**Spatial Reference Model (SRM)**

**Accuracy Assessment Procedure**

RELEASE / REVISION DATE:

**V1.0b/ 27 June 2008**

ABSTRACT:

This procedure describes the steps to be taken in assessing the SRM accuracy performance in a consistent way by establishing an assessment method based on a fixed set of Gold Data supplied by NGA and pre-established runtime routines. This document is intended for users who are to independently assess the SRM accuracy in their particular computing environment and capture the results of the assessment in the results section of this document.

Authors

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Revision History

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| --- | --- | --- |
| **Version** | **Date** | **Description of Update** |
| v0.1 | May 28, 2008 | Initial draft for review. |
| v1.0 | June 27, 2008 | Initial release |

# **1 SRM Accuracy Assessment**

## 1.1 Test Item:

The software under test is the SRM C/C++ SDK version 4.3. Only the C++ implementation is currently included in the assessment procedure described in this document. The C and Java implementations of the SRM may be included in the future.

## 1.2 Description:

The assessment procedure described in this document is for the collection of accuracy metrics related to the execution of the SRM coordinate conversion and transformation operations applied to a select set of coordinates in various spatial reference frames (SRF) supported by the SRM. These SRFs include, but are not limited to, Celestiocentric, Celestiodetic (commonly known as geocentric and geodetic, respectively), and Transverse Mercator. The select set of test coordinates is organized as separate data files, each containing the specification of the reference frame for the associated coordinates. The select set of data is available from the National Geospatial-Intelligence Agency (NGA) as the “gold” coordinate conversion data. The package name containing these test data files is “GoldData\_v6.1”. For more information on obtaining the NGA “gold” data, please contact Mr. Craig Rollins whose contact information is included in the “Contributors” listed above. A general description of the gold data is in Appendix A.

This assessment is divided into three test categories based on the *NGA gold data*:

* Coordinate conversions between the Celestiodetic SRF and map projection SRFs. The map projection SRFs include Mercator, Transverse Mercator, Lambert Conformal Conic, and Polar Stereographic
* Coordinate conversions between the Celestiodetic SRF and global 3D SRFs
* Coordinate transformations between a Celestiodetic SRF using the WGS 1984 Object Reference Models (ORM) and Celestiodetic SRFs using a number of different ORMs. These are also known as *datum transformations* from the WGS84 datum to various locally defined datums.

Note: The gold data available from NGA supports both the single standard parallel (LCC-1) and the double standard parallel (LCC-2) varieties of the Lambert Conformal Conic map projection. The test data includes test vectors for both. The SRM supports only one of these forms, the LCC-2. Therefore, there are nine data files, related to the LCC SRF under the map projection category, which need to be modified to provide the equivalent SRM LCC parameter set. There is also an error in the line ordering in the NGA\_3parDT/Set\_A/Local\_geodetic\_201.csv file. The changes to those files are captured in Appendix E.

The accuracy assessment application (herein called the *Test Driver*) invokes the SRM changeCoordinateSRF operation on the coordinate in all the three categories of conversions described above. All coordinate conversion tests are bi-directional, i.e., test data provided in SRF A is converted to SRF B (and the results are compared to the expected gold data values for SRF B), and test data provided in SRF B is converted to SRF A (and the results are compared to the expected gold data values for SRF A). Once the computed coordinates are compared with the gold data, a difference value is computed for each individual test vector. Only those reference frames that are supported by the SRM (and within those only those coordinates that fall within the acceptable domain and range of the given SRF) are included in the test. SRM defines the concept of valid regions for the coordinates, and only coordinates within the valid region can be used in a coordinate operation. For example, in a Celestiodetic SRF, only coordinates whose longitude component value is within the range of (-π, π], and latitude component value is within the range of (-π/2, π/2), and ellipsoidal height component value is greater than the minus semi-minor axis are considered valid.

All tests use the accuracy domain of the SRM default profile (see ISO/IEC 18026 Spatial Reference Model specification for more details). The difference computation is the Euclidean distance between the computed position and the expected position via the gold data (see Appendix F for additional details). Within each category, a coordinate test operation involves a pair of .csv files, where one .csv file serves as the set of input test coordinates and the other serves as the expected set of output values for the corresponding input test coordinates. For each test set, the following statistics are computed on the resulting differences:

* 1. Number of (input) coordinates used in the test.
  2. Minimum.
  3. Maximum.

Any coordinate that does not fall within the valid region is excluded from the conversion computation, and from the statistics; hence the number of coordinates accounts for a subset of the input coordinates, excluding those that are not in the valid range or fall outside the accuracy domain.

## 1.3 Software Information:

The software under test is SRM C++ SDK version 4.3. The Test Driver invokes the necessary SRM initialization and execution of operations for the SRM C++. It also computes and collects the coordinate conversion accuracy metrics.

## 1.4 Test Driver/Environment Information:

The Test Driver invokes the SRM C++ changeCoordinateSRF method to carry out the coordinate test operations according to the test configuration file test\_accuracy\_config\_all.csv. This configuration file specifies the path as well as the source and target files for the coordinate operations. The content of the configuration file is in Appendix B.

The output of the accuracy assessment is also stored as a .csv file whose name is specified in the Test Driver argument list. The Test Driver software was written in C++ and supports both WIN32 and Linux platforms, and can be built using the native SRM C/C++ SDK build environment with minimal setup. See the SRM C/C++ SDK documentation for instructions on how to compile and build an SRM application with the SRM API.

## 1.5 Test Runtime Environment:

Any WIN32 or Linux computing platform supported by the SRM C/C++ SDK can be used to run the SRM performance test. The platform characteristics should be recorded and kept with the test results. As a minimum, the following platform characteristics should be captured:

**CPU**. (Example: 2.4 GHz Xeon / 533 Processor)

**RAM.** (Example: 1.5 Gb DDR at 266 MHz)

**Operating System.** (Example:Linux RedHat 8.0)

**Compiler.** (Example: GCC v3.2.2)

## 1.6 Initial Conditions:

It is recommended that all other applications running on the platform be terminated, prior to running the SRM tests for the purposes of efficiency. This includes any background applications that may be part of the operating system functions that may preempt the CPU and force the Test Driver application to wait while the CPU responds to a different program.

## 1.7 Accuracy Assessment

### 1.7.1 Description

For the accuracy assessment, the Test Driver invokes the SRM changeCoordinateSRF operation according to the input accuracy configuration file. Upon completion of the accuracy assessment execution, two output .csv files are created:

1. srm\_conv\_accuracy\_results.csv - containing the results of coordinate conversion associated with the map projection (map\_proj directory)) and global 3D (global\_3D directory) gold data.
2. srm\_datum\_accuracy\_results.csv – containing the results of coordinate conversion associated with the datum (NGA\_3parDT) gold data.

Example output .csv files are in Appendix C and D.

### 1.7.2 Test Procedure

This test procedure assumes that srm\_accuracy (Test Driver) executable is built from the srm\_accuracy.cpp source code and statically linked to the SRM C++ 4.3 library. The SRM C/C++ SDK 4.3 documentation can be consulted on how to build an executable using SRM. The input configuration file and the top directory of the gold data package should be in the same directory where the Test Driver executable is run.

|  |  |  |
| --- | --- | --- |
| **No.** | **Step Description** | **Expected Result** |
| 1 | Make changes to the following files under GoldData\_v6.1 according to Appendix E:  map\_proj/Sphere/LCC\_60a.csv  map\_proj/Sphere/LCC\_61.csv  map\_proj/Sphere/LCC\_67.csv  map\_proj/SRMmax/LCC\_37a.csv  map\_proj/SRMmax/LCC\_38.csv  map\_proj/SRMmax/LCC\_44.csv  map\_proj/WGS84/LCC\_14a.csv  map\_proj/WGS84/LCC\_15.csv  map\_proj/WGS84/LCC\_21.csv  NGA\_3parDT/Set\_A/  Local\_geodetic\_201.csv  Note: The gold data files are in MS-DOS text file format with <CR> at the end of each line. Those must be removed prior to use the files in a Unix system. | The LCC SRF parameter set in the gold data is compatible with the SRM specification and the row ordering in Local\_geodetic\_201.csv is fixed. |
| 2 | Run the srm\_accuracy executable with the following command line arguments:  srm\_accuracy test\_accuracy\_config\_all.csv  This configuration file assumes the root of the gold data tree (GoldData\_v6.1) to be in the same directory where the test driver resides.  Note: Users can also use a third command line argument “t” to turn on the verbose mode for the output file. In that mode, each conversion result is listed with its corresponding gold data. | Two messages will appear on the display indicating the beginning and the end of the test as follows:  “Running SRM accuracy test...” and  “Completed accuracy test!”  The result of the test will be saved in srm\_conv\_accuracy\_results.csv and srm\_datum\_accuracy\_results.csv. |

Note: The content of the output file (.csv) can be viewed in Excel.

### 1.7.3 Actual Accuracy Results

This section is intended for recording the relevant information associated with a particular accuracy assessment experiment including the actual results from that assessment.

#### **Person who performed the assessment:**

* Name:
* Affiliation:
* Phone #:
* E-mail:

#### **Accuracy Assessment Execution Information:**

* Date (mm/dd/yyyy):
* Time Started (hh:mm):
* Time Completed (hh:mm):

#### **Accuracy Assessment computation environment:**

* CPU:
* RAM:
* Operating System:
* Compiler:

#### **Accuracy Assessment Results:**

< Insert here the accuracy results from the output srm\_conv\_accuracy\_results.csv and srm\_datum\_accuracy\_results.csv files or references to them >

#### **Notes and/or Conclusions:**

**Appendix A**

NGA’s gold data package (GoldData\_v6.1) file organization structure is as follows:

GOLDDATA\_V6.1

| Instructions.rtf

| Release\_Notes.rtf

|

+---global\_3D

| | global\_3D\_index.xls

| |

| +---SRMmax

| | ellipsoidal\_110.csv

| | geodetic\_106.csv

| | geodetic\_Lat\_first\_107.c

| | rectangular\_108.csv

| | spherical\_109.csv

| |

| \---WGS84

| ellipsoidal\_105.csv

| geodetic\_101.csv

| geodetic\_Lat\_first\_102.c

| rectangular\_103.csv

| spherical\_104.csv

|

+---map\_proj

| | map\_proj\_index.xls

| | Show\_Lon\_Lat\_points.pdf

| |

| +---Sphere

| | Lat\_Lon.csv

| | LCC\_60.csv

| | LCC\_60a.csv

| | LCC\_61.csv

| | LCC\_62.csv

| | LCC\_62a.csv

| | LCC\_63.csv

| | LCC\_64.csv

| | LCC\_65.csv

| | LCC\_66.csv

| | LCC\_67.csv

| | LCC\_68.csv

| | LCC\_69.csv

| | Lon\_Lat.csv

| | Mercator\_51.csv

| | Mercator\_51a.csv

| | Mercator\_52.csv

| | Mercator\_53.csv

| | Mercator\_54.csv

| | Mercator\_54a.csv

| | Mercator\_54b.csv

| | Ney\_70.csv

| | Ney\_71.csv

| | PolarStereo\_55.csv

| | PolarStereo\_55a.csv

| | PolarStereo\_55b.csv

| | PolarStereo\_56.csv

| | PolarStereo\_57.csv

| | PolarStereo\_57a.csv

| | PolarStereo\_57b.csv

| | PolarStereo\_58.csv

| | PolarStereo\_58a.csv

| | PolarStereo\_59.csv

| | PolarStereo\_59a.csv

| | TransMerc\_72.csv

| | TransMerc\_72a.csv

| | TransMerc\_73.csv

| |

| +---SRMmax

| | Lat\_Lon.csv

| | LCC\_37.csv

| | LCC\_37a.csv

| | LCC\_38.csv

| | LCC\_39.csv

| | LCC\_39a.csv

| | LCC\_40.csv

| | LCC\_41.csv

| | LCC\_42.csv

| | LCC\_43.csv

| | LCC\_44.csv

| | LCC\_45.csv

| | LCC\_46.csv

| | Lon\_Lat.csv

| | Mercator\_28.csv

| | Mercator\_28a.csv

| | Mercator\_29.csv

| | Mercator\_30.csv

| | Mercator\_31.csv

| | Mercator\_31a.csv

| | Mercator\_31b.csv

| | Ney\_47.csv

| | Ney\_48.csv

| | PolarStereo\_32.csv

| | PolarStereo\_32a.csv

| | PolarStereo\_32b.csv

| | PolarStereo\_33.csv

| | PolarStereo\_34.csv

| | PolarStereo\_34a.csv

| | PolarStereo\_34b.csv

| | PolarStereo\_35.csv

| | PolarStereo\_35a.csv

| | PolarStereo\_36.csv

| | PolarStereo\_36a.csv

| | TransMerc\_49.csv

| | TransMerc\_49a.csv

| | TransMerc\_50.csv

| |

| \---WGS84

| Lat\_Lon.csv

| LCC\_14.csv

| LCC\_14a.csv

| LCC\_15.csv

| LCC\_16.csv

| LCC\_16a.csv

| LCC\_17.csv

| LCC\_18.csv

| LCC\_19.csv

| LCC\_20.csv

| LCC\_21.csv

| LCC\_22.csv

| LCC\_23.csv

| Lon\_Lat.csv

| Mercator\_5.csv

| Mercator\_5a.csv

| Mercator\_6.csv

| Mercator\_7.csv

| Mercator\_8.csv

| Mercator\_8a.csv

| Mercator\_8b.csv

| Ney\_24.csv

| Ney\_25.csv

| PolarStereo\_09.csv

| PolarStereo\_09a.csv

| PolarStereo\_09b.csv

| PolarStereo\_10.csv

| PolarStereo\_11.csv

| PolarStereo\_11a.csv

| PolarStereo\_11b.csv

| PolarStereo\_12.csv

| PolarStereo\_12a.csv

| PolarStereo\_13.csv

| PolarStereo\_13a.csv

| TransMerc\_26.csv

| TransMerc\_26a.csv

| TransMerc\_27.csv

|

\---NGA\_3parDT

| NGA\_3parDT\_index.xls

|

+---Set\_A

| Local\_geodetic\_201.csv

| WGS84\_geodetic\_202.csv

|

\---Set\_B

Local\_geodetic\_203.csv

WGS84\_geodetic\_204.csv

The gold data provides a set of comma separated value (csv) files, where each file specifies a coordinate reference frame along with the necessary parameters, and a set of coordinates within that reference frame. The gold data includes three broad categories of coordinate test data:

1. Map projection coordinate test data. (map\_proj branch)
2. Three-dimensional coordinate test data. (global\_3d branch)
3. Geodetic coordinate test data for various Earth model datums (NGA\_3parDT branch)

For map projection and global 3D branches, each of their sub-branches group data files containing the coordinate values for a same set of coordinates in different spatial reference frames using the same datum. There are 300 coordinate values for the map projection case and 600 coordinate values for the global 3D case. For instance, in the map\_proj/WGS84 branch, the lon\_lat.csv file contains 300 locations specified as geodetic coordinates, while the TransMerc\_27.csv contains the same 300 locations as coordinates in a Transverse Mercator (map projection) reference frame. Both reference frames use the WGS 1984 Earth model datum.

For the NGA\_3parDT branch, there are two sub-branches including two files with 5000 geodetic coordinates each, with one file having all the geodetic coordinates based on the WGS 1984 and the other file containing the same 5000 locations in space, but associated with a geodetic reference frame using various Earth model datums other than WGS 1984.

The gold data also includes documentation describing an overview of its content.

**APPENDIX B**

The content of the test\_accuracy­\_config\_all.csv file is as follows:

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_14.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_14a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_15.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_16.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_16a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_17.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_18.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_19.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_20.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_21.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_22.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,LCC\_23.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Mercator\_5.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Mercator\_5a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Mercator\_6.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Mercator\_7.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Mercator\_8.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Mercator\_8a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Mercator\_8b.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Ney\_24.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,Ney\_25.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_09.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_09a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_09b.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_10.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_11.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_11a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_11b.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_12.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_12a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_13.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,PolarStereo\_13a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,TransMerc\_26.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,TransMerc\_26a.csv

GoldData\_v6.1/map\_proj/WGS84/,Lon\_Lat.csv,TransMerc\_27.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_37.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_37a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_38.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_39.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_39a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_40.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_41.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_42.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_43.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_44.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_45.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,LCC\_46.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Mercator\_28.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Mercator\_28a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Mercator\_29.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Mercator\_30.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Mercator\_31.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Mercator\_31a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Mercator\_31b.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Ney\_48.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,Ney\_47.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_32.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_32a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_32b.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_33.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_34.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_34a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_34b.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_35.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_35a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_36.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,PolarStereo\_36a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,TransMerc\_49.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,TransMerc\_49a.csv

GoldData\_v6.1/map\_proj/SRMmax/,Lon\_Lat.csv,TransMerc\_50.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_60.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_60a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_61.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_62.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_62a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_63.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_64.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_65.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_66.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_67.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_68.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,LCC\_69.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Mercator\_51.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Mercator\_51a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Mercator\_52.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Mercator\_53.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Mercator\_54.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Mercator\_54a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Mercator\_54b.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Ney\_71.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,Ney\_70.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_55.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_55a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_55b.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_56.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_57.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_57a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_57b.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_58.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_58a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_59.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,PolarStereo\_59a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,TransMerc\_72.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,TransMerc\_72a.csv

GoldData\_v6.1/map\_proj/Sphere/,Lon\_Lat.csv,TransMerc\_73.csv

GoldData\_v6.1/global\_3D/WGS84/,geodetic\_101.csv,rectangular\_103.csv

GoldData\_v6.1/global\_3D/WGS84/,geodetic\_101.csv,spherical\_104.csv

GoldData\_v6.1/global\_3D/WGS84/,geodetic\_101.csv,ellipsoidal\_105.csv

GoldData\_v6.1/global\_3D/SRMmax/,geodetic\_106.csv,rectangular\_108.csv

GoldData\_v6.1/global\_3D/SRMmax/,geodetic\_106.csv,spherical\_109.csv

GoldData\_v6.1/global\_3D/SRMmax/,geodetic\_106.csv,ellipsoidal\_110.csv

GoldData\_v6.1/NGA\_3parDT/Set\_A/,Local\_geodetic\_201.csv,WGS84\_geodetic\_202.csv

GoldData\_v6.1/NGA\_3parDT/Set\_B/,WGS84\_geodetic\_204.csv,Local\_geodetic\_203.csv

**Appendix C**

**A sample** accuracy assessment output srm\_conv\_accuracy\_results.csv file is as follows:

Note: These files can be viewed in MS Excel in a tabular form. You may cut and paste the following into an ASCII test file with extension “.csv”, and from there, load into Excel.

Coordinate conversion accuracy assessment for SRM C++ 4.3

(The results are given as the Euclidean distance (in meters) between the computed coordinate and the gold data)

Test conducted: Wed Jun 25 09:58:35 2008

ORM/RT, Conversion, Count, MIN (m), MAX (m)

WGE, Lon\_Lat.csv to LCC\_14.csv, 300, 4.3930397983904e-008, 1.03190621959572e-005

WGE, LCC\_14.csv to Lon\_Lat.csv, 300, 3.49560439936265e-008, 1.24937044102701e-005

WGE, Lon\_Lat.csv to LCC\_14a.csv, 300, 4.65661287307739e-008, 0.0485254914475023

WGE, LCC\_14a.csv to Lon\_Lat.csv, 300, 1.00069251178863e-006, 0.00898214764877519

WGE, Lon\_Lat.csv to LCC\_15.csv, 300, 7.30355248611219e-005, 0.00664613155240192

WGE, LCC\_15.csv to Lon\_Lat.csv, 300, 1.0284373776686e-005, 0.00945956664182126

WGE, Lon\_Lat.csv to LCC\_16.csv, 300, 3.5255203453354e-008, 2.45155000351608e-005

WGE, LCC\_16.csv to Lon\_Lat.csv, 300, 0, 1.25115230455474e-005

WGE, Lon\_Lat.csv to LCC\_16a.csv, 300, 2.20636981362144e-008, 2.45654229393535e-005

WGE, LCC\_16a.csv to Lon\_Lat.csv, 300, 5.32964690989503e-008, 1.25542277928617e-005

WGE, Lon\_Lat.csv to LCC\_17.csv, 300, 8.33000234328132e-009, 2.8117780703377e-006

WGE, LCC\_17.csv to Lon\_Lat.csv, 300, 1.41623091030368e-009, 1.21358793240946e-005

WGE, Lon\_Lat.csv to LCC\_18.csv, 300, 5.66903088064723e-005, 0.0107708494103355

WGE, LCC\_18.csv to Lon\_Lat.csv, 300, 4.74007611481407e-006, 0.000216296817328449

WGE, Lon\_Lat.csv to LCC\_19.csv, 300, 4.50551360010351e-008, 2.88336157733516e-006

WGE, LCC\_19.csv to Lon\_Lat.csv, 300, 2.84195548410481e-009, 1.29002225001415e-005

WGE, Lon\_Lat.csv to LCC\_20.csv, 300, 1.32644007987903e-007, 0.000310699666542567

WGE, LCC\_20.csv to Lon\_Lat.csv, 300, 1.55785400133405e-008, 1.19909643732123e-005

WGE, Lon\_Lat.csv to LCC\_21.csv, 300, 2.27839541853074e-006, 0.059845581565247

WGE, LCC\_21.csv to Lon\_Lat.csv, 300, 2.35574989449233e-006, 0.00250128106958158

WGE, Lon\_Lat.csv to LCC\_22.csv, 300, 0.00712329229267342, 0.0220999677618538

WGE, LCC\_22.csv to Lon\_Lat.csv, 300, 1.27764408034037e-007, 0.000217996382087533

WGE, Lon\_Lat.csv to LCC\_23.csv, Exception: Incompatible SRF Parameter Set

WGE, LCC\_23.csv to Lon\_Lat.csv, Exception: Incompatible SRF Parameter Set

WGE, Lon\_Lat.csv to Mercator\_5.csv, 300, 5.68944960832596e-006, 0.000889730736278927

WGE, Mercator\_5.csv to Lon\_Lat.csv, 300, 0, 1.21723992758586e-005

WGE, Lon\_Lat.csv to Mercator\_5a.csv, 300, 5.68851828575134e-006, 0.000889733529813024

WGE, Mercator\_5a.csv to Lon\_Lat.csv, 300, 0, 1.21723537268119e-005

WGE, Lon\_Lat.csv to Mercator\_6.csv, 300, 4.34182584285736e-006, 0.000771385180608366

WGE, Mercator\_6.csv to Lon\_Lat.csv, 300, 0, 1.20150911592185e-005

WGE, Lon\_Lat.csv to Mercator\_7.csv, 300, 4.08198684453964e-006, 0.000623211456412458

WGE, Mercator\_7.csv to Lon\_Lat.csv, 300, 0, 1.23205701746336e-005

WGE, Lon\_Lat.csv to Mercator\_8.csv, 300, 5.68974261141936e-006, 0.000889730764801951

WGE, Mercator\_8.csv to Lon\_Lat.csv, 300, 0, 1.21742965875402e-005

WGE, Lon\_Lat.csv to Mercator\_8a.csv, 300, 4.34238765651804e-006, 0.000771385164711863

WGE, Mercator\_8a.csv to Lon\_Lat.csv, 300, 0, 1.20137961906253e-005

WGE, Lon\_Lat.csv to Mercator\_8b.csv, 300, 4.34425006078347e-006, 0.000771384699220933

WGE, Mercator\_8b.csv to Lon\_Lat.csv, 300, 0, 1.20124065799497e-005

WGE, Lon\_Lat.csv to Ney\_24.csv, Ney SRF not supported

WGE, Ney\_24.csv to Lon\_Lat.csv, Ney SRF not supported

WGE, Lon\_Lat.csv to Ney\_25.csv, Ney SRF not supported

WGE, Ney\_25.csv to Lon\_Lat.csv, Ney SRF not supported

WGE, Lon\_Lat.csv to PolarStereo\_09.csv, 252, 3.08487919021495e-006, 0.000593962147831917

WGE, PolarStereo\_09.csv to Lon\_Lat.csv, 222, 5.68354450217515e-009, 1.25207627983441e-005

WGE, Lon\_Lat.csv to PolarStereo\_09a.csv, 252, 3.08487919021495e-006, 0.000593962147831917

WGE, PolarStereo\_09a.csv to Lon\_Lat.csv, 222, 5.68354450217515e-009, 1.25207627983441e-005

WGE, Lon\_Lat.csv to PolarStereo\_09b.csv, 252, 1.71464986118016e-006, 0.00041587371379137

WGE, PolarStereo\_09b.csv to Lon\_Lat.csv, 207, 5.68354450217515e-009, 1.25735358362838e-005

WGE, Lon\_Lat.csv to PolarStereo\_10.csv, 252, 2.61761368897605e-006, 0.000554230064153671

WGE, PolarStereo\_10.csv to Lon\_Lat.csv, 218, 2.04491907860038e-008, 1.26319046745504e-005

WGE, Lon\_Lat.csv to PolarStereo\_11.csv, 252, 3.13126695236495e-006, 0.000593868950151787

WGE, PolarStereo\_11.csv to Lon\_Lat.csv, 222, 5.68354450217515e-009, 1.24838314071052e-005

WGE, Lon\_Lat.csv to PolarStereo\_11a.csv, 252, 2.58684616047907e-006, 0.000554373021150332

WGE, PolarStereo\_11a.csv to Lon\_Lat.csv, 217, 4.54410718675068e-008, 1.23673291029248e-005

WGE, Lon\_Lat.csv to PolarStereo\_11b.csv, 252, 2.5867974057413e-006, 0.000554373976036101

WGE, PolarStereo\_11b.csv to Lon\_Lat.csv, 217, 4.40210383716472e-008, 1.23673291029248e-005

WGE, Lon\_Lat.csv to PolarStereo\_12.csv, 252, 3.11050621885369e-006, 0.000594038516283035

WGE, PolarStereo\_12.csv to Lon\_Lat.csv, 222, 5.68354450217515e-009, 1.25207627983441e-005

WGE, Lon\_Lat.csv to PolarStereo\_12a.csv, 252, 2.64176203624273e-006, 0.000554300844669342

WGE, PolarStereo\_12a.csv to Lon\_Lat.csv, 218, 2.04583993721597e-008, 1.26347197608437e-005

WGE, Lon\_Lat.csv to PolarStereo\_13.csv, 111, 1.98936964798464e-005, 0.000593829203242181

WGE, PolarStereo\_13.csv to Lon\_Lat.csv, 81, 5.68354450217515e-009, 1.15713440730081e-005

WGE, Lon\_Lat.csv to PolarStereo\_13a.csv, 111, 1.84684928866687e-005, 0.000554335498995751

WGE, PolarStereo\_13a.csv to Lon\_Lat.csv, 76, 4.90488615570422e-008, 1.17314952284449e-005

WGE, Lon\_Lat.csv to TransMerc\_26.csv, 66, 2.84006076064948e-010, 0.000267375347903085

WGE, TransMerc\_26.csv to Lon\_Lat.csv, 66, 2.85436789319599e-010, 0.000190458064180728

WGE, Lon\_Lat.csv to TransMerc\_26a.csv, 66, 1.532267380387e-007, 0.000267375622558535

WGE, TransMerc\_26a.csv to Lon\_Lat.csv, 64, 3.83140637555062e-007, 0.000190073497145352

WGE, Lon\_Lat.csv to TransMerc\_27.csv, 71, 1.00675970315933e-006, 0.000438463757746003

WGE, TransMerc\_27.csv to Lon\_Lat.csv, 71, 8.00174958423453e-008, 0.000180355782610913

Test\_SRMmax, Lon\_Lat.csv to LCC\_37.csv, 300, 3.9731051925366e-008, 9.85375831954678e-006

Test\_SRMmax, LCC\_37.csv to Lon\_Lat.csv, 300, 2.31663510935513e-008, 0.000381471110865589

Test\_SRMmax, Lon\_Lat.csv to LCC\_37a.csv, 300, 4.65661287307739e-008, 0.0401512034695211

Test\_SRMmax, LCC\_37a.csv to Lon\_Lat.csv, 300, 9.41325314645159e-007, 0.00965499422757313

Test\_SRMmax, Lon\_Lat.csv to LCC\_38.csv, 300, 2.52956713766325e-006, 0.00662580777350205

Test\_SRMmax, LCC\_38.csv to Lon\_Lat.csv, 300, 1.83949883577976e-006, 0.00854663467275184

Test\_SRMmax, Lon\_Lat.csv to LCC\_39.csv, 300, 3.17879918327108e-008, 2.54439596365702e-005

Test\_SRMmax, LCC\_39.csv to Lon\_Lat.csv, 300, 9.4423231718582e-012, 0.0003816018433031

Test\_SRMmax, Lon\_Lat.csv to LCC\_39a.csv, 300, 3.35793129677324e-009, 2.56787186768267e-005

Test\_SRMmax, LCC\_39a.csv to Lon\_Lat.csv, 300, 1.00907209044798e-007, 0.000381331955398546

Test\_SRMmax, Lon\_Lat.csv to LCC\_40.csv, 300, 6.97435633348266e-008, 2.70789465825182e-006

Test\_SRMmax, LCC\_40.csv to Lon\_Lat.csv, 300, 1.42108547093127e-009, 0.000381475497860136

Test\_SRMmax, Lon\_Lat.csv to LCC\_41.csv, 300, 0.000105477298273556, 0.0109390436232343

Test\_SRMmax, LCC\_41.csv to Lon\_Lat.csv, 300, 1.02447255963871e-007, 0.000419616733474439

Test\_SRMmax, Lon\_Lat.csv to LCC\_42.csv, 300, 6.29096378358862e-008, 2.95248282283958e-006

Test\_SRMmax, LCC\_42.csv to Lon\_Lat.csv, 300, 2.13162820639691e-008, 0.00038189483838088

Test\_SRMmax, Lon\_Lat.csv to LCC\_43.csv, 300, 9.56001602152622e-008, 0.000308814768255255

Test\_SRMmax, LCC\_43.csv to Lon\_Lat.csv, 300, 1.42202970324846e-008, 0.000381063030310385

Test\_SRMmax, Lon\_Lat.csv to LCC\_44.csv, 300, 1.1184171582029e-005, 0.0691533759061338

Test\_SRMmax, LCC\_44.csv to Lon\_Lat.csv, 300, 8.05559878559813e-006, 0.00312757018463405

Test\_SRMmax, Lon\_Lat.csv to LCC\_45.csv, 300, 0.00713659264489731, 0.0221745803747782

Test\_SRMmax, LCC\_45.csv to Lon\_Lat.csv, 300, 6.25379996108334e-007, 0.000477747507327764

Test\_SRMmax, Lon\_Lat.csv to LCC\_46.csv, Exception: Incompatible SRF Parameter Set

Test\_SRMmax, LCC\_46.csv to Lon\_Lat.csv, Exception: Incompatible SRF Parameter Set

Test\_SRMmax, Lon\_Lat.csv to Mercator\_28.csv, 300, 0.000211504413986261, 0.052903074771642

Test\_SRMmax, Mercator\_28.csv to Lon\_Lat.csv, 300, 0, 0.000380789435076393

Test\_SRMmax, Lon\_Lat.csv to Mercator\_28a.csv, 300, 0.000211503356695175, 0.0529030710463556

Test\_SRMmax, Mercator\_28a.csv to Lon\_Lat.csv, 300, 0, 0.000380789435076393

Test\_SRMmax, Lon\_Lat.csv to Mercator\_29.csv, 300, 0.000183473218475712, 0.0458918958926174

Test\_SRMmax, Mercator\_29.csv to Lon\_Lat.csv, 300, 0, 0.000381102261885513

Test\_SRMmax, Lon\_Lat.csv to Mercator\_30.csv, 300, 0.000148053089790383, 0.037032753229939

Test\_SRMmax, Mercator\_30.csv to Lon\_Lat.csv, 300, 0, 0.000381204179223797

Test\_SRMmax, Lon\_Lat.csv to Mercator\_31.csv, 300, 0.000211504413986261, 0.0529030747733655

Test\_SRMmax, Mercator\_31.csv to Lon\_Lat.csv, 300, 0, 0.000380789662435794

Test\_SRMmax, Lon\_Lat.csv to Mercator\_31a.csv, 300, 0.000183473218475712, 0.0458918958912901

Test\_SRMmax, Mercator\_31a.csv to Lon\_Lat.csv, 300, 0, 0.000381102062462656

Test\_SRMmax, Lon\_Lat.csv to Mercator\_31b.csv, 300, 0.000183474272489548, 0.0458918958912901

Test\_SRMmax, Mercator\_31b.csv to Lon\_Lat.csv, 300, 0, 0.000381100483145287

Test\_SRMmax, Lon\_Lat.csv to Ney\_48.csv, Ney SRF not supported

Test\_SRMmax, Ney\_48.csv to Lon\_Lat.csv, Ney SRF not supported

Test\_SRMmax, Lon\_Lat.csv to Ney\_47.csv, Ney SRF not supported

Test\_SRMmax, Ney\_47.csv to Lon\_Lat.csv, Ney SRF not supported

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_32.csv, 252, 0.000419197672253563, 0.0258558383211493

Test\_SRMmax, PolarStereo\_32.csv to Lon\_Lat.csv, 209, 4.69052628639038e-008, 0.00038151239272577

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_32a.csv, 252, 0.000419197672253563, 0.025855838728603

Test\_SRMmax, PolarStereo\_32a.csv to Lon\_Lat.csv, 209, 4.69052628639038e-008, 0.00038151239272577

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_32b.csv, 252, 0.000293187313380958, 0.0180987874045968

Test\_SRMmax, PolarStereo\_32b.csv to Lon\_Lat.csv, 224, 1.17067171846081e-007, 0.000381296508482604

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_33.csv, 252, 0.000391141453155978, 0.0241265594959259

Test\_SRMmax, PolarStereo\_33.csv to Lon\_Lat.csv, 215, 4.47280576117359e-008, 0.000381295038154911

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_34.csv, 252, 0.000419292107276018, 0.0258554814719444

Test\_SRMmax, PolarStereo\_34.csv to Lon\_Lat.csv, 212, 4.69052628639038e-008, 0.000381506752136568

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_34a.csv, 252, 0.000391192585067766, 0.0241268068875943

Test\_SRMmax, PolarStereo\_34a.csv to Lon\_Lat.csv, 211, 4.45187478651762e-008, 0.00038144001542608

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_34b.csv, 252, 0.000391192596210981, 0.0241268069471143

Test\_SRMmax, PolarStereo\_34b.csv to Lon\_Lat.csv, 211, 4.58726742220965e-008, 0.00038144001542608

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_35.csv, 252, 0.000419288998205169, 0.0258558737114072

Test\_SRMmax, PolarStereo\_35.csv to Lon\_Lat.csv, 209, 4.69052628639038e-008, 0.000381512393391594

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_35a.csv, 252, 0.000391224440113484, 0.0241265930235386

Test\_SRMmax, PolarStereo\_35a.csv to Lon\_Lat.csv, 215, 4.43198423644104e-008, 0.000381295038154911

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_36.csv, 111, 0.000419254768020084, 0.021778890388896

Test\_SRMmax, PolarStereo\_36.csv to Lon\_Lat.csv, 71, 4.69052628639038e-008, 0.000353769370532931

Test\_SRMmax, Lon\_Lat.csv to PolarStereo\_36a.csv, 111, 0.000391153251395546, 0.0203222285279267

Test\_SRMmax, PolarStereo\_36a.csv to Lon\_Lat.csv, 70, 4.54969341130958e-008, 0.000353837632266746

Test\_SRMmax, Lon\_Lat.csv to TransMerc\_49.csv, 66, 5.64884257905767e-010, 0.000637112185359001

Test\_SRMmax, TransMerc\_49.csv to Lon\_Lat.csv, 66, 5.70551786294043e-010, 0.00276694164617706

Test\_SRMmax, Lon\_Lat.csv to TransMerc\_49a.csv, 66, 4.30736690759659e-008, 0.000637069344520569

Test\_SRMmax, TransMerc\_49a.csv to Lon\_Lat.csv, 64, 4.06982792571014e-008, 0.00276698574508127

Test\_SRMmax, Lon\_Lat.csv to TransMerc\_50.csv, 71, 8.10250639915466e-006, 0.000636642772448865

Test\_SRMmax, TransMerc\_50.csv to Lon\_Lat.csv, 71, 6.1719543180262e-007, 0.00277182644903772

Test\_sphere, Lon\_Lat.csv to LCC\_60.csv, 300, 2.47714213974188e-008, 1.04297164783592e-005

Test\_sphere, LCC\_60.csv to Lon\_Lat.csv, 300, 0, 6.84213903986634e-007

Test\_sphere, Lon\_Lat.csv to LCC\_60a.csv, 300, 4.65661287307739e-008, 0.0455912039798063

Test\_sphere, LCC\_60a.csv to Lon\_Lat.csv, 300, 1.41357985842823e-009, 0.00865865116965006

Test\_sphere, Lon\_Lat.csv to LCC\_61.csv, 300, 3.19584421529403e-005, 0.0066746355576476

Test\_sphere, LCC\_61.csv to Lon\_Lat.csv, 300, 2.93170188787499e-005, 0.00935023718831485

Test\_sphere, Lon\_Lat.csv to LCC\_62.csv, 300, 2.35711561721142e-008, 2.41241377986281e-005

Test\_sphere, LCC\_62.csv to Lon\_Lat.csv, 300, 1.41357985842823e-009, 9.16641076056836e-007

Test\_sphere, Lon\_Lat.csv to LCC\_62a.csv, 300, 2.51628325015469e-008, 2.42184213798607e-005

Test\_sphere, LCC\_62a.csv to Lon\_Lat.csv, 300, 7.06789929214115e-010, 7.39740700580065e-007

Test\_sphere, Lon\_Lat.csv to LCC\_63.csv, 300, 2.60770320892334e-008, 2.53882291900524e-006

Test\_sphere, LCC\_63.csv to Lon\_Lat.csv, 300, 0, 8.8364600094405e-007

Test\_sphere, Lon\_Lat.csv to LCC\_64.csv, 300, 0.000321165392554622, 0.0110012488668346

Test\_sphere, LCC\_64.csv to Lon\_Lat.csv, 300, 4.96166530308309e-007, 0.000136901827149544

Test\_sphere, Lon\_Lat.csv to LCC\_65.csv, 300, 9.27288779165189e-008, 2.87775390524984e-006

Test\_sphere, LCC\_65.csv to Lon\_Lat.csv, 300, 2.20871852879411e-009, 2.88076451141454e-006

Test\_sphere, Lon\_Lat.csv to LCC\_66.csv, 300, 5.3443635759516e-008, 0.000310509664698685

Test\_sphere, LCC\_66.csv to Lon\_Lat.csv, 300, 3.7172148830415e-008, 1.21001499069945e-006

Test\_sphere, Lon\_Lat.csv to LCC\_67.csv, 300, 1.37261757534828e-006, 0.055352537611593

Test\_sphere, LCC\_67.csv to Lon\_Lat.csv, 300, 1.37117246267538e-006, 0.00232038561875955

Test\_sphere, Lon\_Lat.csv to LCC\_68.csv, 300, 0.0070968184314018, 0.022054825736481

Test\_sphere, LCC\_68.csv to Lon\_Lat.csv, 300, 8.36485881224905e-007, 0.000212723601285799

Test\_sphere, Lon\_Lat.csv to LCC\_69.csv, Exception: Incompatible SRF Parameter Set

Test\_sphere, LCC\_69.csv to Lon\_Lat.csv, Exception: Incompatible SRF Parameter Set

Test\_sphere, Lon\_Lat.csv to Mercator\_51.csv, 300, 1.11758708953857e-008, 1.43872312857315e-005

Test\_sphere, Mercator\_51.csv to Lon\_Lat.csv, 300, 0, 5.87943609408888e-007

Test\_sphere, Lon\_Lat.csv to Mercator\_51a.csv, 300, 1.49011611938477e-008, 1.43909339629506e-005

Test\_sphere, Mercator\_51a.csv to Lon\_Lat.csv, 300, 0, 5.85983399065315e-007

Test\_sphere, Lon\_Lat.csv to Mercator\_52.csv, 300, 3.25962901115417e-008, 1.31788587718062e-005

Test\_sphere, Mercator\_52.csv to Lon\_Lat.csv, 300, 0, 6.09661764990871e-007

Test\_sphere, Lon\_Lat.csv to Mercator\_53.csv, 300, 1.16415321826935e-008, 1.05776592700142e-005

Test\_sphere, Mercator\_53.csv to Lon\_Lat.csv, 300, 0, 8.09078039194165e-007

Test\_sphere, Lon\_Lat.csv to Mercator\_54.csv, 300, 1.13086388674259e-007, 1.4390175849312e-005

Test\_sphere, Mercator\_54.csv to Lon\_Lat.csv, 300, 0, 6.57044384932635e-007

Test\_sphere, Lon\_Lat.csv to Mercator\_54a.csv, 300, 9.79356854141494e-008, 1.31856813332219e-005

Test\_sphere, Mercator\_54a.csv to Lon\_Lat.csv, 300, 0, 7.80651082838086e-007

Test\_sphere, Lon\_Lat.csv to Mercator\_54b.csv, 300, 9.68575477600098e-008, 1.31893864875032e-005

Test\_sphere, Mercator\_54b.csv to Lon\_Lat.csv, 300, 0, 7.81616201196255e-007

Test\_sphere, Lon\_Lat.csv to Ney\_71.csv, Ney SRF not supported

Test\_sphere, Ney\_71.csv to Lon\_Lat.csv, Ney SRF not supported

Test\_sphere, Lon\_Lat.csv to Ney\_70.csv, Ney SRF not supported

Test\_sphere, Ney\_70.csv to Lon\_Lat.csv, Ney SRF not supported

Test\_sphere, Lon\_Lat.csv to PolarStereo\_55.csv, 252, 0, 1.53411140153789e-006

Test\_sphere, PolarStereo\_55.csv to Lon\_Lat.csv, 223, 1.41357985842823e-009, 5.90510148157952e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_55a.csv, 252, 0, 1.53367989199901e-006

Test\_sphere, PolarStereo\_55a.csv to Lon\_Lat.csv, 223, 1.41357985842823e-009, 5.89225158488262e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_55b.csv, 252, 1.62981450557709e-009, 1.12561974674463e-006

Test\_sphere, PolarStereo\_55b.csv to Lon\_Lat.csv, 230, 3.6753076319134e-008, 8.84277910477777e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_56.csv, 252, 5.58793544769287e-009, 1.54980807565153e-006

Test\_sphere, PolarStereo\_56.csv to Lon\_Lat.csv, 219, 6.71450432753409e-009, 6.87940544355078e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_57.csv, 252, 3.1237508787305e-009, 1.00760229313804e-006

Test\_sphere, PolarStereo\_57.csv to Lon\_Lat.csv, 226, 4.06168096074863e-008, 6.38352861399537e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_57a.csv, 252, 1.01863406598568e-008, 1.26955914886279e-006

Test\_sphere, PolarStereo\_57a.csv to Lon\_Lat.csv, 220, 3.72676320917817e-008, 6.87954355513313e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_57b.csv, 252, 1.02445483207703e-008, 1.26948286011266e-006

Test\_sphere, PolarStereo\_57b.csv to Lon\_Lat.csv, 220, 3.72676320917817e-008, 6.87761099580543e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_58.csv, 252, 9.31322574615479e-010, 1.53567273596216e-006

Test\_sphere, PolarStereo\_58.csv to Lon\_Lat.csv, 223, 1.41357985842823e-009, 5.9054188846257e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_58a.csv, 252, 9.31322574615479e-009, 1.55065208673477e-006

Test\_sphere, PolarStereo\_58a.csv to Lon\_Lat.csv, 219, 6.71450432753409e-009, 6.87719715705118e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_59.csv, 111, 1.74000993292158e-008, 9.57941667805879e-007

Test\_sphere, PolarStereo\_59.csv to Lon\_Lat.csv, 85, 4.06168096074863e-008, 5.57902464033805e-007

Test\_sphere, Lon\_Lat.csv to PolarStereo\_59a.csv, 111, 1.49011611938477e-008, 1.1116356136608e-006

Test\_sphere, PolarStereo\_59a.csv to Lon\_Lat.csv, 79, 5.5129614478701e-008, 6.89715155228241e-007

Test\_sphere, Lon\_Lat.csv to TransMerc\_72.csv, 66, 1.16218487640948e-007, 5.63410920975438e-007

Test\_sphere, TransMerc\_72.csv to Lon\_Lat.csv, 66, 1.41357985842823e-009, 8.72255499434866e-005

Test\_sphere, Lon\_Lat.csv to TransMerc\_72a.csv, 66, 3.1978802839534e-008, 5.9502908560011e-007

Test\_sphere, TransMerc\_72a.csv to Lon\_Lat.csv, 64, 1.41357985842823e-008, 8.72065624766737e-005

Test\_sphere, Lon\_Lat.csv to TransMerc\_73.csv, 71, 6.05035246763156e-008, 8.19529345476624e-007

Test\_sphere, TransMerc\_73.csv to Lon\_Lat.csv, 71, 1.0813885916976e-007, 0.000495939578571915

WGE, geodetic\_101.csv to rectangular\_103.csv, 465, 1.47773920917936e-007, 0.000101433130052283

WGE, rectangular\_103.csv to geodetic\_101.csv, 451, 0, 0.000878061633994873

WGE, geodetic\_101.csv to spherical\_104.csv, Spherical SRF not supported

WGE, spherical\_104.csv to geodetic\_101.csv, Spherical SRF not supported

WGE, geodetic\_101.csv to ellipsoidal\_105.csv, Ellipsoidal SRF not supported

WGE, ellipsoidal\_105.csv to geodetic\_101.csv, Ellipsoidal SRF not supported

Test\_SRMmax, geodetic\_106.csv to rectangular\_108.csv, 465, 1.19290585316948e-007, 0.00159103050874449

Test\_SRMmax, rectangular\_108.csv to geodetic\_106.csv, 449, 0, 0.0141402706503869

Test\_SRMmax, geodetic\_106.csv to spherical\_109.csv, Spherical SRF not supported

Test\_SRMmax, spherical\_109.csv to geodetic\_106.csv, Spherical SRF not supported

Test\_SRMmax, geodetic\_106.csv to ellipsoidal\_110.csv, Ellipsoidal SRF not supported

Test\_SRMmax, ellipsoidal\_110.csv to geodetic\_106.csv Ellipsoidal SRF not supported

**Appendix D**

**A sample** accuracy assessment output srm\_datum\_accuracy\_results.csv file is as follows:

Note: These files can be viewed in MS Excel in a tabular form. You may cut and paste the following into an ASCII test file with extension “.csv”, and from there, load into Excel.

Datum conversion accuracy assessment for SRM C++ 4.3

(The results are given as the Euclidean distance (in meters) between the computed coordinate and the gold data)

Test conducted: Wed Jun 25 09:58:35 2008

Src ORM, Tgt ORM, Count, MIN (m), MAX (m)

ADI-M, WGE, 63, 8.53482834778243e-005, 0.000684794025855462

ADI-A, WGE, 25, 0.000105869212791717, 0.000649439183311397

ADI-B, WGE, 63, 5.79789479334134e-005, 0.000723187539449374

ADI-C, WGE, 25, 0.000144617845158476, 0.00065220103845651

ADI-D, WGE, 25, 0.000137210658688357, 0.000688068315707844

ADI-E, WGE, 25, 0.000183871177698355, 0.000711967586058017

ADI-F, WGE, 25, 3.42482206188252e-005, 0.000759040794003536

AFG, WGE, 42, 0.0001142325238321, 0.000728725012330328

AIA, WGE, 4, 0.000240846327600401, 0.000513322113202536

AIN-A, WGE, 4, 0.000283328358896137, 0.000527836218703765

AIN-B, WGE, 63, 9.47155455725548e-005, 0.000700950150624384

AMA, WGE, 9, 0.000260401306694595, 0.000705106629580444

ANO, WGE, 9, 0.000258595970091232, 0.000727018283424189

ARF-M, WGE, 81, 5.21662214311581e-005, 0.000735907679517239

ARF-A, WGE, 25, 0.000180725408762206, 0.000681688885792637

ARF-B, WGE, 9, 0.000138407818754077, 0.000637434071935685

ARF-C, WGE, 15, 7.69353986064306e-005, 0.000617219724687299

ARF-D, WGE, 12, 0.00022559943899655, 0.000593523770849389

ARF-E, WGE, 25, 8.43136497076124e-005, 0.000699902268419647

ARF-F, WGE, 30, 9.76516137302036e-005, 0.000683657938905388

ARF-G, WGE, 25, 0.000140659470561947, 0.000579546042190806

ARF-H, WGE, 20, 0.000185895238732357, 0.0006996939804098

ARS-M, WGE, 25, 0.00017942249711705, 0.000594493436922239

ARS-A, WGE, 25, 5.56233327911203e-005, 0.000719710620029538

ARS-B, WGE, 25, 0.000136056355087104, 0.000668853371221885

ASC, WGE, 4, 8.92900495825326e-005, 0.000337895439549552

ASM, WGE, 4, 0.000377988567304506, 0.000548306646905164

ASQ, WGE, 4, 0.000329199624069217, 0.000603598321105801

ATF, WGE, 4, 0.00031105579523321, 0.0005238800106655

AUA, WGE, 81, 8.59962951137982e-005, 0.000706681689828524

AUG, WGE, 81, 0.000127008757798357, 0.000757049986180332

BAT, WGE, 91, 9.4655697253664e-005, 0.000756555964170997

BID, WGE, 25, 7.0559157517937e-005, 0.000714765408706571

BER, WGE, 4, 0.000376576423406989, 0.000669783068406664

BOO, WGE, 20, 0.000178135910296264, 0.000665623241206696

BUR, WGE, 9, 0.00021732097528125, 0.000679871762985266

CAC, WGE, 45, 2.67754004743137e-005, 0.000658795154315392

CAI, WGE, 35, 9.69147533823896e-005, 0.000637817210637768

CAO, WGE, 20, 0, 0.000770879448032731

CAP, WGE, 30, 0.000144853732590523, 0.000696965400999164

CAZ, WGE, 24, 6.82119524919458e-005, 0.00054050621568625

CCD, WGE, 15, 0.000112752027196039, 0.000525312431976338

CGE, WGE, 25, 0.000102039208557214, 0.000665825510585806

CHI, WGE, 9, 0, 0.000563186523306158

CHU, WGE, 25, 6.74800046661727e-005, 0.000677263254786291

COA, WGE, 63, 7.44910598612308e-005, 0.000732991229792425

DAL, WGE, 12, 0.000115375770033492, 0.000708499242717393

DID, WGE, 4, 8.57069841707881e-005, 0.000516083869771412

DOB, WGE, 4, 0.000328074213011248, 0.00054967412112793

EAS, WGE, 4, 6.1658932393854e-005, 0.000614668128967747

ENW, WGE, 12, 6.99725712992829e-005, 0.000661109887768964

EST, WGE, 12, 0.000112462589317352, 0.00052172391757494

EUR-M, WGE, 55, 5.42197010706884e-005, 0.000633676435368288

EUR-A, WGE, 117, 3.52089219684744e-005, 0.000616848925140719

EUR-B, WGE, 35, 6.66309928770263e-005, 0.000630598594636395

EUR-C, WGE, 25, 6.77822999458347e-005, 0.000539171752528883

EUR-D, WGE, 30, 0.000122530147658872, 0.000653757654053248

EUR-E, WGE, 4, 0.000189975034565023, 0.00044567862039257

EUR-F, WGE, 25, 0.000150740263820446, 0.000611450882261435

EUR-G, WGE, 9, 0.000114807800052287, 0.0005223903028465

EUR-H, WGE, 25, 0.000103883923063546, 0.000663375961323414

EUR-I, WGE, 9, 0.000390046529858001, 0.000658967322243146

EUR-J, WGE, 9, 0.000281182006581855, 0.000625254218974776

EUR-K, WGE, 12, 0.000114807800052287, 0.000574084816650084

EUR-L, WGE, 4, 0.000411842263743718, 0.000535084970076117

EUR-S, WGE, 35, 0.000143935504060055, 0.000709842095973375

EUR-T, WGE, 25, 7.63837021475411e-005, 0.000707446284671715

EUS, WGE, 77, 9.2590110802433e-005, 0.000650169483292201

FAH, WGE, 25, 0.000134851586593575, 0.000602928257647751

FLO, WGE, 4, 0.000222636519967007, 0.000608488676012927

FOT, WGE, 4, 0.000207017006836397, 0.00062778169571762

GAA, WGE, 6, 0.000244440246243386, 0.000586874660544884

GEO, WGE, 16, 0.000207049994361501, 0.00069242603548384

GIZ, WGE, 4, 0.000188270615356461, 0.000525620027695499

GRA, WGE, 4, 0.000328078341680464, 0.000553331258722857

GUA, WGE, 4, 0.000309858835438289, 0.000516364667294522

GSE, WGE, 16, 7.84338166711095e-005, 0.000699522669693586

HEN, WGE, 25, 0.00010916005984751, 0.000683209292520733

HER, WGE, 15, 6.80539514851931e-005, 0.00064190510655302

HIT, WGE, 45, 7.21508983237587e-005, 0.00069311423578083

HJO, WGE, 15, 0.000133523725677476, 0.000551707465428273

HKD, WGE, 6, 0.000264466557707718, 0.000619738847751661

HTN, WGE, 9, 0.000304386349391583, 0.000680665012546732

IBE, WGE, 4, 0.000366714096198744, 0.000565923304528146

IDN, WGE, 36, 3.91850924474543e-005, 0.000714458450408677

IND-B, WGE, 20, 0.000143135312182181, 0.000560521872291734

IND-I, WGE, 35, 0.000108820817725928, 0.000681125677210297

IND-P, WGE, 35, 6.93454391277418e-005, 0.000669581788459123

INF-A, WGE, 35, 0.0001697317724436, 0.00077569885024991

ING-A, WGE, 15, 0.000221211859399246, 0.000530753896422263

ING-B, WGE, 4, 0.000277285334978323, 0.000718957815063897

INH-A, WGE, 20, 5.15096818323262e-005, 0.000608820715330811

INH-A1, WGE, 20, 0.00017549953488816, 0.000683591053914874

IRL, WGE, 6, 0.000235651763708524, 0.000568136870425771

ISG, WGE, 4, 0.00036227295587067, 0.000508839209673342

IST, WGE, 9, 0.000325315464607068, 0.000696315676034577

JOH, WGE, 6, 0.000269909430072831, 0.000589799570308492

KAN, WGE, 9, 7.12686954521292e-005, 0.000567779245853865

KEG, WGE, 8, 0.000295978544710364, 0.000520013283366359

KEA, WGE, 12, 0.000126279050445553, 0.000585897866724519

KUS, WGE, 15, 0.000205681325070388, 0.000690931910792234

LCF, WGE, 4, 8.58932252219336e-005, 0.000448797632022427

LEH, WGE, 20, 0.000109726293106473, 0.000656149594431696

LIB, WGE, 20, 4.61446649850831e-005, 0.000762045327448522

LUZ-A, WGE, 15, 0.000133002635843841, 0.000604108662430422

LUZ-B, WGE, 9, 0.000190718996695532, 0.000745485696906126

MAS, WGE, 20, 0.000112542573254702, 0.000675912140375032

MER, WGE, 25, 8.3540890635297e-005, 0.000682626797599417

MID, WGE, 6, 0, 0.000650307563081876

MIK, WGE, 4, 0.000476970127100119, 0.000613457238808841

MIN-A, WGE, 25, 0.000101389117339056, 0.000665795329460025

MIN-B, WGE, 25, 2.44254978020457e-005, 0.000638669069547925

MOD, WGE, 9, 0.000149804631528258, 0.000597967467315108

MPO, WGE, 12, 0.000103575907578717, 0.000635425333791438

MVS, WGE, 4, 0.000288626520336691, 0.000600673674399154

NAH-A, WGE, 4, 0.000128228107559419, 0.000579838146594048

NAH-B, WGE, 20, 0.000109828012363525, 0.000640343994105618

NAH-C, WGE, 63, 8.00369650674565e-005, 0.00071807529816343

NAP, WGE, 4, 0.000266111801818283, 0.000607921340453797

NAR-A, WGE, 20, 6.67502941344795e-005, 0.000120284010836361

NAR-B, WGE, 24, 0, 0.000127343353986759

NAR-C, WGE, 16, 5.32010677409758e-005, 0.00012825680784736

NAR-D, WGE, 24, 3.93415212727902e-005, 0.000124997383346781

NAR-E, WGE, 50, 0, 0.00052581964558656

NAR-H, WGE, 9, 0.000334020565811857, 0.000689854702289375

NAS-A, WGE, 35, 6.61451474861816e-005, 0.000686012571068583

NAS-B, WGE, 30, 0.000112206220063253, 0.000668021703171208

NAS-C, WGE, 36, 0.000124980982091029, 0.000727298922643932

NAS-D, WGE, 30, 6.43456914666887e-005, 0.000627133653229253

NAS-E, WGE, 77, 0, 0.000630531611040718

NAS-F, WGE, 15, 0.000198292054223548, 0.000617098276759556

NAS-G, WGE, 36, 0.000134593563121927, 0.000581584579315322

NAS-H, WGE, 20, 0.000144639837697178, 0.000579728914082564

NAS-I, WGE, 45, 0, 0.000624494414880353

NAS-J, WGE, 35, 0.000126557562351739, 0.000559429494326987

NAS-L, WGE, 40, 0.000127537807232349, 0.000685611990465758

NAS-N, WGE, 12, 9.05691848279998e-005, 0.000591004739533963

NAS-O, WGE, 9, 0.000259839662933896, 0.000644606979992319

NAS-P, WGE, 20, 0.000337129399089866, 0.000727920517110186

NAS-Q, WGE, 9, 0.000163643117256663, 0.000516934838731615

NAS-R, WGE, 4, 0.000270228697132379, 0.000664970009663595

NAS-T, WGE, 12, 6.20520001789246e-005, 0.000603853651691739

NAS-U, WGE, 12, 8.90260924029626e-005, 0.000393514357603854

NAS-V, WGE, 15, 0, 0.00062675067797857

NAS-W, WGE, 9, 0.000233315661634821, 0.000470346269910331

NSD, WGE, 30, 0.000134315717212429, 0.00069905849450659

OEG, WGE, 9, 0.000279771056669436, 0.000538728281113187

OGB-M, WGE, 9, 0.000177604814537564, 0.000563709149968086

OGB-A, WGE, 9, 0.000129144936082018, 0.000627638082747919

OGB-B, WGE, 9, 0.000300983250997801, 0.000547247353363513

OGB-C, WGE, 20, 0.000123412348518123, 0.000554626493618185

OGB-D, WGE, 9, 8.78994084642965e-005, 0.000431692918821963

OHA-M, WGE, 9, 6.83472894459661e-005, 0.000614522365236718

OHA-A, WGE, 6, 0.000164591842735161, 0.000662896621078041

OHA-B, WGE, 6, 0.000290938774447988, 0.000539120807750705

OHA-C, WGE, 4, 0.000163699942569841, 0.00053606036700609

OHA-D, WGE, 6, 7.83774445901129e-005, 0.000534817705554968

OHI-M, WGE, 9, 0.000171255071836122, 0.000678554448779057

OHI-A, WGE, 4, 0.000312545019365143, 0.000614100927591543

OHI-B, WGE, 6, 0.000288507423161466, 0.000698356520793525

OHI-C, WGE, 4, 0.000269674071456813, 0.000556551255633037

OHI-D, WGE, 6, 9.78612973551707e-005, 0.000510194417524325

PHA, WGE, 12, 0.000171194156536228, 0.000615645464944824

PIT, WGE, 12, 0.000191572820131487, 0.000602009531026443

PLN, WGE, 6, 0.000159432161153684, 0.000404241806243186

POS, WGE, 6, 0.000204954312529092, 0.000592811368000116

PRP-A, WGE, 25, 3.31917813103432e-005, 0.000750550362650189

PRP-B, WGE, 45, 7.61975194215269e-005, 0.000591190390947721

PRP-C, WGE, 45, 9.89395841540135e-005, 0.000637930189543793

PRP-D, WGE, 25, 8.15757378890959e-005, 0.000589380579701663

PRP-E, WGE, 16, 1.17159321960095e-005, 0.000627704491591138

PRP-F, WGE, 20, 0.000149375954420164, 0.000677028589381577

PRP-G, WGE, 25, 0.000143662816878305, 0.000661253342905702

PRP-H, WGE, 30, 0.000130559439903926, 0.000740241470082162

PRP-M, WGE, 45, 8.67336442270797e-005, 0.000659618279290968

PTB, WGE, 27, 8.78778529501815e-005, 0.000723353087474574

PTN, WGE, 20, 0.000149565597013478, 0.000655769015795303

PUK, WGE, 198, 0, 0.000672987032521947

PUR, WGE, 9, 0.000160910271533671, 0.000613142699260259

QAT, WGE, 12, 0.000258428473739766, 0.000580052692960888

QUO, WGE, 55, 4.53377772133153e-005, 0.000570614575998048

REU, WGE, 16, 0.000196602568191421, 0.000661541346743695

SAE, WGE, 16, 0.000101970091738817, 0.000724147862744746

SAO, WGE, 4, 0.000423845012624591, 0.000567367777230621

SAP, WGE, 9, 0.000201900331501675, 0.000565909610496171

SAN-M, WGE, 56, 5.31032996813274e-005, 0.000610049854760225

SAN-A, WGE, 40, 8.52303368208182e-005, 0.000722471974946464

SAN-B, WGE, 25, 0.000156958720058627, 0.000673748985984799

SAN-C, WGE, 49, 6.74389098023793e-005, 0.000738898681256001

SAN-D, WGE, 45, 9.08598635465084e-005, 0.000579223596721974

SAN-E, WGE, 25, 0.000122724663694949, 0.000717904550483173

SAN-F, WGE, 16, 0.000192341673146258, 0.000758910761422151

SAN-G, WGE, 20, 0.000214308918025543, 0.000646551720665953

SAN-H, WGE, 25, 2.30828579616464e-005, 0.000696720258303137

SAN-I, WGE, 25, 0.000101872658540463, 0.000713821996808731

SAN-J, WGE, 4, 0.000183763671995888, 0.000359249964731092

SAN-K, WGE, 9, 7.24649226588947e-005, 0.000669202211776817

SAN-L, WGE, 30, 0.000136535666116711, 0.000618496722726913

SCK, WGE, 25, 4.30036768387167e-005, 0.000672387792948524

SGM, WGE, 4, 0.000204389644976599, 0.000655638437170408

SHB, WGE, 4, 8.9423303597071e-005, 0.000635978159898251

SOA, WGE, 4, 0.000390450100676176, 0.000711070967391275

SPK-A, WGE, 12, 0.000190164412904056, 0.000531749516412172

SPK-B, WGE, 15, 0.000159622194370156, 0.000615879810887703

SPK-C, WGE, 15, 0.000101123641051504, 0.000605984713608905

SPK-D, WGE, 9, 0.000220128225490506, 0.000545952838229192

SPK-E, WGE, 36, 9.18912928504347e-005, 0.000639629181480138

SPK-F, WGE, 9, 0.000271030728966145, 0.000557823007136946

SPK-G, WGE, 25, 0.000139538823273113, 0.000638995245836027

SRL, WGE, 16, 0.000308875720201864, 0.000661298059135942

TAN, WGE, 15, 0.000132827618040199, 0.000661268882682196

TDC, WGE, 4, 9.3635998825093e-005, 0.000439260202476475

TIL, WGE, 25, 3.6402149017962e-005, 0.000731081066192322

TOY-A, WGE, 25, 0.000109466481565474, 0.000658726557389585

TOY-B, WGE, 20, 0.000148624242166006, 0.000628135319134516

TOY-B1, WGE, 20, 0.000181812749294708, 0.000645409012504429

TOY-C, WGE, 16, 0.000122782286412368, 0.000598564371945449

TOY-M, WGE, 36, 0.000104128907413989, 0.000691335506201731

TRN, WGE, 4, 0.000161909321515689, 0.000566525078390033

VOI, WGE, 30, 8.39044503726128e-005, 0.000709918396706009

VOR, WGE, 30, 0.000109472794537291, 0.000722160157656264

WAK, WGE, 4, 3.26853296766212e-005, 0.000563702802824218

YAC, WGE, 16, 0.000181296060429717, 0.000650763644639936

ZAN, WGE, 30, 0.000165380413525537, 0.000747379210555281

KGS, WGE, 20, 4.66174643989729e-005, 8.26168791306086e-005

SIR, WGE, 44, 9.1953755086051e-005, 0.000114333681449093

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WGE, ADI-A, 25, 0.000105826051720114, 0.000711092023913069

WGE, ADI-B, 63, 5.85534741670301e-005, 0.000706958988458495

WGE, ADI-C, 25, 8.22310457153654e-005, 0.000734708128697017

WGE, ADI-D, 25, 9.01704020526385e-005, 0.000700143996713598

WGE, ADI-E, 25, 0.00011564408999156, 0.000632928667050799

WGE, ADI-F, 25, 7.56663716297398e-005, 0.000600316952236043

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WGE, AIN-A, 4, 0.000266182867358252, 0.000517546372747619

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WGE, ANO, 9, 0.000110556568502837, 0.000652733916682142

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WGE, ARF-A, 25, 6.21251407435602e-005, 0.000648614562634583

WGE, ARF-B, 9, 0.000122291259410345, 0.000597926579176583

WGE, ARF-C, 15, 8.9961672070103e-005, 0.000556041306064898

WGE, ARF-D, 12, 0.000255584600701361, 0.000695606459885719

WGE, ARF-E, 25, 0.0001273458944158, 0.00069227454876697

WGE, ARF-F, 30, 4.71418129370125e-005, 0.000752905043468362

WGE, ARF-G, 25, 3.64872553046599e-005, 0.000693106406779246

WGE, ARF-H, 20, 0.000168244880593048, 0.000681034878084499

WGE, ARS-M, 25, 0.000171140577987803, 0.000740576900921056

WGE, ARS-A, 25, 0.000130320620444184, 0.000696397384676737

WGE, ARS-B, 25, 6.37289148075525e-005, 0.000603670185454237

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WGE, ASM, 4, 0.000191545617324528, 0.000634148900663777

WGE, ASQ, 4, 0.000147849242932377, 0.000334220570769528

WGE, ATF, 4, 0.000166955010558082, 0.000562029166914748

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WGE, AUG, 81, 0.000111624481268522, 0.000722288785337555

WGE, BAT, 91, 1.25534742077505e-005, 0.000748390493603058

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WGE, BER, 4, 0.000455022350529137, 0.000709928723438896

WGE, BOO, 20, 1.50001447721498e-005, 0.000666934574942398

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WGE, CGE, 25, 0.000138567283873719, 0.000564637439195284

WGE, CHI, 9, 0, 0.000488244080249181

WGE, CHU, 25, 0.000108534817032212, 0.000663159718935262

WGE, COA, 63, 0.000122898794885279, 0.000745374159917439

WGE, DAL, 12, 0.000246115393512063, 0.000712976426441596

WGE, DID, 4, 0.00020196493816334, 0.000361751655259052

WGE, DOB, 4, 0.000275827340228929, 0.000497678945702926

WGE, EAS, 4, 0.000277446163794161, 0.000478607644149916

WGE, ENW, 12, 4.24221484958809e-005, 0.000635377865764015

WGE, EST, 12, 5.5855333086371e-005, 0.000512938405088807

WGE, EUR-M, 55, 0.000103088359059564, 0.000597149462265144

WGE, EUR-A, 117, 2.16792698931292e-005, 0.000678507047112365

WGE, EUR-B, 35, 9.24215145560949e-005, 0.000612672353187322

WGE, EUR-C, 25, 2.78748507612024e-005, 0.000582154701130386

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WGE, EUR-E, 4, 0.000137280578104091, 0.000577655234820449

WGE, EUR-F, 25, 9.96463047181043e-005, 0.000681436973649203

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WGE, EUR-J, 9, 0.00019474795760335, 0.000582943750871636

WGE, EUR-K, 12, 0.000114167628625721, 0.000625876937127291

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WGE, EUR-T, 25, 0.000132279637379923, 0.000571690446181355

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WGE, FLO, 4, 0.000230841956513549, 0.000558812686134708

WGE, FOT, 4, 0.000130032221294868, 0.000420966363767448

WGE, GAA, 6, 0.000391780231361683, 0.000753936548818515

WGE, GEO, 16, 0.000181930771436849, 0.000597006978253965

WGE, GIZ, 4, 0.000274198031665933, 0.0004864150850058

WGE, GRA, 4, 0.000277787061091642, 0.000607247681724222

WGE, GUA, 4, 0.000469713628093436, 0.000545688897534816

WGE, GSE, 16, 0.000156918509475043, 0.000693827517872539

WGE, HEN, 25, 9.11391989002346e-005, 0.000695645296890169

WGE, HER, 15, 0.000117343095395851, 0.000610071879017461

WGE, HIT, 45, 0.000108047927691436, 0.000645601627246572

WGE, HJO, 15, 0.00012370777012553, 0.000585839409764442

WGE, HKD, 6, 0.000207603925406865, 0.000601778665787044

WGE, HTN, 9, 6.23781429652211e-005, 0.000632417475707207

WGE, IBE, 4, 0.000289427846243524, 0.000386058156439769

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WGE, IND-I, 35, 8.8695557826701e-005, 0.000625052516006272

WGE, IND-P, 35, 0.000132220572911687, 0.000732770854448925

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WGE, ING-A, 15, 0.00017742130408237, 0.000622059016767433

WGE, ING-B, 4, 0.000379886108487295, 0.000588668320380416

WGE, INH-A, 20, 0.000126395552086782, 0.000621170627624374

WGE, INH-A1, 20, 8.20313135161744e-005, 0.000723068964141674

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WGE, ISG, 4, 0.000165010945698387, 0.000277419764439336

WGE, IST, 9, 3.03620821653337e-005, 0.000487067478911231

WGE, JOH, 6, 0.000138105876322978, 0.000499178185383416

WGE, KAN, 9, 0.000188022282573207, 0.00069701635617593

WGE, KEG, 8, 0.000224338062785103, 0.000582725251439755

WGE, KEA, 12, 0.000181219772859987, 0.000643556682428016

WGE, KUS, 15, 8.98244991484672e-005, 0.000740572888020788

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WGE, LIB, 20, 9.52317960046637e-005, 0.000659667007370989

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WGE, LUZ-B, 9, 0.000226053517123669, 0.00066134447002523

WGE, MAS, 20, 2.666661937566e-005, 0.000686423572850056

WGE, MER, 25, 0.000170776912843691, 0.000573763624910857

WGE, MID, 6, 0, 0.000702448671547613

WGE, MIK, 4, 0.000193272839367498, 0.000741757353212644

WGE, MIN-A, 25, 0.000146342563219062, 0.000603645119396991

WGE, MIN-B, 25, 7.96323129790759e-005, 0.000738809098718428

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WGE, MPO, 12, 0.000139235868692303, 0.000668044511753474

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WGE, NAH-A, 4, 0.000108241298988282, 0.000399401422172941

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WGE, NAR-C, 16, 5.2963320202207e-005, 0.000127771791208392

WGE, NAR-D, 24, 3.958520908771e-005, 0.000124847434901975

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WGE, NAS-F, 15, 5.90533498260414e-005, 0.000574807256064888

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WGE, NAS-H, 20, 6.63296317517787e-005, 0.000580136263008395

WGE, NAS-I, 45, 0, 0.000587168282065817

WGE, NAS-J, 35, 6.42153770257754e-005, 0.000593220084229828

WGE, NAS-L, 40, 0.000158021665965481, 0.000695065787425683

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WGE, NAS-Q, 9, 0.000258922309772644, 0.000568215973717351

WGE, NAS-R, 4, 0.000466723548087967, 0.000572612135907035

WGE, NAS-T, 12, 9.25543110713837e-005, 0.000671127016734345

WGE, NAS-U, 12, 6.15956671216955e-005, 0.000519897128669827

WGE, NAS-V, 15, 0, 0.000625940891597988

WGE, NAS-W, 9, 0.000204156427330618, 0.000469019832427678

WGE, NSD, 30, 0.000138781281305928, 0.000694904719813455

WGE, OEG, 9, 0.000213595197283862, 0.000687671231309289

WGE, OGB-M, 9, 0.000229575814366462, 0.000561344142508429

WGE, OGB-A, 9, 0.000240835801359704, 0.000497912847811516

WGE, OGB-B, 9, 0.000124348686991425, 0.000500669543347822

WGE, OGB-C, 20, 6.57283656140818e-005, 0.000572077366064132

WGE, OGB-D, 9, 0.000194866571472919, 0.000570017147947245

WGE, OHA-M, 9, 0.000259306424067758, 0.000594672098874743

WGE, OHA-A, 6, 2.91792907878309e-005, 0.000597316957760813

WGE, OHA-B, 6, 0.000330254036631509, 0.000668010080101128

WGE, OHA-C, 4, 0.000217690567299106, 0.000426035669113181

WGE, OHA-D, 6, 0.000142345402391693, 0.000596776938430601

WGE, OHI-M, 9, 0.000131501660282535, 0.000628270277080195

WGE, OHI-A, 4, 0.000210958906830105, 0.00058284405355758

WGE, OHI-B, 6, 0.000177295014153578, 0.000694024730078236

WGE, OHI-C, 4, 0.000207301080480239, 0.000339501622037014

WGE, OHI-D, 6, 0.000129246078109171, 0.000644819622408634

WGE, PHA, 12, 0.000181164258965633, 0.000624509322922671

WGE, PIT, 12, 4.96971405828356e-005, 0.000650316130968614

WGE, PLN, 6, 6.60477538829572e-005, 0.000547817582116612

WGE, POS, 6, 0.000218506748043226, 0.000607865940790986

WGE, PRP-A, 25, 0.000115419170122686, 0.000705388546053293

WGE, PRP-B, 45, 6.15998072957346e-005, 0.000717776644441416

WGE, PRP-C, 45, 0.000152761346104966, 0.000653138801644602

WGE, PRP-D, 25, 9.85339085154735e-005, 0.000743550484325476

WGE, PRP-E, 16, 6.41681238833428e-005, 0.000658739124112394

WGE, PRP-F, 20, 8.14586017431888e-005, 0.000721800564747554

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WGE, PTN, 20, 6.10959606204449e-005, 0.00067542784855703

WGE, PUK, 198, 0, 0.000634126307323697

WGE, PUR, 9, 8.37957007718936e-005, 0.000691683620618064

WGE, QAT, 12, 9.60873400318364e-005, 0.000698613192398033

WGE, QUO, 55, 4.84377051351454e-005, 0.00055935477631236

WGE, REU, 16, 0.000119363704478912, 0.000712868766127348

WGE, SAE, 16, 5.57853820959614e-005, 0.000537752680866026

WGE, SAO, 4, 0.000166002394393811, 0.000641650534143188

WGE, SAP, 9, 0.000189246163091935, 0.000538580100563081

WGE, SAN-M, 56, 7.48047983259737e-005, 0.000626801724784132

WGE, SAN-A, 40, 8.3230756827441e-005, 0.000634064930508107

WGE, SAN-B, 25, 0.000129757146186419, 0.000670319529813515

WGE, SAN-C, 49, 0.000104214800263595, 0.000756439566795787

WGE, SAN-D, 45, 7.62811523837954e-005, 0.000659898076268727

WGE, SAN-E, 25, 0.000123719287878404, 0.00059782678070203

WGE, SAN-F, 16, 0.000154994643172008, 0.000677014684148906

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WGE, SAN-J, 4, 0.000123035856465539, 0.000489468465500211

WGE, SAN-K, 9, 0.0002320037743642, 0.000617073268570584

WGE, SAN-L, 30, 0.000132323161608302, 0.000677414201503246

WGE, SCK, 25, 4.53823811053926e-005, 0.000721841446837876

WGE, SGM, 4, 0.000283056802122847, 0.000624214264378747

WGE, SHB, 4, 0.000257778686248323, 0.000535012995280803

WGE, SOA, 4, 0.000442171369027587, 0.000744444116407635

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WGE, SPK-C, 15, 0.000106219925193243, 0.000638223395715249

WGE, SPK-D, 9, 0.00010175489924711, 0.000551257037260293

WGE, SPK-E, 36, 9.88959091266816e-005, 0.000588379313629153

WGE, SPK-F, 9, 0.000146858466013788, 0.000573998570832085

WGE, SPK-G, 25, 0.000100478524726637, 0.000601282541548002

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WGE, TAN, 15, 8.71280421530551e-005, 0.00067641634437494

WGE, TDC, 4, 0.000195001848342871, 0.000590274748735089

WGE, TIL, 25, 3.35338807800704e-005, 0.000588566991399642

WGE, TOY-A, 25, 5.41770379040165e-005, 0.000633603367119386

WGE, TOY-B, 20, 0.000211329641199272, 0.000602438692742127

WGE, TOY-B1, 20, 0.000143585271315407, 0.000646773667786607

WGE, TOY-C, 16, 7.56740391538856e-005, 0.000684493110846273

WGE, TOY-M, 36, 0.000153444600816333, 0.000645985184093849

WGE, TRN, 4, 8.84108217011204e-005, 0.000529462166735195

WGE, VOI, 30, 0.000125903402648854, 0.000637343696453944

WGE, VOR, 30, 0.000105510571150949, 0.000701034887242213

WGE, WAK, 4, 0.000176439783712463, 0.0004837884799862

WGE, YAC, 16, 0.000158599726131509, 0.000694776097532106

WGE, ZAN, 30, 0.000147173296833793, 0.000730498974802784

WGE, KGS, 20, 4.66174643989729e-005, 8.26168791306086e-005

WGE, SIR, 44, 9.23995488491718e-005, 0.000114287982731782

**Appendix E**

The following changes must be applied to the gold data files under GoldData\_v6.1 before running the accuracy assessment software:

|  |  |
| --- | --- |
| **File Name** | **Changes** |
| map\_proj/Sphere/LCC\_60a.csv | Replace:  SCALE FACTOR: 0.70000  With:  STANDARD PARALLEL ONE: 88.721725469719  STANDARD PARALLEL TWO: 6.400806738511  #SCALE FACTOR: 0.70000 |
| map\_proj/Sphere/LCC\_61.csv | Replace:  SCALE FACTOR: 0.70000  With:  STANDARD PARALLEL ONE: 41.171577695673  STANDARD PARALLEL TWO: -49.946673509297  #SCALE FACTOR: 0.70000 |
| map\_proj/Sphere/LCC\_67.csv | Replace:  SCALE FACTOR: 1.00000  With:  STANDARD PARALLEL ONE: 89.99970000  STANDARD PARALLEL TWO: 89.99970000  #SCALE FACTOR: 1.00000 |
| map\_proj/SRMmax/LCC\_37a.csv | Replace:  SCALE FACTOR: 0.70000  With:  TANDARD PARALLEL ONE: 6.11179388706249  STANDARD PARALLEL TWO: 88.7228746084839  #SCALE FACTOR: 0.70000 |
| map\_proj/SRMmax/LCC\_38.csv | Replace:  SCALE FACTOR: 0.70000  With:  STANDARD PARALLEL ONE: 41.386639345913  STANDARD PARALLEL TWO: -50.113947418586  #SCALE FACTOR: 0.70000 |
| map\_proj/SRMmax/LCC\_44.csv | Replace:  SCALE FACTOR: 1.00000  With:  STANDARD PARALLEL ONE: 89.99970000  STANDARD PARALLEL TWO: 89.99970000  #SCALE FACTOR: 1.00000 |
| map\_proj/WGS84/LCC\_14a.csv | Replace:  SCALE FACTOR: 0.70000  With:  STANDARD PARALLEL ONE: 6.25610696306762  STANDARD PARALLEL TWO: 88.7223009764950  #SCALE FACTOR: 0.70000 |
| map\_proj/WGS84/LCC\_15.csv | Replace:  SCALE FACTOR: 0.70000  With:  STANDARD PARALLEL ONE: -50.0306612963145  STANDARD PARALLEL TWO: 41.279556918820  #SCALE FACTOR: 0.70000 |
| map\_proj/WGS84/LCC\_21.csv | Replace:  SCALE FACTOR: 1.00000  With:  STANDARD PARALLEL ONE: 89.99970000  STANDARD PARALLEL TWO: 89.99970000  #SCALE FACTOR: 1.00000 |
| NGA\_3parDT/Set\_A/Local\_geodetic\_201.csv | Replace:  3, A 3, DI-M, 25.000, -5.000, 0  2, A 2, DI-M, 20.000, -5.000, 0  With:  A 3, DI- 2, DI-M, 20.000, -5.000, 0  3, DI-M, 25.000, -5.000, 0 |

**Appendix F**

Section 1.2 states that, “The difference computation is the Euclidean distance between the computed position and the expected position via the gold data”.

The following explains the meaning of the phrase, “the Euclidean distance between the computed position and the expected position”. There are four cases:

For the forward map projection tests, whose outputs are rectangular coordinates in the projection plane and may be labeled , the difference is measured as:



For the inverse map projection tests, whose outputs are longitude () and latitude () in radians, the difference is measured as:



For any coordinate conversion tests whose outputs are Euclidean\_3D coordinates , the difference is measured as:



For any coordinate conversion or datum transformation tests whose outputs are geodetic coordinates , the difference is measured as:



In the above formulas, the quantities  are functions of  and , and may be evaluated at any of  or  or  for  and any of  or  or  for . The symbols  are defined in Table 5.6 of the SRM standard ISO/IEC 18026.