PROBLEM 1

? *The average monthly snowfall in the United States of America has been carefully measured for 40 years. Your task is to analyze the raster dataset profoundly (months available: January, February, and March) in order to detect or recover significant and advantageous deviations assisting your customers' wishes.*
One customer is especially interested in these regions where he can expect snow falling less frequently in January.

After loading all layers I noticed a slight difference concerning the data structure: January's snowfall was given in inches while the data available for February and March were quantified in centimetres. A simple conversion using the Raster Calculator swiftly eliminated that hurdle.

Geographic Information Systems usually handle numbers, values, facts. These abstract things, called *raw data*, can be evaluated according to statistical formulas and algorithms. To me, the visual system of human beings can be far superior when it comes to detecting pattern hidden in datasets. Therefore, I recognize the process of applying a uniform colour ramp as a must have.

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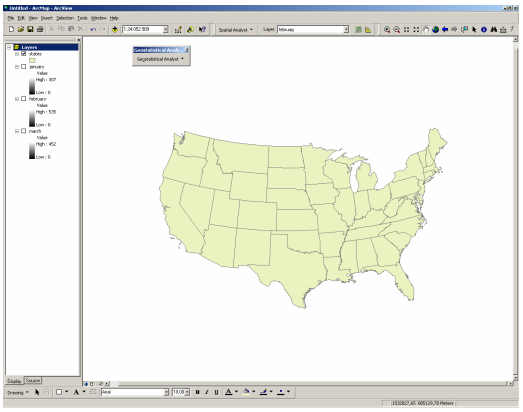

Figure 1 *The United States*

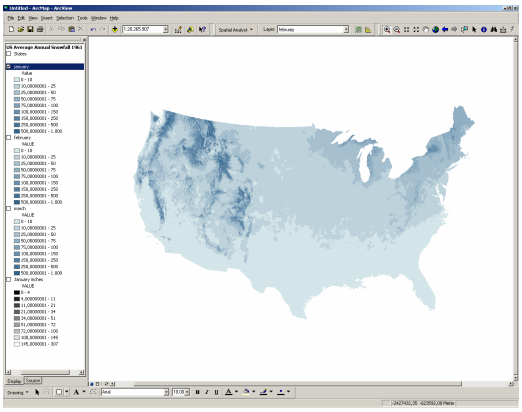

Figure 2 *Average snowfall in January*

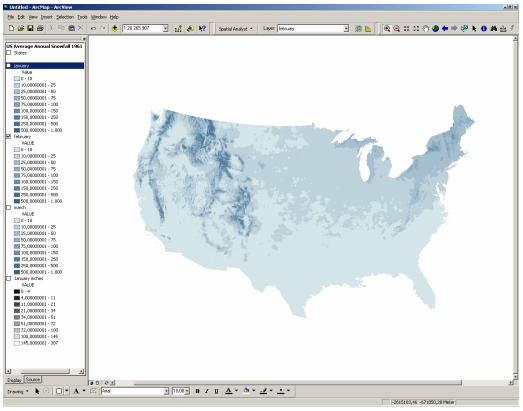

Figure 3 *February*

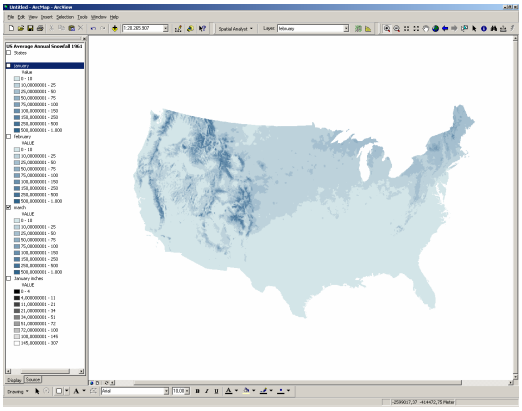

Figure 4 *March*

The chosen blue scale denotes regions of a high level of snowfall by dark shades. The Rocky Mountains typically observe several meters a year. Unknown to me, the New England states see much snow, too, despite the fact that there are merely mountains or even hills.

A new layer holds the average snowfall, which is the mean of January, February, and March. The mean can be calculated for each raster point by running the *Cell Statistics*.

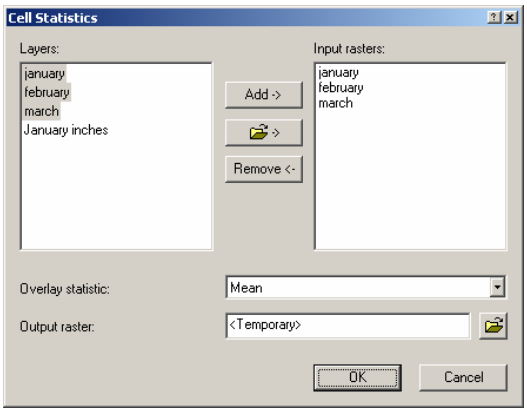

Figure 5 *Requesting a mean raster*

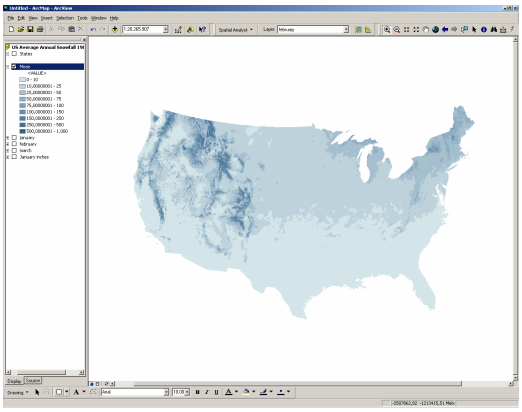

Figure 6 *The result of Figure 5*

The Raster Calculator evaluated the expression [January] < [Mean] to a Boolean layer. Modifying the colour representing *true* to transparent, the Great Plains and parts of eastern California (still blue) seem to fit the pattern requested by the customer. On the other hand, the overwhelming majority of the United States observe the main snowfall in January.

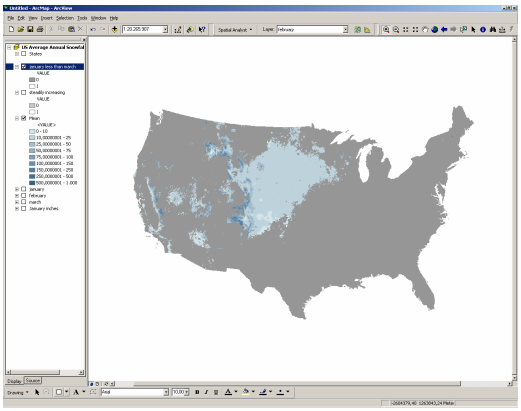

Figure 7 *Regions with low snowfall (blue, in January)*

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PROBLEM 2

? *A second customer wishes to receive more detailed information about the distribution of snow over the three given months. Are there any regions with a steadily increasing snowfall throughout the time from January to March ?*

A single equation passed to the *Raster Calculator* leads to the desired result:

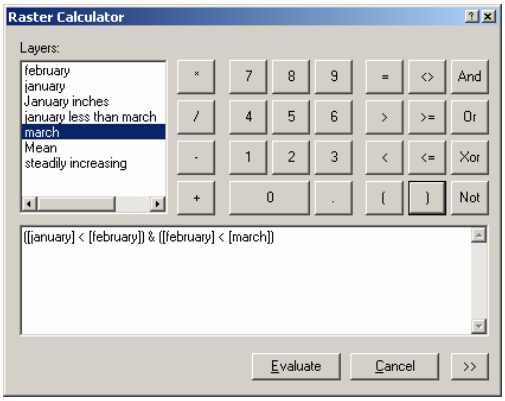

Figure 8 *Raster Calculator*

I added to January-less-than-average layer obtained in the previous problem enriching the resulting image: only the red areas see a steadily increasing snowfall during January, February, and March. The sum of these red areas and the remaining blue zones gives exactly the image found in Figure 7.

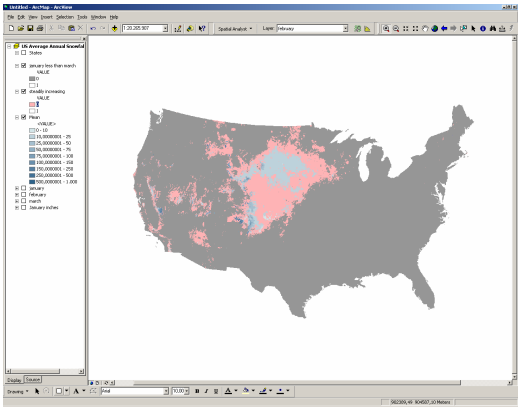

Figure 9 *Raster Calculator*

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PROBLEM 3

? *A third customers asks whether you could generate a map of the United States that illustrates the month (out of January, February, March) of the highest snowfall.*

As always, the *Raster Calculator* is my friend. Two equations determine whether January (Figure 10, yields dark blue regions) or February (Figure 11, light blue) observe the highest snowfall. All remaining regions must do so in March (according to my basic knowledge of mathematical logic) and appear in grey in Figure 12. Nevertheless, there are huge areas especially in the southern part where no snow at all has been measured. I added a third, yellow, layer visualizing that information. For example, the whole state of Florida is simply too warm and friendly in winter.

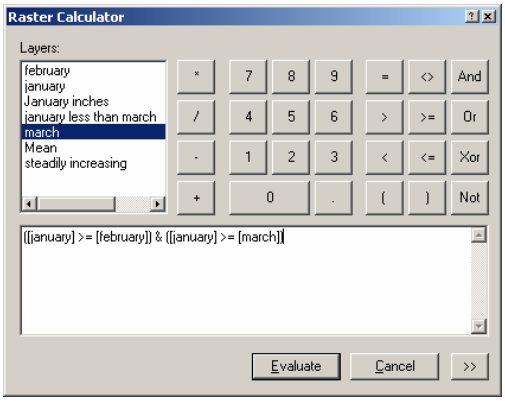

Figure 10 *Peak in January*

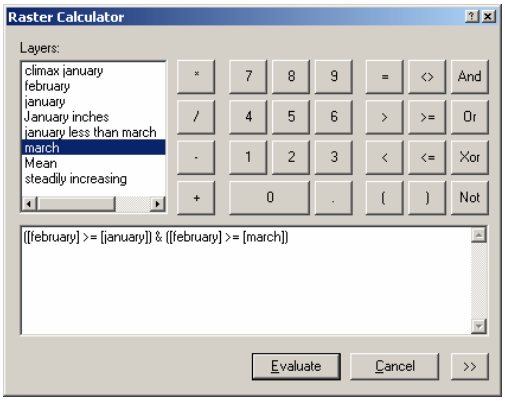

Figure 11 *Peak in February*

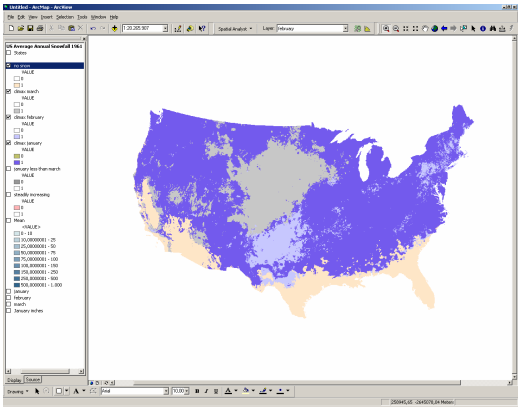

Figure 12 *Peak in January*

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PROBLEM 4

? *One of your friends, always keen on snowboarding, needs to know the places where he can expect at least 10 centimetres of snow. In addition, hand him over a map that outlines the range between minimum and maximum snowfall.*

To make a long story short: *Cell Statistics* give me two layers – one showing the minimum snowfall, one containing the range – with ease. The first one is made semi-transparent, e.g., all regions with less than 10 centimetres are still grey, while any value above is transparent. A blue colour denotes high ranges. It does not mean that these regions actually receive most snow, there are just large difference throughout the winter.

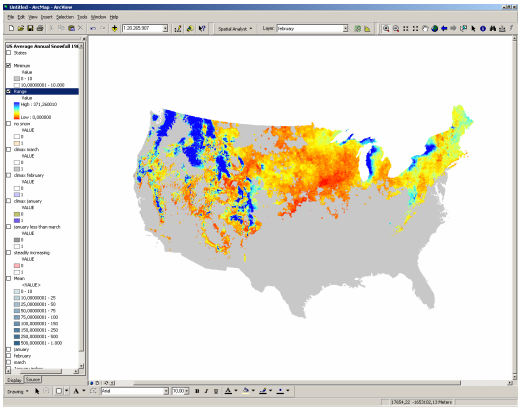

Figure 13 *Range of snowfall if more than 10 centimetres a year observed*

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