Method of using the GRIB data in ArcGIS 8.2 Project problem and solution

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General Introduction

- **It was very important part of our student project - to find a way of using GRIB meteorological data with ArcGIS 8.2.**
- **It was discovered that though GRIB data is widely used for many years in non-GIS applications we could not find any recommendations about importing it into ArcGIS. The only commercial software called Metwork FileServer was found through ESRI web site that automatically converts the WMO forecast GRIB format grids into ESRI grid format did not appeared to be available. (http://gis.esri.com/library/userconf/proc00/professional/papers/PAP334/p334.htm)**
- **In March 2003 CMC GRIB data become available and thus was downloaded daily and used further in the project (http://dd.weatheroffice.ec.gc.ca/grib/public/hires). We have decided to work with surface temperatures for the start.**

Technical Problem Introduction

- **GRIB stands for Gridded Binary. It is a data format. It is an efficient vehicle for transmitting large volumes of gridded data to automated centers over high speed telecommunication lines using modern protocols. By packing information into the GRIB code, messages (or records - the terms are synonymous in this context) can be made more compact than character oriented bulletins, which will produce faster computer-to-computer transmissions.**
- **We needed to find the ways to convert this data into ESRI Grid format.**
  This problem contained two parts:
  - converting files from binary to ASCII format
  - converting from ASCII to ESRI grid

Problem Details

- **At the beginning of the project we have contacted UBC specialist Trina C. to find how do they use WMO GRIB data and have received a number a valuable general advices. In particular we've learned about the utility program called wgrib available for downloading from the Internet. This practically solved the first part of the problem – translating file to ASCII format. We used Windows version of wgrib to translate all project GRIB files, manually running commands from the Command Prompt.**

Example 1: C:\work\>wgrib ps60km.grib –V this provides only DOS output with the brief description of the file content (not saved anywhere, I copied it here for the demonstration purposes).

rec 1:0:date 2003031900 TMP kpds5=11 kpds6=105 kpds7=2 levels=(0,2) grid=255 2m above gnd anl:TMP=Temp. [K] timerange 10 P1 0 P2 0 TimeU 1 nx 135 ny 95 GDS grid 5 num_in_ave 0 missing 0 center 54 subcenter 0 process 36 Table 2 polar stereo: Lat1 27.203000 Long1 -135.213000 Orient 249.000000 north pole (135 x 95) Dx 60000 Dy 60000 scan 64 min/max data 232.646 301.846 num bits 10 BDS_Ref 2326.46 DecScale 1 BinScale 0

Example 2: D:\work\GRIB>wgrib ps60km.grib -d 1 –text this creates some DOS output and a dump file.

1:0:d=03031900:TMP:kpds5=11:kpds6=105:kpds7=2:TR=10:P1=0:P2=0:TimeU=1:2 m above gnd:anl:NAve=0

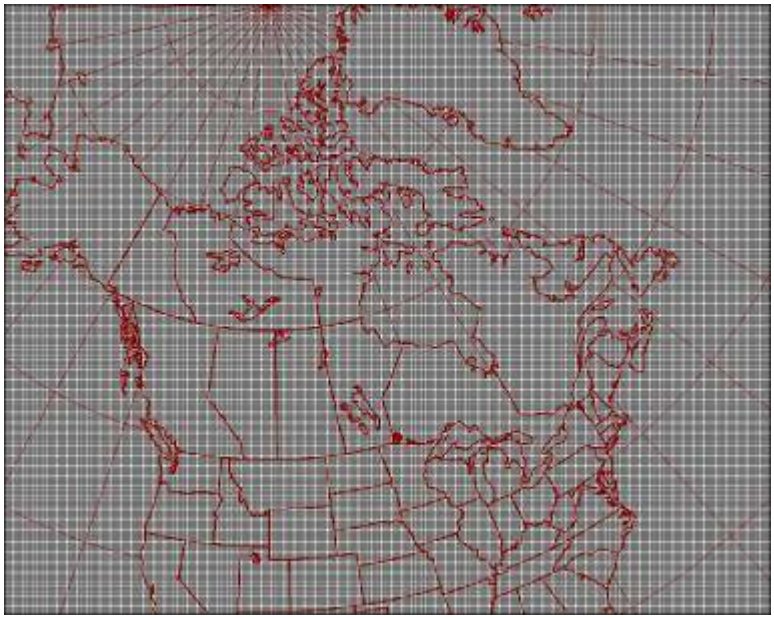
Contents of the dump file:

313 249 **- number of rows and columns**
291.146 **- values in sequence, in this case**
290.746 **surface temperatures [K].**
290.246
and so on…

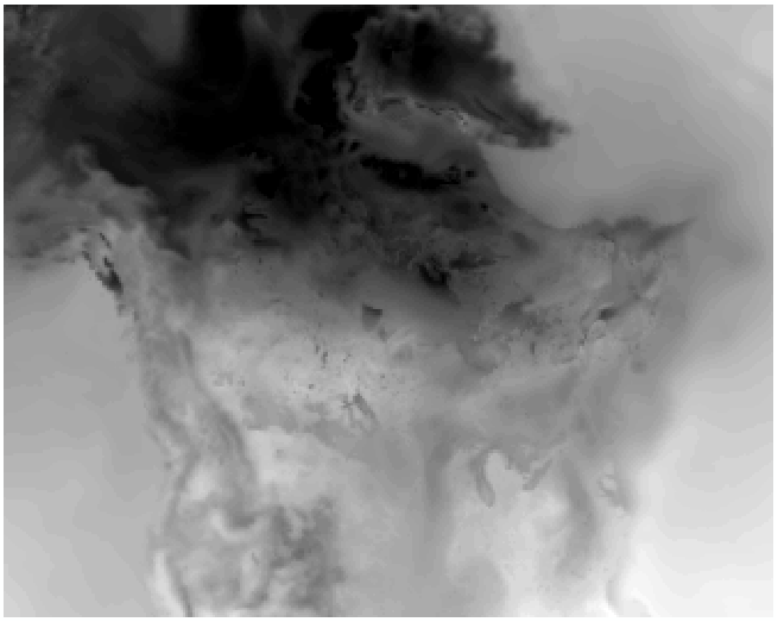
- **So for each day we had a GRIB file with temperatures in the high-resolution regional GRIB dataset on a 313x249 Polar-Stereographic grid covering North America and adjacent waters with a 24 km resolution at 60 N and a dump file.**

- **It was not clear how were the points organized in the grid, so we had to use “try and see” method to figure out that first point is at the lower left corner and the sequence is from left to the right in the columns and from bottom up in rows.**
- **ESRI Grid image below is a grid, displayed in ArcMap that was created by ASCIIGRID command over the slightly modified dump file.**
- **However we could not use it for analysis – there was a problem with georeferencing of that grid. The reason (IMHO) is that Polar-Stereographic grid points are not equally spaced as ASCIIGRID function assumes. Some other approach of creating grids had to be found.**

Polar Stereographic Grid



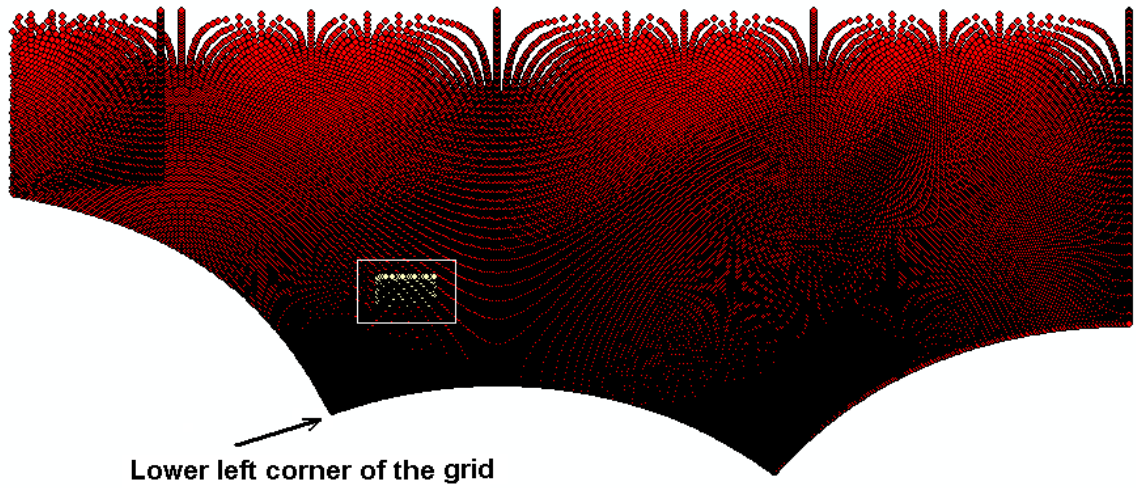
ESRI Grid



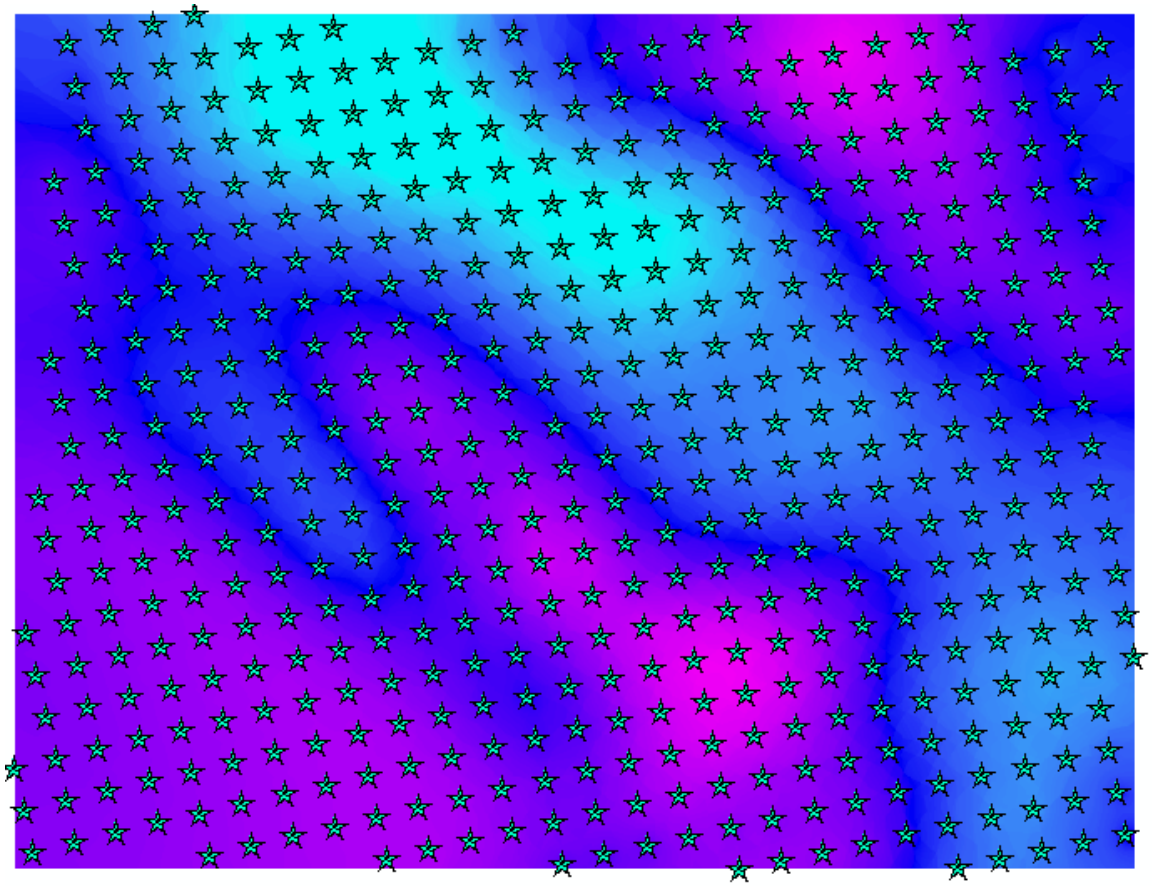
Problem Solution

- **We have contacted Yves P. from CMC for help on this matter and he send us file, containing geographical coordinates for each point of the regional grid.**

- **It was decided that we needed to create point coverage first (using Generate To Coverage Wizard of ArcToolbox) and then interpolate point values to a grid.**
- **Next step was to merge daily temperatures of the dump file with corresponding geographic coordinates. For this purpose I have wrote a file formatting utility using VB.NET. This program is reading dump file into an array, then reads the file with geographic coordinates into another array, merges them and creates a subset of desired geographic extent as a new text file, ready to use with Generate To Coverage Wizard.**
- **The image below demonstrates point coverage for the whole region and for the Quadrangle 92 area in geographic projection.**

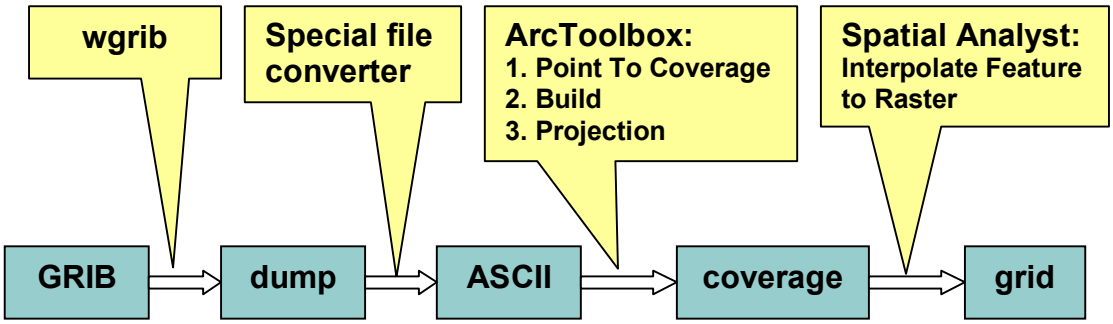


This image demonstrates GRIB point's coverage and grid of the Quadrangle 92 area in UTM projection, interpolated to 100 m resolution.



Summary

Finally the solution of the problem could be presented by the following algorithm:



On my opinion solving this problem significantly helped moving the project ahead and I am looking forward for new tasks to work on.