



STCD (STation Coordinates Difference) format (version 1.1)

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Introduction.

The STCD format has been developed by the IDS Central Bureau and the Analysis Coordinator with the objective to provide a user-friendly presentation of DORIS coordinate time-series results for a potentially broader community of users.

The STCD files are ASCII files giving for one geodetic point the times series of both Cartesian and geographic coordinates. Coordinate time series consist of residuals relative to a reference position. Each coordinate of the series is assumed to be expressed in a same reference system at the observation epoch. Users can then easily plot the time evolution of the point position and observe its horizontal and vertical displacement.

The STCD file consists of 5 mandatory blocks. 4 blocks derived of the SINEX format (FILE/REFERENCE; FILE/COMMENT; SITE/ID; SOLUTION/APRIORI) form the header. They provide information needed to the creation of the series of which main elements are the reference position of the geodetic point, and the characteristics of the ellipsoid used to express the Cartesian coordinates in geographic system. The 5th block gives the coordinate differences as a function of time. Time unit is the Modified Julian Day (MJD). Residual unit is the millimetre.

We propose hereafter a description of the STCD format, and an example of a STCD file.

Note that STCD files of DORIS stations can easily be generated from a series of SINEX files, under the condition that the SINEX solutions are all expressed in a common reference frame.

Tools to extract STCD from a series of SINEX files are currently being developed by the Central Bureau.

Description.

The 4 SINEX-like blocks follow the general description rules of the SINEX format (Blewitt 2003). They are formed of line of 80 characters or less. The 5th block (coordinate differences) is a 13-column block of which fields and format are described in the FILE/COMMENT block.

The blocks are separated by lines of 79 "-" starting with "*". There is no such a line after the 5th block. The total of the lines of the 4 blocks including the separating lines is exactly 29. The first line of the coordinate differences block is the 30th.

Version log.

1.0 (2006/03/26): first version

1.1 (2017/09/27): changed format to take into account large amplitude station motions due to important velocities (ex. stations of the Pacific islands):

FORMAT - 2x,f7.1,2(2x,3(1x,f7.1),3(1x,f5.1)) (instead of "FORMAT - 2x,f7.1,2(2x,3(1x,f6.1),3(1x,f5.1))")



Block #1

FILE/REFERENCE Block (Mandatory)

Description:

This block provides description of the input and output, information on the organization, point of contact, the software and hardware involved in the creation of the file.

Contents:

DESCRIPTION *Name of Analysis Center*

OUTPUT *Description of the file contents*

CONTACT *Name and email of the relevant contact*

SOFTWARE *Software use to generate the results*

HARDWARE *Computer hardware on which above software was run*

INPUT *Brief description of the input used to generate this time series*

The block starts with the line

+FILE/REFERENCE

The block ends with the line

-FILE/REFERENCE

Block #2

FILE/COMMENT Block (Mandatory)

Description:

This block provides information on the content of the block Coordinate Differences (fields, format, units), reference system in which the coordinates are expressed, and description of the Earth ellipsoid (flattening factor and equatorial radius) used to convert the Cartesian coordinates into geographical coordinates.

Contents:

FIELDS - modified julian date, dX, dY, dZ, sX, sY, sZ, dEast, dNorth, dUp, sEast, sNorth, sUp

FORMAT - 2x,f7.1,2(2x,3(1x,f7.1),3(1x,f5.1))

UNITS - all position residuals in millimeters

REFERENCE SYSTEM - *Name of the reference system*

EARTH ELLIPSOID - flattening factor: *value* equatorial radius: *value unit*

The block starts with the line

+FILE/COMMENT

The block ends with the line

-FILE/COMMENT



Block #3

SITE/ID Block (Mandatory)

Description:

This block provides general information for the site containing estimated parameters: site code, point code, DOMES number, station description, approximate longitude, approximate latitude, approximate height

Contents:

Comment line (mandatory)

*Code Pt __Domes__ T _Station Description__ _Longitude_ _Latitude__ _Height

immediatly followed on one line by the parameters described in the table below:

[Site Code] [Point Code] [DOMES number] [Observation Code] Station description
Approximate Longitude Approximate Latitude Approximate Height

The block starts with the line

+SITE/ID

The block ends with the line

-SITE/ID



S I T E I D D A T A L I N E		
Field	Description	Format
[Site Code]	4 character mnemonic of the station	1X,A4
[Point Code]	Physical monument used at the site	1X,A2
[DOMES number]	Unique alpha-numeric monument identification. For ITRF purposes, it is a 9 character DOMES number (5 digits, followed by the single letter 'S', followed by 3 digits)	1X,A9
[Observation Code]	Observation technique(s) used. Code for DORIS is D	1X,A1
Station description	Free-format description of the site, typically the town and/or country.	1X,A22
Approximate Longitude	Approximate longitude of the site in degrees (E/+), minutes and seconds.	1X,I3, 1X,I2, 1X,F4.1
Approximate Latitude	Approximate latitude of the site in degrees (NS/+), minutes and seconds.	1X,I3, 1X,I2, 1X,F4.1
Approximate Height	Approximate height of the site in metres.	1X,F7.1
		75



Block #4

SOLUTION/APRIORI Block (Mandatory)

Description:

Reference position with respect to which residuals are given

Contents:

Comment line (mandatory)

*Index _Type_ Code Pt Soln _Ref_Epoch__ Unit S __Estimated Value____ _Std_Dev____

immediatly followed on three lines by the station coordinates X,Y,Z as described in the table below:

Parameter index, parameter type, site code, point code, solution ID, time, parameter units, constraint code, parameter value, parameter standard deviation.

The block starts with the line

+ SOLUTION/APRIORI

The block ends with the line

- SOLUTION/APRIORI



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S O L U T I O N A P R I O R I D A T A L I N E		
Field	Description	Format
Parameter Index	Index of a priori parameters.	1X,I5
[Parameter Type]	Identification of the type of parameter. STAX - Coordinate in X-direction m STAY - Coordinate in Y-direction m STAZ - Coordinate in Z-direction m	1X,A6
[Site Code]	4 character mnemonic of the station	1X,A4
[Point Code]	Physical monument used at the site	1X,A2
[Solution ID]	Solution ID at the Site code	1X,A4
[Time]	Epoch at which the a priori parameter or the inner constraint is valid.	1X,I2.2, 1H:,I3.3, 1H:,I5.5
Parameter Units	Units used for the coordinates and sigmas. They should be m	1X,A4
[Constraint Code]	Constraint applied to the parameter.	1X,A1
Parameter value	Value of the coordinate	1X,E21.15
Parameter Standard Deviation	Standard deviation for the coordinate	1X,E11.6
		80



Block #5

The coordinate time series. No name block (Mandatory)

Description: coordinate differences in cartesian (XYZ) and geographic (East (E), North (N), Up (U) and associated uncertainties all expressed in mm as a function of time expressed in Modified Julian Day.

Contents:

One result per line, 13 fields separated by blanks:

MJD (Modified Julian Date), dX (X residual), dY (Y residual), dZ (Z residual), sigdX (uncertainty of dX), sigdY (uncertainty of dY), sigdZ (uncertainty of dZ), dE (East residual), dN (North residual), dU (Up residual), sigdE (uncertainty of dE), sigdN (uncertainty of dN), sigdU (uncertainty of dU)



Examples of STCD file.
VERSION 1.0

+FILE/REFERENCE

DESCRIPTION LEGOS/CLS Analysis Center
 OUTPUT Monthly position residuals at observation epoch
 CONTACT Laurent Soudarin <laurent.soudarin@cls.fr> info-doris@cls.fr
 SOFTWARE GINS / DYNAMO (GRGS/CNES)
 HARDWARE SUN / CRAY
 INPUT SPOT2, SPOT3, SPOT4, SPOT5, TOPEX, ENVISAT DORIS data

-FILE/REFERENCE

*

+FILE/COMMENT

FIELDS - modified julian date, dX, dY, dZ, sX, sY, sZ, dEast, dNorth, dUp, sEast, sNorth, sUp
 FORMAT - 2x, f7.1, 2(2x, 3(1x, f6.1), 3(1x, f5.1))
 UNITS - all position residuals in millimeters
 REFERENCE SYSTEM - ITRF2000 using a global LCA solution (1993_2004) for transformation
 EARTH ELLIPSOID - flattening factor: 298.257810 equatorial radius: 6378136.0 m

-FILE/COMMENT

*

+SITE/ID

*Code	Pt	Domes	T	Station Description	Longitude	Latitude	Height
AMSA	A	91401S001	C	AMSTERDAM antenna	77 34 17.0	-37 47 54.3	62.3

-SITE/ID

*

+SOLUTION/APRIORI

*Index	Type	Code	Pt	Soln	Ref_Epoch	Unit	S	Estimated Value	Std_Dev
1	STAX	AMSA	A	1	97:001:00000	m	2	0.108606165885490E+07	0.17099E-02
2	STAY	AMSA	A	1	97:001:00000	m	2	0.492796300849270E+07	0.89032E-03
3	STAZ	AMSA	A	1	97:001:00000	m	2	-.388782838175110E+07	0.89761E-03

-SOLUTION/APRIORI

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49001.9	-0.9	42.6	51.5	12.0	8.3	10.9	10.1	66.3	1.1	15.4	9.6	9.6
49031.2	-1.4	28.1	33.3	12.7	8.7	11.7	7.4	43.1	1.0	16.1	10.5	10.0
49064.0	-8.5	7.5	11.4	13.4	9.3	11.8	9.9	12.4	-2.6	17.1	10.5	10.5
49093.3	13.2	20.4	36.0	12.6	9.2	12.5	-8.5	42.5	-4.0	16.1	11.1	10.7
49126.1	-19.2	45.3	18.4	11.1	8.0	11.1	28.4	39.3	20.4	14.1	10.0	9.2
49155.3	-27.6	40.0	38.6	10.6	7.4	10.4	35.5	51.0	2.5	13.6	9.3	8.6
49184.6	9.3	13.7	21.4	11.3	7.9	10.7	-6.1	26.4	-1.0	14.3	9.5	9.3
49213.8	20.9	15.6	18.9	10.6	7.3	10.3	-17.1	27.1	4.0	13.5	9.2	8.5
49246.7	-38.5	22.1	35.1	11.3	7.5	10.4	42.3	36.0	-11.1	14.4	9.3	8.7
49275.9	-40.9	24.4	20.1	11.2	8.3	10.6	45.1	25.2	-0.4	14.3	9.3	9.6
49308.7	-17.6	28.9	32.2	9.2	6.3	8.9	23.3	40.5	-0.5	11.7	8.0	7.4
49338.0	4.2	28.1	8.2	10.1	6.7	9.1	1.9	23.9	17.4	12.8	8.2	7.7
49367.2	-25.8	42.8	14.2	9.7	6.5	9.2	34.4	33.5	20.0	12.4	8.3	7.5
49396.4	-20.4	37.6	10.8	9.4	6.4	8.9	28.0	28.4	18.9	12.0	8.0	7.4
49429.3	-29.4	31.3	23.3	8.6	5.8	8.4	35.4	33.4	4.9	10.9	7.5	6.9
49458.5	-9.2	25.5	14.0	8.4	5.6	8.5	14.5	25.2	9.5	10.7	7.6	6.8
49491.4	-17.9	28.3	-1.6	12.5	8.7	9.7	23.6	13.4	19.8	16.1	8.6	9.6



VERSION 1.1

+FILE/REFERENCE

DESCRIPTION Analysis of the GSC (26-29) weekly solutions by the IDS Combination Center
 INPUT Weekly sinex in free-network
 OUTPUT Weekly sinex expressed in ITRF2014
 CONTACT Guilhem.Moreaux@cls.fr
 SOFTWARE CATREF software

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+FILE/COMMENT

FIELDS - modified julian date, dX, dY, dZ, sX, sY, sZ, dEast, dNorth, dUp, sEast, sNorth, sUp
 FORMAT - 2x,f7.1,2(2x,3(1x,f7.1),3(1x,f5.1))
 UNITS - all position residuals in millimeters
 REFERENCE SYSTEM - DORIS terrestrial system
 EARTH ELLIPSOID - flattening factor: 298.257810 equatorial radius: 6378136.0 m
 -FILE/COMMENT

*

+SITE/ID

*Code	Pt	Domes	T	Station Description	Longitude	Latitude	Height
AMSA	A	91401S001	D	AMSTERDAM, AMSTERDAM	77 34 17.0	-37 47 54.3	62.2

-SITE/ID

*

+SOLUTION/APRIORI

*Index	Type	Code	Pt	Soln	Ref Epoch	Unit	S	Estimated Value	Std Dev
205	STAX	AMSA	A	1	00:001:00000	m	2	0.108606161884285E+07	0.91609E-02
206	STAY	AMSA	A	1	00:001:00000	m	2	0.492796297433942E+07	0.64428E-02
207	STAZ	AMSA	A	1	00:001:00000	m	2	-.388782829004420E+07	0.54301E-02

-SOLUTION/APRIORI

*

49000.5	-44.6	47.5	43.5	27.7	18.6	16.0	53.7	57.2	2.4	27.3	17.2	18.0
49007.5	76.8	7.5	12.6	24.9	16.1	13.7	-73.3	24.6	11.1	24.5	14.9	15.6
49014.5	65.1	44.6	25.1	23.0	15.0	12.6	-53.9	55.3	30.1	22.6	13.8	14.5
49021.5	-24.6	-7.1	31.6	23.5	15.6	13.0	22.5	17.5	-29.0	23.2	14.2	15.0
49028.5	69.4	53.7	-9.3	22.3	15.5	12.3	-56.2	34.0	58.9	22.0	13.8	14.6
49035.5	114.1	-0.4	7.4	22.9	14.6	12.5	-111.4	20.7	14.5	22.5	13.5	14.2
49042.5	36.7	-43.8	25.9	28.0	18.6	15.3	-45.2	-0.9	-43.4	27.6	16.9	17.8
49049.5	98.4	25.6	-14.0	23.1	16.4	13.2	-90.4	17.3	45.0	22.8	14.7	15.6
49056.5	41.9	13.3	-0.3	23.7	16.9	13.9	-38.0	13.3	17.5	23.4	15.3	16.1
49070.5	69.5	-91.7	-0.4	34.1	26.3	21.3	-87.5	-46.1	-58.7	33.8	23.5	24.8
49077.5	49.8	27.3	-43.1	25.2	15.6	13.1	-42.7	-11.2	56.0	24.8	14.4	15.1
49084.5	73.8	-7.5	20.8	21.5	15.2	12.8	-73.5	21.7	-6.0	21.2	13.9	14.6
49091.5	91.6	-9.4	46.2	21.9	15.0	12.3	-91.4	43.0	-20.0	21.6	13.6	14.3
49098.5	73.7	-7.5	30.8	32.2	22.9	19.7	-73.5	29.7	-12.1	31.8	21.2	22.1
49105.5	65.8	-5.3	-32.9	23.8	15.9	13.5	-65.3	-20.5	27.3	23.4	14.7	15.4
49112.5	62.6	-50.5	-49.5	25.8	17.7	14.4	-71.9	-61.3	2.0	25.5	15.9	16.9
49119.5	71.4	-9.2	-4.2	24.9	16.0	13.4	-71.6	0.6	7.6	24.5	14.7	15.4
49126.5	70.1	41.5	13.5	23.5	17.1	13.2	-59.5	44.9	35.7	23.2	14.9	16.0
49133.5	53.5	42.4	4.2	23.3	16.8	13.8	-43.1	35.8	39.2	23.0	15.2	16.0
49140.5	19.3	39.7	11.6	23.9	15.4	12.8	-10.3	35.6	26.8	23.5	14.0	14.8
49147.5	42.4	53.4	10.3	22.4	16.0	12.7	-29.9	45.9	42.1	22.1	14.2	15.1
49154.5	94.6	20.2	5.9	23.0	15.1	12.3	-87.9	29.3	28.0	22.7	13.6	14.4
49161.5	42.1	-12.2	18.5	23.1	15.4	12.8	-43.7	12.9	-13.6	22.8	14.0	14.8
49168.5	34.7	9.2	39.5	24.7	19.1	14.9	-31.9	41.4	-11.2	24.4	16.7	17.9
49175.5	111.3	-5.5	-16.1	22.4	15.0	12.3	-109.7	-1.3	24.5	22.1	13.6	14.3
49182.5	85.4	6.5	-12.7	23.1	15.3	12.6	-81.9	5.1	27.3	22.8	13.9	14.7
49189.5	53.2	-34.2	35.2	23.7	16.6	13.3	-59.3	14.4	-39.0	23.4	14.8	15.7
49196.5	42.9	3.6	-3.2	25.4	16.4	13.5	-41.0	5.4	12.0	25.1	14.9	15.7



Annex

Relationship between MJD and decimal year.

$$\text{Decimal year} = 2000.0000 + (\text{MJD} - 51544.03) / 365.2422$$

Relationship between MJD and day of year (DOY):

Year	MJD	Year	MJD

1991	48256 + DOY	2006	53735 + DOY
1992	48621 + DOY	2007	54100 + DOY
1993	48987 + DOY	2008	54465 + DOY
1994	49352 + DOY	2009	54831 + DOY
1995	49717 + DOY	2010	55196 + DOY
1996	50082 + DOY	2011	55561 + DOY
1997	50448 + DOY	2012	55926 + DOY
1998	50813 + DOY	2013	56292 + DOY
1999	51178 + DOY	2014	56657 + DOY
2000	51543 + DOY	2015	57022 + DOY
2001	51908 + DOY	2016	57387 + DOY
2002	52274 + DOY	2017	57753 + DOY
2003	52639 + DOY	2018	58118 + DOY
2004	53004 + DOY	2019	58483 + DOY
2005	53370 + DOY	2020	58848 + DOY