Use of cell_measures and cell methods in a fregrid regridding algorithm.

Below is a summary of the part of the function *do_scalar_conserve_interp()* used by fregrid.

Algorithm Assumptions and Conventions:

1. Algorithm below is for 1st order conservative interpolation regridding; this shortened summary version assumes there is only one elevation and only one tile.
2. Desired mapping is from $grid\_s$ (source) to $grid\_t$ (target), and an exchange grid ($xgrid$) between the two has been calculated. For every cell of $grid\_t$, $xgrid$ wil have indices into one or more cells of $grid\_s$.
3. n_e, n_t, n_s *are indices into the exchange, target, and source grids, respectively*
4. Field/variable $field\_s$ is mapped onto $grid\_t$ and to be called $field\_t$
5. cell_methods are specified as metadata per field. Similarly for cell_measures, but if its specified as *true* for a field, then the input file must also specify an area per grid cell of the corresponding input grid).
6. Cell_measures default is $false$; cell_methods default is $cell\_methods\_mean$, and the alternative is $cell\_methods\_sum$.
7. $field\_s.area[n_s]$ - defined as “fraction of cell area”
8. nx is the number of cells in the longitudinal (X) coordinate.

Algorithm:

1. $loop\ over\ n_e$; $n_e \equiv 0, 1, 2, \ldots, (size(xgrid) - 1)$
    a. $i_t \equiv xgrid.iout[n_e]$; $j_t \equiv xgrid.jout[n_e]$; $n_t = j_t * nx_t + i_t$
    $i_s \equiv xgrid.iin[n_e]$; $j_s \equiv xgrid.jin[n_e]$; $n_s = j_s * nx_s + i_s$
    b. $area = xgrid.area[n_e]$ //(I.e. The area of overlap of cells index by n_s *and* n_t)
        i. $if\ (weight\_exist)\ area = area \times grid\_s.weight[n_s]$
        ii. $if\ (field\_s.cell\_methods\_sum)\ area = area \div grid\_s.cell\_area[n_s]$
        $elif\ (field\_s.cell\_measures)\ area = area \times field\_s.area[n_s] \div grid\_s.cell\_area[n_s]$
    c. $field\_t.val[n_t] = field\_t.val[n_t] + field\_s.val[n_s] \times area$
2. $End\ of\ loop\ over\ n_e$