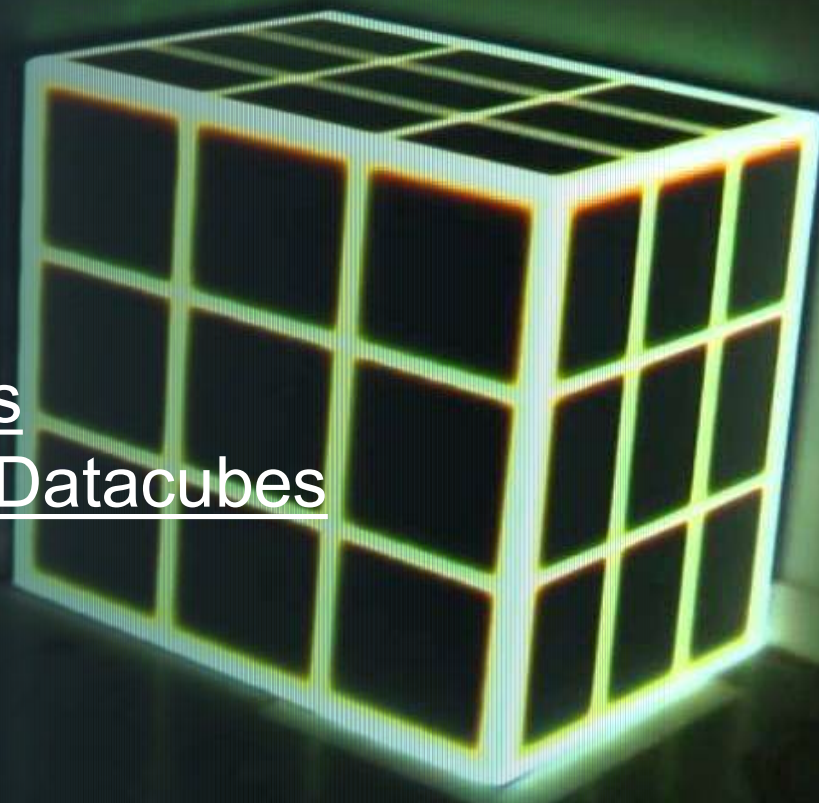
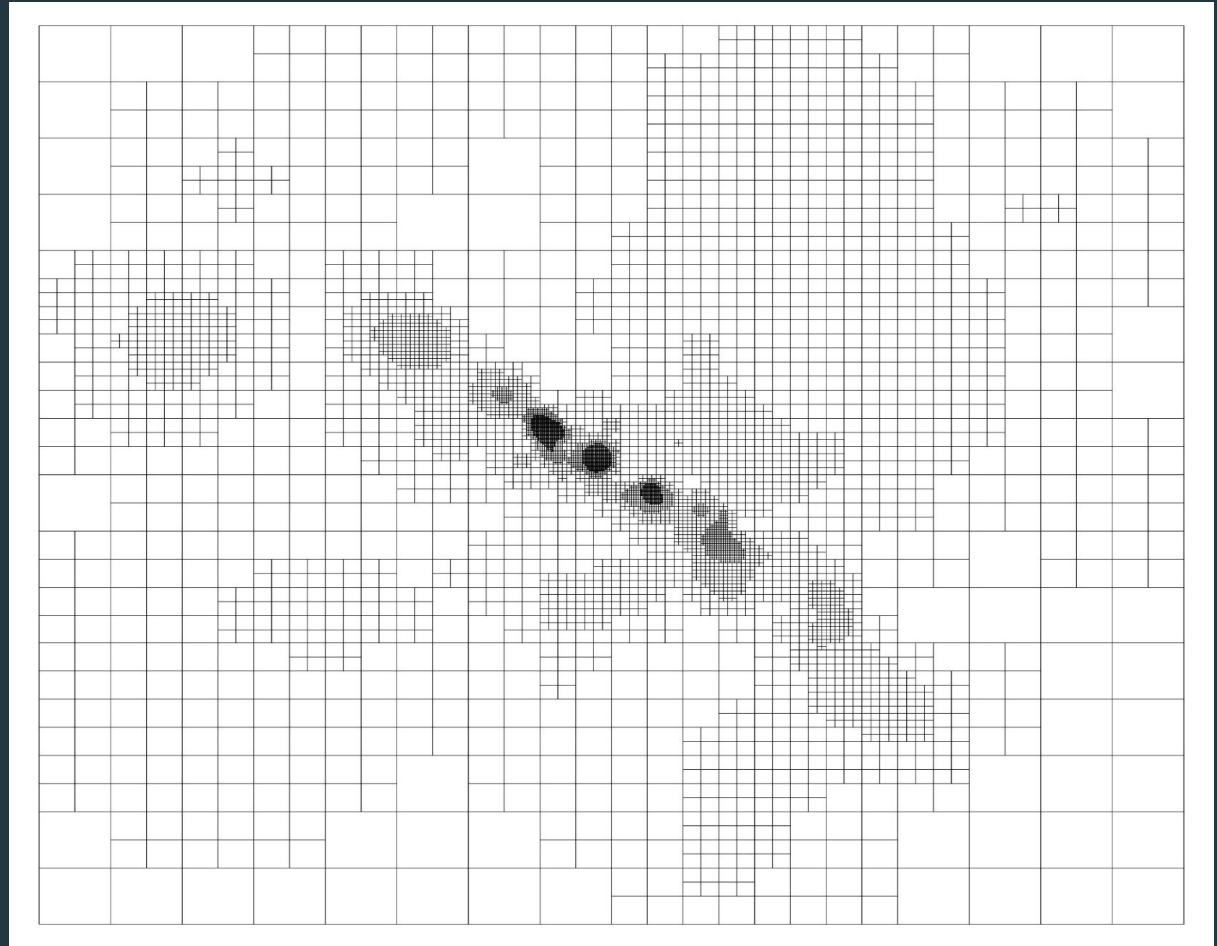
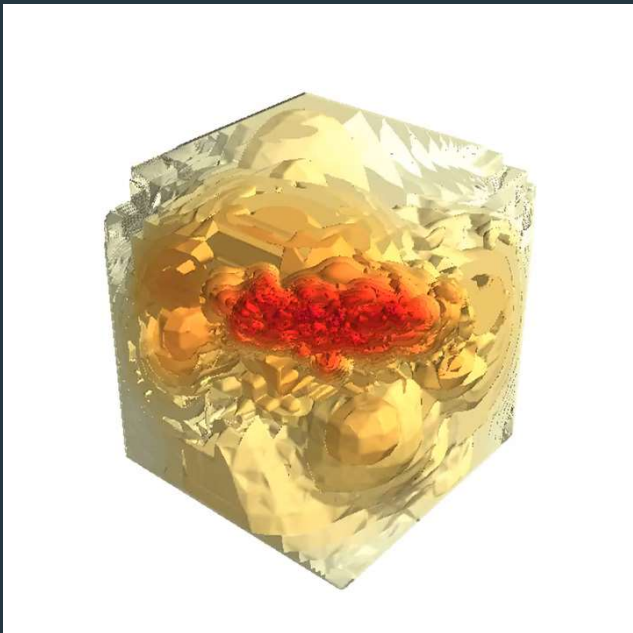


The Algorithm
for Creating Moment0 Maps
from Simulated 3D Galaxy Datacubes

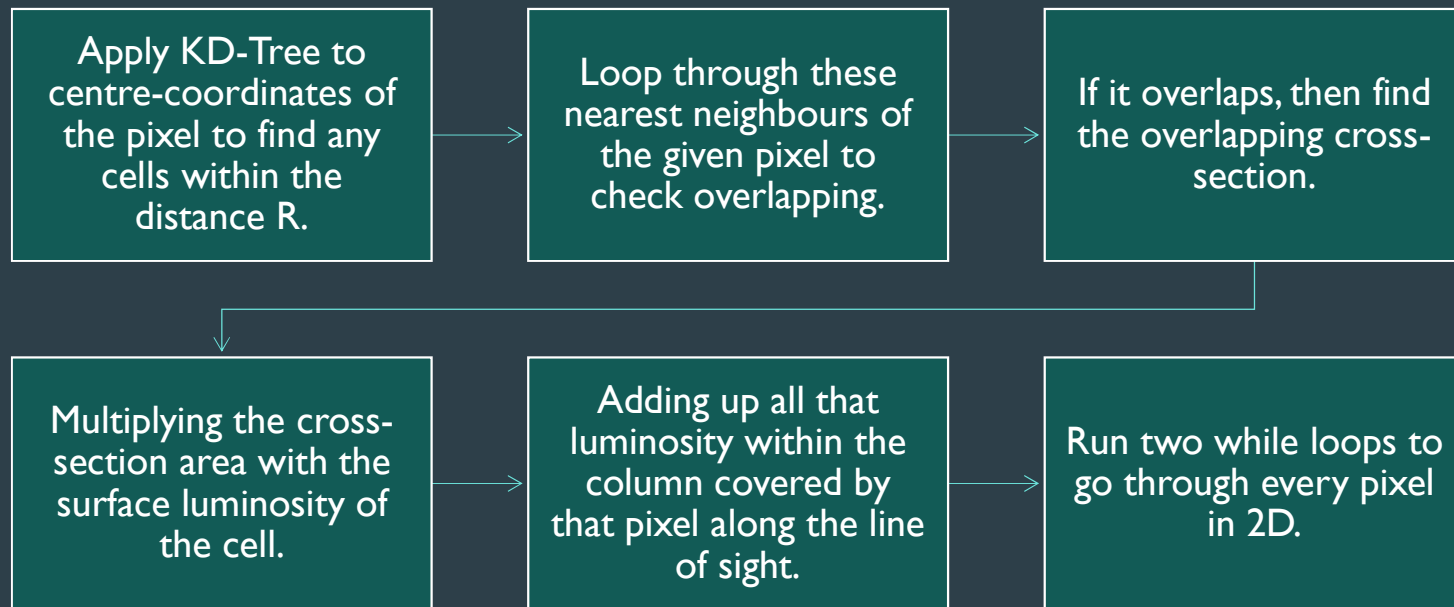


Data Cube



Credits: Karen Olsen

Algorithm

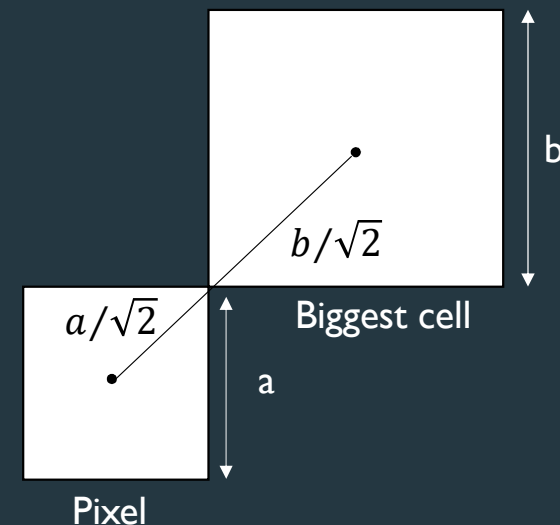


Scipy's spatial.KDTree class

<https://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.cKDTree.html>

- `query_ball_point()` method
- Identifies all the points within a particular radius from the particular point
- Set the radius to be the maximum distance between centre of any touching cell and centre of the pixel

- Radius (R) = $a/\sqrt{2} + b/\sqrt{2}$

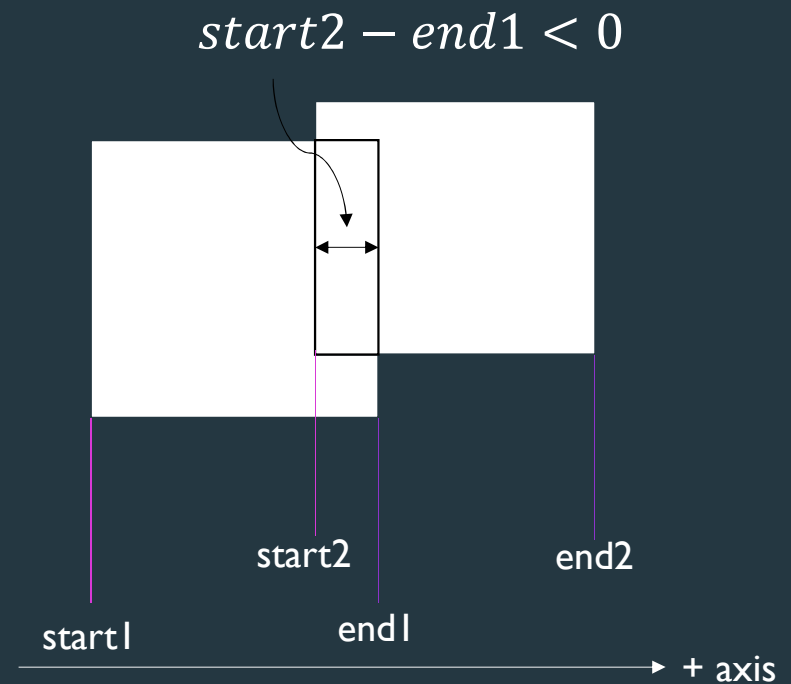


Overlapping

- Loop through each nearest neighbour cell to check overlapping

- Cell and pixel overlaps if and only if:

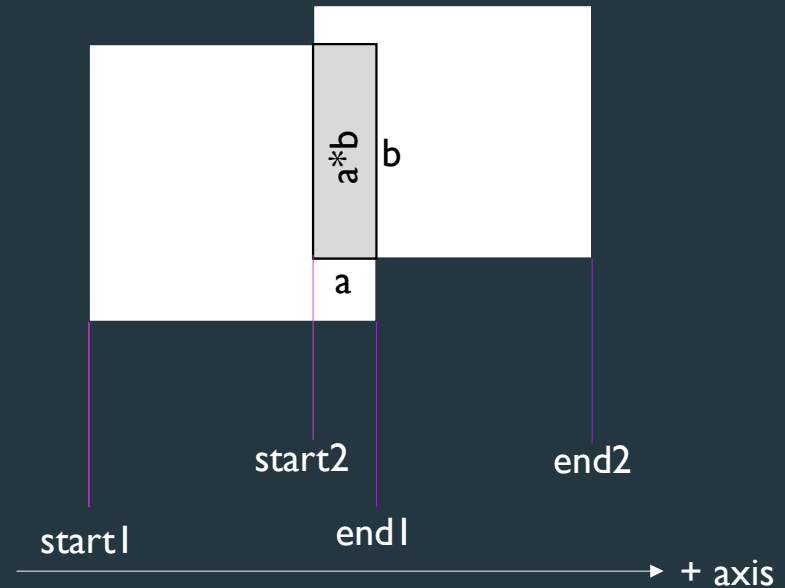
$$\max(\text{starting edges}) - \min(\text{ending edges}) < 0$$



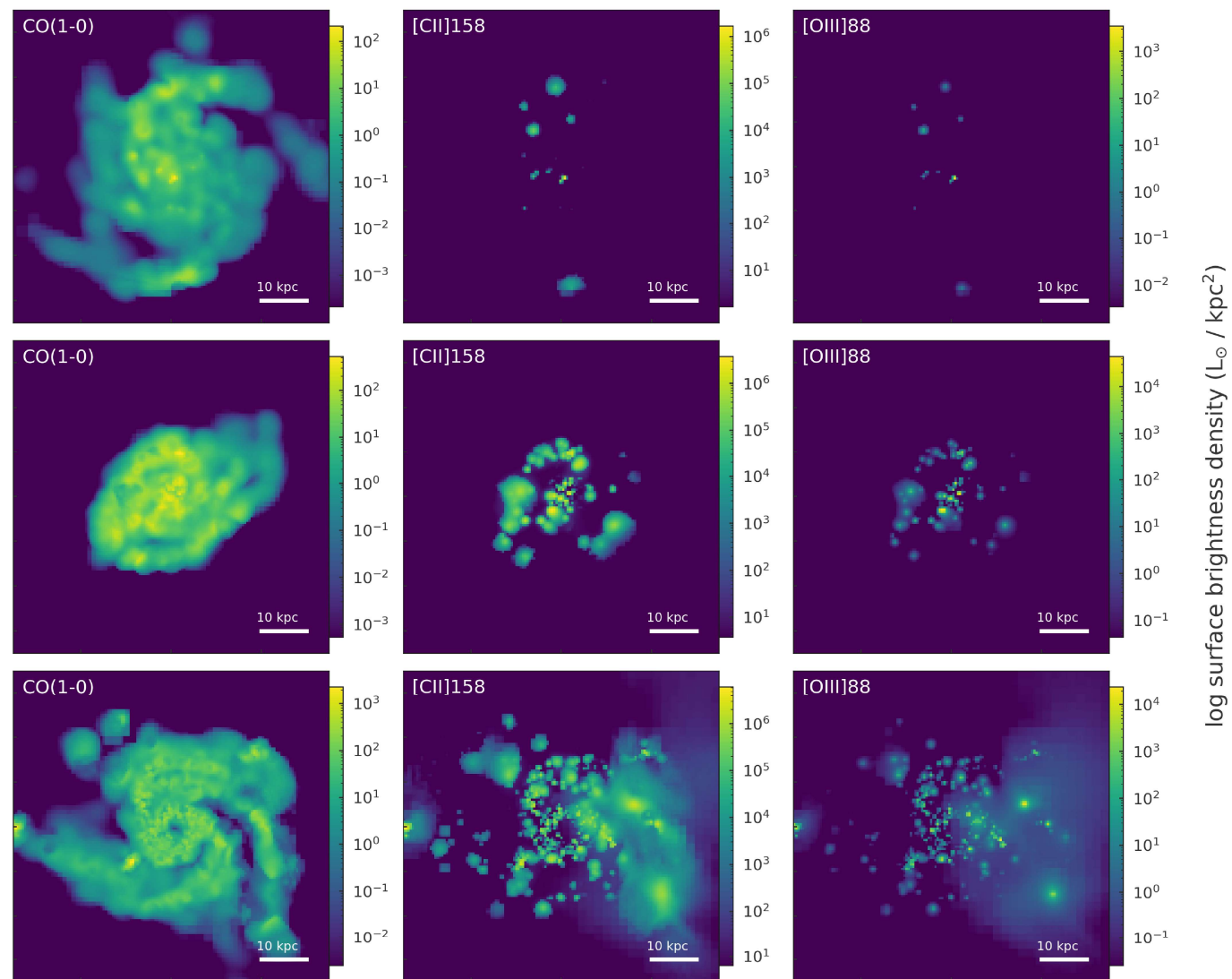
Cross-section Area and Adding up Luminosity

- Then, we find cross-section area of the overlapping cell and pixel.
- We multiply this cross-section area with the surface luminosity of the cell.
- We add up all the luminosity in that particular pixel.
- We find surface luminosity of every pixel using while loops.

$$a = end1 - start2 = \min(ends) - \max(starts)$$



Results





Further Developments

- Creating line ratio maps from the moment0 maps and analysing them.
- Correlating moment0 maps of line emissions to various properties of ISM.
- Creating radial maps.
- Implementation of higher order moment maps.



Thank You
- Jay Motka

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