Heliophysics Integrated Observatory

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Feature description
SDOSS
1.1

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Revision History

Version	Date	Released by	Detail
1.0	2011-11-27	Xavier Bonnin	First release. Description and outputs of the code
1.1	2012-10-05	Xavier Bonnin	Update file's content

Note: This document will continue to undergo revisions during the implementation phase of HELIO to incorporate changes and improvements.

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List of acronyms

CSV: Comma-Separated Values
HELIO : Heliophysics Integrated Observatory
HFC : Heliospheric Feature Catalogue
FRC : Feature Recognition Code
HMI : Helioseismic and magnetic imager
IDL : Interactive Data Language
MDI : Michelson Doppler Imager
SDO : Solar Dynamics Observatory
SOHO : Solar and Heliospheric Observatory
SSW : Solar SoftWare
TBC : To Be Confirmed
TBD : To Be Defined
UTC : Universal Time Coordinates

Relevant Documents

1. HELIO_HFC_V2.0 Description of the HFC
2. "Technique for automated recognition of sunspots on full-disk solar images", S. Zharkov, V. Zharkova, S. Ipson, and A. Benkhalil, EURASIP Journal on Advances in Signal Processing, Volume: 2005, Issue: 15, Pages: 2573-2584, 2005
3. HELIO_Feature_Description_MDISS Description of the MDISS code

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Feature Description

The scope of this document is to provide a description of the outputs files produced by the SDO SunSpots (SDOSS) feature recognition code (frc). SDOSS is dedicated to the sunspot detection on SDO/HMI images. Sunspots are the visible part of active regions (AR) on the photosphere. A sunspot is a dark cooler part of the Sun's surface; it is cooler than the surrounding atmosphere because of the presence of a strong magnetic field that inhibits the transport of heat via convective motion in the Sun. The magnetic field is formed below the Sun's surface, and extends out into the solar corona. Sunspots are best observed in the visible continuous spectrum also known as "white light" (WL). Larger sunspots can also be observed in Ca II K1 absorption line images as well as in Hα and Ca II K3 absorption line images. Sunspots generally consist of two parts: a darker, often circular central umbra, and a lighter outer penumbra. In many cases, they present two magnetic flux polarities as seen on magnetograms (see Figure 1). Sunspots, and more generally ARs, are often the origin site of others solar activity phenomena like flares or Coronal Mass Ejections (CMEs).

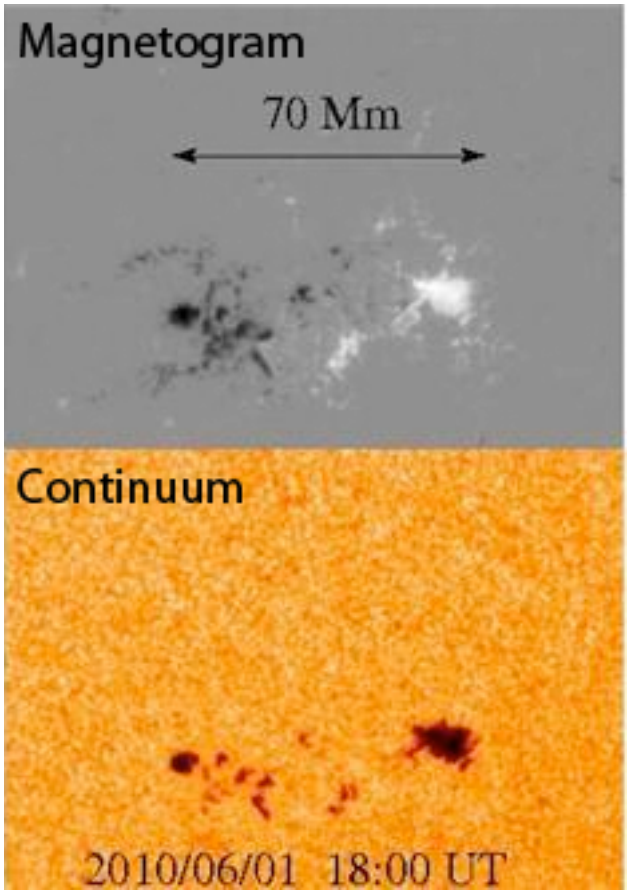

Figure 1. Zoom on a sunspot observed by SDO HMI, which can measure both the line of sight magnetic field (image above), and the white light intensity (image below).

Feature Code Characteristics

SDOSS code is adapted from the MDI SunSpots (MDISS) code developed in the frame of the EGSO project to automatically detect sunspots on SOHO/MDI data. It takes as input data pairs of SDO/HMI line-of-sight magnetograms and Intensity continuum images at 617.133 nm, and extract relevant sunspots parameters like morphological contours, minimum/maximum/average intensity and magnetic field values, etc. The code is written in IDL, a full description of the recognition algorithm can be found in Ref. 2.

Output of the Feature Code

Six types of output ascii files are produced during each SDOSS execution:

sdoss_***ver***_sdo_***frc_info.***csv, which contains frc information.
sdoss_***ver***_sdo_***observatory.***csv, which contains observatory information.
sdoss_***ver***_sdo_***pp_info***.csv, which contains pre-processing code information.
sdoss_***ver_yyyymmddThhnnss***_sdo_***init.***csv, which contains meta-data relative to the original observations.
sdoss_***ver_yyyymmddThhnnss***_sdo_***norm.***csv, which contains meta-data relative to the pre-processed observations.
sdoss_***ver_yyyymmddThhnnss***_sdo_***feat.***csv, which contains feature parameters extracted by the code.

In the nomenclature, ***ver*** provides the version number of the code with which the current files have been produced, ***yyyymmdd*** and ***hhnnss*** are respectively the date and time of observations (**yyyy** = year, **mm** = month, **dd** = day, **hh** = hours, **nn** = minutes, **ss** = secondes) given in UTC, and, and ***init***, ***norm***, ***feat***, ***frc_info, pp_info***, and ***observatory*** refer to the type of data written into the corresponding file. The content of these files is described in more details in next sub-sections; especially tables containing short descriptions of all the output parameters are given. The data format indicated is related to the corresponding fields used in the HFC database.

Frc info file

The frc info file (i.e., sdoss_***ver***_sdo_***frc_info.***csv) provides meta-data relative to the SDOSS code. The content of this file is not supposed to be modified until a new version of the code is released or the institute and/or person in charge change, and only one copy is produced during each execution of the code. The list of parameters written in this file is:

ID_FRC_INFO;INSTITUT;CODE;VERSION;FEATURE_NAME;ENC_MET;PERSON;CONTACT;
REFERENCE

NAME	FORMAT	DESCRIPTION	COMMENT

ID_FRC_INFO	INT(11)	Primary index	
INSTITUT	VARCHAR(150)	Name of the institute responsible for running the code	
CODE	VARCHAR(100)	Name of the code	
VERSION	VARCHAR(50)	Version of the code	"1.05"
FEATURE_NAME	VARCHAR(100)	Name of the feature detected.	"SUNSPOTS"
ENC_MET	VARCHAR(50)	Encoding method	"chain code/raster scan"
PERSON	VARCHAR(150)	Name of the person responsible for running the code	
CONTACT	VARCHAR(150)	Contact of the person responsible for running the code	Should be an email address.
REFERENCE	VARCHAR(150)	Any reference to a document or article that describes the code algorithm.	Could be a URL (ADS for instance) or DOI

Observatory file

The observatory file (i.e., sdoss_***ver***_sdo_***observatory.***csv) contains all the information about the observatory that produces data used by the code (i.e., here SDO/MDI

instrument). As for the frc info output file, the content of this file is not supposed to be modified, and only one copy is produced during each execution of the code. The list of parameters written in this file is:

ID_OBSERVATORY;OBSERVAT;INSTRUME;TELESCOP;UNITS;WAVEMIN;WAVEMAX;WAVENAME;WAVEUNIT;SPECTRAL_NAME;OBS_TYPE;COMMENT

NAME	FORMAT	DESCRIPTION	COMMENT
ID_OBSERVATORY	INT(11)	Primary index	
OBSERVAT	VARCHAR(255)	Name of the observatory/spacecraft where the instrument that produces data is located.	"SDO"
INSTRUME	VARCHAR(150)	Name of the instrument.	"HMI"
TELESCOP	VARCHAR(150)	Name of the telescop/channel used.	"continuum", "magnetogram"
UNITS	VARCHAR(100)	Intensity/Flux Units	"Counts", "Gauss"
WAVEMIN	FLOAT	Wavelength minimum value on the observations.	617.133 nm
WAVEMAX	FLOAT	Wavelength maximum value on the observations.	617.133 nm
WAVENAME	VARCHAR(50)	Name of the wavelength	Fe I
WAVEUNIT	VARCHAR(10)	Units of wavelengths.	"nm"

SPECTRAL_NAME	VARCHAR(100)	Spectral domain covered by the wavelengths	“visible”,”line-of-sight magnetic field”
OBS_TYPE	VARCHAR(100)	Type of observation	“remote-sensing”
COMMENT	TEXT	Any additional coment concerning data.	

PP info file

The pp info file (i.e., sdoss_***ver***_sdo_***pp_info.***csv) contains information about the pre-processing code. In the case of SDOSS, pre-processing steps are already implemented in the code to produce cleaned images. Meta-data provided are:

ID_PP_INFO;INSTITUT;CODE;VERSION;PERSON;CONTACT;REFERENCE

NAME	FORMAT	DESCRIPTION	COMMENT
ID_PP_INFO	INT(11)	Primary index	
INSTITUT	VARCHAR(150)	Name of the institute responsible for running the pre-processing code	“Observatoire de Paris-Meudon”
CODE	VARCHAR(100)	Name of the code	“SDOSS”
VERSION	VARCHAR(50)	Version of the code	“1.05”
PERSON	VARCHAR(150)	Name of the person responsible for running the pre-	

		processing code	
CONTACT	VARCHAR(150)	Contact of the person responsible for running the pre-processing code	Should be an email address.
REFERENCE	VARCHAR(150)	Any reference to a document or article that describes the pre-processing code algorithm.	Could be a URL (ADS for instance) or DOI

Observation file

The observation file (i.e., sdoss_***ver***_sdo_***yyyymmddThhnnss_init.***csv) contains main information about the observation used for the detection. During each code execution, one output file is produced for each input data file (i.e., sdo/hmi fits file corresponding of the date of observation ***yyyymmddThhnnss***) processed. The fields provided in the file are:

ID_OBSERVATIONS;OBSERVATORY_ID;DATE_OBS;DATE_END;JDINT;JDFRAC;EXP_TIME;C_ROTATION;BSCALE;BZERO;BITPIX;NAXIS1;NAXIS2;R_SUN;CENTER_X;CENTER_Y;CDELT1;CDELT2;QUALITY;FILENAME;FILE_FORMAT;COMMENT;LOC_FILENAME;URL;QCLK_URL;QCLK_FNAME

Note: In this case, the output fields mainly come from the header of the sdo/hmi fits files.

NAME	FORMAT	DESCRIPTION	COMMENT
ID_OBSERVATIONS	INT(11)	Primary index	
OBSERVATORY_ID	INT(11)	Index pointing to ID_OBSERVATORY provided in the observatory file.	

DATE_OBS	DATETIME	Date and time of the beginning of the observation in UTC (ISO 8601)	
DATE_END	DATETIME	Date and time of the end of the observation in UTC (ISO 8601)	
JDINT	INT(11)	Integer part of DATE_OBS in Julian days	
JDFRAC	DOUBLE	Fractional part of DATE_OBS in Julian days	
EXP_TIME	FLOAT	Exposure time	
C_ROTATION	INT(7)	Carrington rotation number at DATE_OBS	
BSCALE	DOUBLE	As extracted from the fits header.	
BZERO	DOUBLE	As extracted from the fits header.	
BITPIX	INT(3)	Coding of the original image.	
NAXIS1	INT(8)	Number of pixels along the first dimension (X-axis)	
NAXIS2	INT(8)	Number of pixels along the second dimension (Y-axis)	
R_SUN	DOUBLE	Radius od the Sun in pixels	

CENTER_X	DOUBLE	X coordinate of the Sun center in pixels	
CENTER_Y	DOUBLE	Y coordinate of the Sun center in pixels	
CDELT1	DOUBLE	Spatial scale along the first dimension (X-axis) on the original image (in arcsecs/pix)	
CDELT2	DOUBLE	Spatial scale along the second dimension (Y-axis) on the original image (in arcsecs/pix)	
QUALITY	VARCHAR(20)	Quality of the original image (in terms of processing)	
FILENAME	VARCHAR(100)	Name of the original image file	
FILE_FORMAT	VARCHAR(50)	Format of the data file	e.g. “fits”
COMMENT	TEXT	As extracted from the fits header.	
LOC_FILENAME	VARCHAR(200)	Full path to the original image file on the local disk.	
URL	TEXT	URL pointing to the original image file location (when available).	
QCLK_URL	VARCHAR(200)	URL of the directory containing the quicklook image of the observation	
QCLK_FNAME	VARCHAR(200)	Filename of the quicklook image	

PP output file

The pp output file (i.e., sdoss_***ver_yyyymmddThhnnss_norm.***csv) contains meta-data about the pre-processed observation. There is one file produced by observation pre-processed. Meta-data are:

ID_PP_OUTPUT;PP_INFO_ID;OBSERVATIONS_ID;RUN_DATE;PR_LOCFNAME;ORG_FNAME;LOC_FILE;EL_CEN_X;EL_CEN_Y;EL_AXIS1;EL_AXIS2;EL_ANGLE;STDEV;STDEVGEO;ALGERR;CDELT1;CDELT2;BITPIX;QSUN_INT;EFIT;STANDARD;LIMBDARK;BACKGROUND;LINECLEAN;LINEC_MAIND;PERCENT;NAXIS1;NAXIS2;CENTER_X;CENTER_Y;R_SUN;DIVISION;INORM;URL

NAME	FORMAT	DESCRIPTION	COMMENT
ID_PP_OUTPUT	INT(11)	Primary index	
PP_INFO_ID	INT(11)	Index pointing to ID_PP_INFO provided in the pp info file.	
OBSERVATIONS_ID	INT(11)	Index pointing to ID_OBSERVATIONS provided in the observations file.	
RUN_DATE	DATETIME	Date and time (in ISO 8601 format) when the pre-processing code was run	
PR_LOCFNAME	VARCHAR(100)	Name of the pre-processed file	
ORG_FNAME	VARCHAR(100)	Name of the original observation file	
LOC_FILE	VARCHAR(150)	Name of the pre-processed file, including the full path to the local directory.	
EL_CEN_X	FLOAT	X coordinate of the ellipse center in pixels	

EL_CEN_Y	DOUBLE	Y coordinate of the ellipse center in pixels	
EL_AXIS1	DOUBLE	Ellipse long axis in pixels	
EL_AXIS2	DOUBLE	Ellipse short axis in pixels	
EL_ANGLE	DOUBLE	Ellipse angle in degrees	
STDEV	DOUBLE	Standard deviation in pixels	
STDEVGEO	DOUBLE	Standard deviation geometric in pixels	
ALGERR	DOUBLE	Algebraic error in pixels	
CDELT1	DOUBLE	Spatial scale of the pre-processed image along the first dimension (X-axis) in arcsec/pix	
CDELT2	DOUBLE	Spatial scale of the pre-processed image along the second dimension (Y-axis) in arcsec/pix	
BITPIX	INT(3)	Coding of the pre-processed image	
QSUN_INT	FLOAT	Quiet Sun average intensity estimated after pre-processing	
EFIT	TINYINT(1)	Has ellipse fitting been used	

STANDARD	TINYINT(1)	Has standardization been used	
LIMBDARK	TINYINT(1)	Has limb darkening removal	
BACKGROUND	TINYINT(1)	Has background cleaning been	
LINECLEAN	TINYINT(1)	Has line cleaning been used	
LINEC_MAIND	FLOAT	Main direction of line cleaning in degrees	
PERCENT	FLOAT	Used in ellipse fitting	
NAXIS1	INT(8)	Number of pixels in the first dimension (X-axis)	
NAXIS1	INT(8)	Number of pixels in the second dimension (Y-axis)	
CENTER_X	DOUBLE	X coordinate of the Sun center (in pixels) on the pre-processing image	
CENTER_Y	DOUBLE	Y coordinate of the Sun center (in pixels) on the pre-processing image	
R_SUN	DOUBLE	Solar radius (in pixels) on the pre-processing image	
DIVISION	TINYINT(1)	Method used to normalize	

INORM	FLOAT	Normalizing parameter for od	
URL	TEXT	URL pointing to the pre-processed file path (when available)	

Feature Parameters file

The feature parameters file (i.e., sdoss_***ver***_sdo_***yyyymmddThhnnss_feat***.csv) provides the products of the feature extraction. As for the observation file, there is one file produced by date of observation ***yyyymmddThhnnss*** processed ; it contains parameters for the sunspots detected at this date. The fields written are:

ID_SUNSPOT;FRC_INFO_ID;OBSERVATIONS_ID_HMI_IC:OBSERVATIONS_ID_HMI_M;FEAT_X_ARCSEC;FEAT_Y_ARCSEC;FEAT_X_PIX;FEAT_Y_PIX;FEAT_HG_LONG_DEG;FEAT_HG_LAT_DEG;FEAT_CARR_LONG_DEG;FEAT_CARR_LAT_DEG;BR_X0_ARCSEC;BR_Y0_ARCSEC;BR_X1_ARCSEC;BR_Y1_ARCSEC;BR_X2_ARCSEC;BR_Y2_ARCSEC;BR_X3_ARCSEC;BR_Y3_ARCSEC;BR_X0_PIX;BR_Y0_PIX;BR_X1_PIX;BR_Y1_PIX;BR_X2_PIX;BR_Y2_PIX;BR_X3_PIX;BR_Y3_PIX;BR_HG_LONG0_DEG;BR_HG_LAT0_DEG;BR_HG_LONG1_DEG;BR_HG_LAT1_DEG;BR_HG_LONG2_DEG;BR_HG_LAT2_DEG;BR_HG_LONG3_DEG;BR_HG_LAT3_DEG;BR_CARR_LONG0_DEG;BR_CARR_LAT0_DEG; BR_CARR_LONG1_DEG;BR_CARR_LAT1_DEG;BR_CARR_LONG2_DEG;BR_CARR_LAT2_DEG;BR_CARR_LONG3_DEG;BR_CARR_LAT3_DEG;FEAT_AREA_PIX;FEAT_AREA_MM2;FEAT_AREA_DEG2;FEAT_DIAM_DEG;FEAT_DIAM_MM;FEAT_MEAN2QSUN;FEAT_MAX_INT;FEAT_MIN_INT;FEAT_MEAN_INT;FEAT_TOT_BZ;FEAT_ABS_BZ;FEAT_MAX_BZ;FEAT_MIN_BZ;FEAT_MEAN_BZ;UMBRA_NUMBER;UMBRA_AREA_PIX;UMBRA_AREA_DEG2;UMBRA_AREA_MM2;UMBRA_DIAM_DEG;UMBRA_DIAM_MM;UMBRA_MEAN2QSUN;UMBRA_MAX_INT;UMBRA_MIN_INT;UMBRA_MEAN_INT;UMBRA_TOT_BZ;UMBRA_ABS_BZ;UMBRA_MAX_BZ;UMBRA_MIN_BZ;CC_X_PIX;CC_Y_PIX;CC_X_ARCSEC;CC_Y_ARCSEC;CC;CC_LENGTH;RS;RS_LENGTH;SNAPSHOT_FN;SNAPSHOT_PATH;HELIO_SS_NUMBER;FEAT_FILENAME;RUN_DATE

NAME	FORMAT	DESCRIPTION	NOTES
ID_SUNSPOT	INT(11)	Primary index	
FRC_INFO_ID	INT(11)	Index pointing to ID_FRC_INFO provided in the frc_info file.	

OBSERVATIONS_ID_HMI_IC	INT(11)	Index pointing to ID_OBSERVATIONS for HMI IC provided in the observations file.	
OBSERVATIONS_ID_HMI_M	INT(11)	Index pointing to ID_OBSERVATIONS for HMI M provided in the observations file.	
FEAT_X_ARCSEC	DOUBLE	X coordinate of the sunspot gravity center in arcsec	
FEAT_Y_ARCSEC	DOUBLE	Y coordinate of the sunspot gravity center in arcsec	
FEAT_X_PIX	INT(8)	X coordinate of the sunspot gravity center in pixel.	
FEAT_Y_PIX	INT(8)	Y coordinate of the sunspot gravity center in pixel.	
FEAT_HG_LONG_DEG	FLOAT	Heliographic longitude (in degrees) of the feature gravity centre.	
FEAT_HG_LAT_DEG	FLOAT	Heliographic latitude (in degrees) of the feature gravity centre.	
FEAT_CARR_LONG_DEG	FLOAT	Carrington longitude (in degrees) of the feature gravity centre.	
FEAT_CARR_LAT_DEG	FLOAT	Carrington latitude (in degrees) of the feature gravity centre.	

BR_X0_PIX	INT(8)	X coordinate of the lower left corner of the bounding rectangle (in pixels)	
BR_Y0_PIX	INT(8)	Y coordinate of the lower left corner of the bounding rectangle (in pixels)	
BR_X1_PIX	INT(8)	X coordinate of the upper left corner of the bounding rectangle (in pixels)	
BR_Y1_PIX	INT(8)	Y coordinate of the upper left corner of the bounding rectangle (in pixels)	
BR_X2_PIX	INT(8)	X coordinate of the lower right corner of the bounding rectangle (in pixels)	
BR_Y2_PIX	INT(8)	Y coordinate of the lower right corner of the bounding rectangle (in pixels)	
BR_X3_PIX	INT(8)	X coordinate of the upper right corner of the bounding rectangle (in pixels)	
BR_Y3_PIX	INT(8)	Y coordinate of the upper right corner of the bounding rectangle (in pixels)	
BR_X0_ARCSEC	DOUBLE	X coordinate of the lower left corner of the bounding rectangle (in arcsec)	
BR_Y0_ARCSEC	DOUBLE	Y coordinate of the lower left corner of the bounding rectangle (in	

		arcsec)	
BR_X1_ARCSEC	DOUBLE	X coordinate of the upper left corner of the bounding rectangle (in arcsec)	
BR_Y1_ARCSEC	DOUBLE	Y coordinate of the upper left corner of the bounding rectangle (in arcsec)	
BR_X2_ARCSEC	DOUBLE	X coordinate of the lower right corner of the bounding rectangle (in arcsec)	
BR_Y2_ARCSEC	DOUBLE	Y coordinate of the lower right corner of the bounding rectangle (in arcsec)	
BR_X3_ARCSEC	DOUBLE	X coordinate of the upper right corner of the bounding rectangle (in arcsec)	
BR_Y3_ARCSEC	DOUBLE	Y coordinate of the upper right corner of the bounding rectangle (in arcsec)	
BR_HG_LONG0_DEG	FLOAT	Heliographic longitude of the lower left corner of the bounding rectangle (in degrees)	
BR_HG_LAT0_DEG	FLOAT	Heliographic latitude of the lower left corner of the bounding rectangle (in degrees)	

BR_HG_LONG1_DEG	FLOAT	Heliographic longitude of the upper left corner of the bounding rectangle (in degrees)	
BR_HG_LAT1_DEG	FLOAT	Heliographic latitude of the upper left corner of the bounding rectangle (in degrees)	
BR_HG_LONG2_DEG	FLOAT	Heliographic longitude of the lower right corner of the bounding rectangle (in degrees)	
BR_HG_LAT2_DEG	FLOAT	Heliographic latitude of the lower right corner of the bounding rectangle (in degrees)	
BR_HG_LONG3_DEG	FLOAT	Heliographic longtiude of the upper right corner of the bounding rectangle (in degrees)	
BR_HG_LAT3_DEG	FLOAT	Heliographic latitude of the upper right corner of the bounding rectangle (in degrees)	
BR_CARR_LONG0_DEG	FLOAT	Carrington longitude of the lower left corner of the bounding rectangle (in degrees)	
BR_CARR_LAT0_DEG	FLOAT	Carrington latitude of the lower left corner of the bounding rectangle (in degrees)	

BR_CARR_LONG1_DEG	FLOAT	Carrington longitude of the upper left corner of the bounding rectangle (in degrees)	
BR_CARR_LAT1_DEG	FLOAT	Carrington latitude of the upper left corner of the bounding rectangle (in degrees)	
BR_CARR_LONG2_DEG	FLOAT	Carrington longitude of the lower right corner of the bounding rectangle (in degrees)	
BR_CARR_LAT2_DEG	FLOAT	Carrington latitude of the lower right corner of the bounding rectangle (in degrees)	
BR_CARR_LONG3_DEG	FLOAT	Carrington longtiude of the upper right corner of the bounding rectangle (in degrees)	
BR_CARR_LAT3_DEG	FLOAT	Carrington latitude of the upper right corner of the bounding rectangle (in degrees)	
FEAT_AREA_PIX	INT(11)	Sunspot area in pixels number	
FEAT_AREA_DEG2	FLOAT	Sunspot area in square degree	
FEAT_AREA_MM2	FLOAT	Sunspot area in square megameter	
FEAT_DIAM_DEG	FLOAT	Sunspot diameter in degrees	

FEAT_DIAM_MM	FLOAT	Sunspot diameter in megameter	
FEAT_MEAN2QSUN	FLOAT	Sunspot mean intensity to quiet sun ratio	
FEAT_MAX_INT	FLOAT	Maximum feature intensity (in units provided by UNITS in observatory file for HMI Ic)	
FEAT_MIN_INT	FLOAT	Minimum feature intensity (in units provided by UNITS observatory file for HMI Ic)	
FEAT_MEAN_INT	FLOAT	Mean feature intensity (in units provided by UNITS observatory file for HMI Ic)	
FEAT_TOT_BZ	FLOAT	Sunspot total line-of-sight magnetic flux (in units provided by UNITS observatory file for HMI M)	
FEAT_ABS_BZ	FLOAT	Sunspot total absolute line-of-sight magnetic flux in units provided by UNITS observatory file for HMI M)	
FEAT_MAX_BZ	FLOAT	Sunspot maximum line-of-sight magnetic field flux (in units provided by UNITS observatory file for HMI M)	
FEAT_MIN_BZ	FLOAT	Sunspot minimum line-of-sight magnetic field flux (in units provided by UNITS observatory file for	

		HMI M)	
UMBRA_NUMBER	INT(8)	Number of umbras	
UMBRA_AREA_PIX	INT(11)	Umbra area in pixels	
UMBRA_AREA_MM2	FLOAT	Umbra area in square megameter	
UMBRA_AREA_DEG2	FLOAT	Umbra area in square degrees	
UMBRA_DIAM_DEG	FLOAT	Umbra diameter in degrees	
UMBRA_DIAM_MM	FLOAT	Umbra diameter in megameter	
UMBRA_MAX_INT	FLOAT	Umbra maximum intensity (in units provided by UNITS observatory file for HMI Ic)	
UMBRA_MIN_INT	FLOAT	Umbra minimum intensity (in units provided by UNITS observatory file for HMI Ic)	
UMBRA_MEAN_INT	FLOAT	Umbra mean intensity (in units provided by UNITS observatory file for HMI Ic)	
UMBRA_TOT_BZ	FLOAT	Umbra total line-of-sight magnetic flux (in units provided by UNITS observatory file for HMI M)	
UMBRA_ABS_BZ	FLOAT	Umbra total absolute line-of-sight magnetic flux (in units provided by UNITS	

		observatory file for HMI M)	
UMBRA_MAX_BZ	FLOAT	Umbra maximum line-of-sight magnetic flux (in units provided by UNITS observatory file for HMI M)	
UMBRA_MIN_BZ	FLOAT	Umbra minimum line-of-sight magnetic flux (in units provided by UNITS observatory file for HMI M)	
CC_X_PIX	INT(8)	X coordinate of the chain code start position in pixels	
CC_Y_PIX	INT(8)	Y coordinate of the chain code start position in pixels	
CC_X_ARCSEC	DOUBLE	X coordinate of the chain code start position in arcsec	
CC_Y_ARCSEC	DOUBLE	Y coordinate of the chain code start position in arcsec	
CC	TEXT	String containing the chain code	
CC_LENGTH	INT(11)	Length of the cc string	
RS	TEXT	String containing the raster scan	
RS_LENGTH	INT(11)	Length of the rs string	
SNAPSHOT_FN	VARCHAR(200)	Name of the snapshot filename (when available)	
SNAPSHOT_PATH	VARCHAR(200)	Full path to the snapshot filename (when available)	
HELIO_SS_NUMBER	INT(11)	HELIO sunspot id number (not defined yet)	
FEAT_FILENAME	VARCHAR(150)	Name of the output code file containing the feature parameters.	

RUN_DATE	DATETIME	Date and time when the code was run (ISO 8601 format)	