Objective Analysis

Definition: **Objective Analysis** - A procedure for obtaining estimates of fields on a regular grid from irregularly-spaced values (typically observations).

This is usually in 2-D or 3-D space but could be in time.

Cressman Objective Analysis Method (Cressman, 1959, *MWR*)

Cressman objective analysis obtain values at grid points, Z_{ij}^a (where *i* and *j* are the grid point indices for a 2D grid) as the weighted average of the difference between observed values Z_k^o and background values interpolated to the observation locations Z_k^b (i.e., $Z_k^o - Z_k^b$, which is called observation increment) plus the background value at the grid point Z_{ij}^b.

$$Z_{ij}^a = Z_{ij}^b + \frac{\sum_k w_k (Z_k^o - Z_k^b)}{\sum_k w_k}, \quad w_k = \frac{R^2 - r_k^2}{R^2 + r_k^2} \text{ for } r_k \le R. \qquad (1)$$

The weight w_k is a function of the distance $r = \sqrt{(x_{ij} - x_k)^2 + (y_{ij} - y_k)^2}$ is that between the individual observation *k* and grid point (*i*, *j*). *R* is the influence radius. Beyond the influence radius the weight is set to zero. *R* is therefore often referred to as cut off radius. The weight function w_k has the following shape as a function of radial distance *r*:

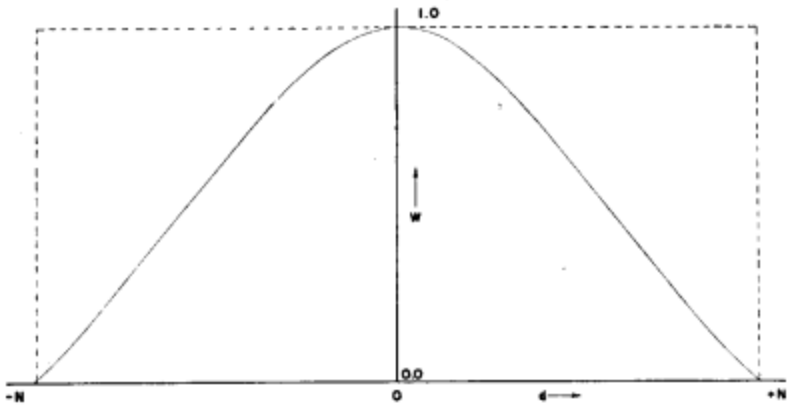

FIGURE 3.—Curve of the weighting function W vs. distance d. Solid line refers to equation (2). Dashed line refers to recent changes for scan 4 (see text).

R should not be too large or too small, and is usually chosen to be a few times of the average station separation distance.