is two-dimensional image whose size is “NUM_PIX" pixel × “NUM_SWATH" pixel.

Table 2. Example values of dimensions in VISI_loc

Dimension	Example value
DIM_FB	2
Num_Height	4
NUM_PIX	64
NUM_SWATH	779

3.3 Data arrays

VISI_loc file contains several data arrays. “SWATH_TIME" is day and time in UT of the observation for each swath. The format of the day and time is “YYYY-MM-SS hh:mm:ss". “ISS_LATI", “ISS_LONGI" and “ISS_ALTI" are the geographic coordinates of the ISS location in WGS-84. The units are, degree, degree and kilometer, respectively. “ISS_LATI" in the northern hemisphere has positive value, and in the southern hemisphere has negative value. “ISS_LONGI" in the eastern hemisphere has positive value, and in the western hemisphere has negative value. “MAPPING_HEIGHT" is the assumed height of the airglow/aurora layers. That is used to calculate the observed location. They correspond to the height of the airglow/aurora emission layers. The unit is kilometer. “LATI" and “LONGI" is the geographic coordinates of the observed location of VISI’s each pixel. The observed location is the point where the line-of-site of each pixel crosses the plane in the “MAPPING_HEIGHT" altitude.

Table 3. Data arrays in VISI_loc

Name	Type	Dimension	Unit
SWATH_TIME	string	(NUM_SWATH)	
ISS_LATI	float	(NUM_SWATH)	Degree
ISS_LONGI	float	(NUMSWATH)	Degree
ISS_ALTI	float	(NUM_SWATH)	km
MAPPING_HEIGHT	float	(Num_Height)	km
LATI	float	(NUM_SWATH, NUM_PIX, DIM_FB, Num_Height)	Degree
LONGI	float	(NUM_SWATH, NUM_PIX, DIM_FB, Num_Height)	Degree

4 Reference

Sakanoi, T., Y. Akiya, A. Yamazaki, Y. Otsuka, A. Saito, I. Yoshikawa, Imaging observation of the earth’s mesosphere, thermosphere and ionosphere by VISI of ISS-IMAP on the international space station, IEEJ Trans. on Fundamentals and Materials, vol. 131, 12, 983-988, doi: 10.1541/ieejfms.131.983, 2011.