METR 5303 Computer Problem #2

Assigned Thursday 22, Due Thursday, October 6, 2016

Using the same data set and grid you worked with in Computer Problem #1, perform the following four objective analysis:

1. $Z_{ij}^a = \dfrac{\sum_k w_k Z_k^o}{\sum_k w_k}, \quad w_k = 1, \; r_k \le R$

2. $Z_{ij}^a = \dfrac{\sum_k w_k Z_k^o}{\sum_k w_k}, \quad w_k = \dfrac{R^2 - r_k^2}{R^2 + r_k^2}$ for $r_k \le R$

3. $$Z_{ij}^a = \sum_k w_k \left[Z_k^o + \frac{f}{mg}(uy - vx)_k \right] / \sum_k w_k$$
$$\equiv \sum_k w_k \left[Z_k^o + \left(\frac{\partial Z}{\partial x}\right)_k \Delta x + \left(\frac{\partial Z}{\partial y}\right)_k \Delta y \right] / \sum_k w_k, \quad w_k = 1 \text{ for } r_k \le R.$$

4. Same as 2, except that $w_k = \dfrac{R^2 - r_k^2}{R^2 + r_k^2}$.

Note: $w_k = 0$, $r_k > R$ and R = 4.32 cm in all analysis, where r_k is distance between grid point and k^{th} station.

Hand in a (22, 28) array of grid pint values as well as a contour plot for each analysis.

Also, after completing each of the four analyses, determine Z_k^a , k =1, N, an estimate of the analysis at each of the N stations within the grid via bi-linear interpolation. For each analysis, print the following five columns of information:

k BLSTN Z_k^o Z_k^a $Z_k^a - Z_k^o$

Finally, compute the root mean square differences between the analysis and observations at the stations via the following for each of the analyses

$$RMSD = \left[\frac{1}{N} \sum_{k=1}^{N} (Z_k^a - Z_k^o)^2 \right]^{1/2}$$

where N is the number of stations within the grid.