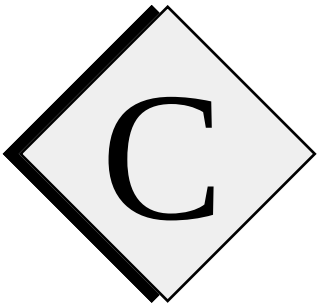

Appendix C. Description of ARPS Supported Terrain Data Sets

C.1. Global 1 Degree Resolution Data

The coarsest resolution database supported by ARPS is the global 1˚ × 1˚ data set found in the NCAR *elev.dat* file. This data file contains the 1˚ and 5' resolution data sets. The direct access 1˚ data set is generated by the executable program DIR1DEG. This program creates two files for use by ARPSTERN. The first is an unformatted data file *dir1deg.dat* and the second a header file *dir1deg.hdr* which includes the record numbers for each 1˚×1˚ block of data in *dir1deg.dat*. Data blocks are written as a single record by an unformatted write statement. Program DIR1DEG writes out the (2,2) array which represents either an average value (constant value for all array elements) or average values for each quadrant of the block (when 30' resolution data is available).

The aerial coverage for the 1˚ data set is global with the exception of the south pole. The data stored in *dir1deg.dat* are ordered as follows: the first record block (record # = 1) is 89˚ S and 0˚ E and the next record is 89˚ S and 1˚ E, the following blocks are stored in order of increasing longitude east to 359˚ E. The latitude is then incremented and the next block is 88˚ S and 0˚ E with subsequent blocks in order of increasing east longitude. Blocks which contain all ocean are set to sea level elevation (0 meters). The data is written in 2-byte integer format in systems which allow 2 byte integer declarations (IBM and others). The minimum integer length on Cray computer is 8 bytes or *8. The variable *comtype* in *arpstern.input* must be properly set to allow the preprocessing programs to create the data set read by ARPSTERN. All preprocessed terrain data are packed by:

packed value = ((elevation in meters) +4000)/20

An inspection of the data provided by NCAR Data Services revealed accuracy variations in the 1˚ data set from 6 to 165 meters with the majority of the data represented by precision in the 10-30 meter range.

C.2. North American/European 5 Minute Resolution Data

The North American/European terrain data set has 5'×5' resolution and covers the continental United States, Mexico, Central America, most of Canada, the Caribbean, and Europe and resides in the NCAR file *elev.dat*. Program DIR5MIN converts the 5' data in *elev.dat* into an unformatted data file and a formatted header file for use in ARPSTERN. The *dir5min.dat* file contains unformatted direct access records with each record comprising a full 1˚×1˚ block of data. Each record represents a (12,12) data array. File *dir5min.hdr* contains the record number for each specific block of data in file *dir5min.dat.* The data recorded in each 5' square is an average value for that particular square. Although error checking was not a part of the preprocessing programs, limited error checking was performed on this data set. Duplicate blocks were found in the initial NCAR data file and removed from the blocks written to *dir5min.dat*. The precision of the 5' data set varies between 6-60 meters with most records precise to within 20-30 meters.

C.3. United States 30 Second Resolution Data

The highest resolution terrain data supported by ARPS 4.0 is the 30"×30" data base developed by the United States Defense Mapping Agency. This data set was obtained from NCAR Data Services. The areal coverage is from 23˚ N to 51˚ N and from 130˚ W to 60˚ W covering the continental US. Blocks containing all ocean data are omitted. The 30" data set (NCAR file *dma_elev.dat*) is processed by program DIR30SEC. Two files, *dir30sec.dat* and *dir30sec.hdr*, are created which contain unformatted direct access records and record numbers for each block, respectively. The resolution varies with latitude but is, in general, on the order of 750×950 meters in the longitudinal and latitudinal directions, respectively. The data in *dma_elev.dat* were created by taking every tenth point from a 3" data set and therefore represent elevations for specific locations on the Earth and not average elevations. The preprocessor program DIR30SEC follows the methods in *dir1deg* and *dir5min* for writing the *dir30sec.dat* file with the following exception: each record in the *dir30sec.dat* file consists of a (120,120) array of data representing a full 1˚×1˚ block of terrain data. The *dir30sec.dat* file does not include overlapping blocks present in the initial NCAR data set. The overlapping portion of data blocks in the NCAR data sets often contained values inconsistent with data from an adjacent block. All inconsistencies in the initial NCAR data set were judged to be associated with the 121st value. Thus, 120 values for each row and column were written into the preprocessed data file instead of the original 121 values in the NCAR data file. In addition, some elevations over Lake Huron were omitted since the data block crossed into Canada. The elevation data recorded on the US side of Lake Huron were used to fill in the remaining missing data points. A detailed description of file *dma_elev.dat* is provided by the NCAR Data Services.