In the following equations, *i* denotes the level 2 pixel, and *j* denotes the level 3 grid cell or grid center point.

The re-gridded vertical column density C(j) is the quotient of two terms A(j) and B(j), defined below. A(j) and B(j) are just cumulative sums of level 2 pixels over certain periods of time. In practice, A(j) and B(j) are saved over short time intervals (e.g., monthly) for the sake of flexibility. For example, if we need to calculate the re-gridded C for all the month of July over 8 years, we may add the corresponding A and B terms respectively and calculate C as the quotient of the summed A and summed B.







In the above equations, is the vertical column density measured at level 2 pixel *i*, and is the uncertainty of vertical column density measured at level 2 pixel *i*.

SRF(i,j) is the spatial response of pixel *i* at the grid point *j*. Strictly speaking, SRF(i,j) should be the average of a much higher resolution spatial response function of pixel *i* over the area covered by grid cell *j*. Using the value at the grid center introduces some discretization error, whose magnitude decreases with increasing resolution of the level 3 grid. For IASI, we approximate the spatial response function with a 2-D Gaussian function parameterized by the axes and rotation angle of the elliptical IASI pixels:

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Here *u* and *v* are the ellipse axes of IASI pixel, *xi* and *yi* are the pixel center, *ti* is the rotation angle, and *xj*, *yj* are coordinates of level 3 grid point *j*. In the case of *ti* = 0,

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