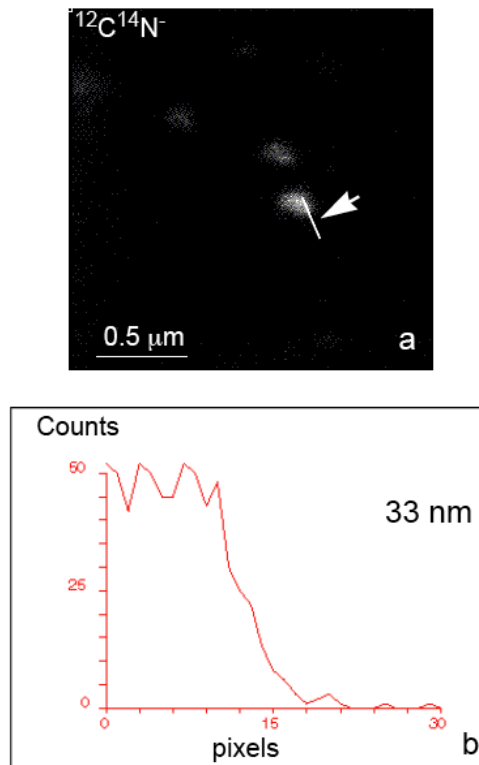


Additional File 2: Estimation of lateral resolution



We have estimated a spatial resolution from the $^{12}\text{C}^{14}\text{N}^-$ signal of a ‘dust grain’ scanned over a $2\ \mu\text{m} \times 2\ \mu\text{m}$ area, 256×256 pixels. The intensity count profile along the line indicated by the arrow in panel a is shown in panel b. Using the ‘16%-84% maximum signal’ criterion, the calculated lateral resolution is 33 nm. The real resolution is likely to be better because the sample – and therefore the step function – are not ideal. Note that the critical aspect of the measurement is ensuring that on either side of the sharp edge, the “knife edge”, one has a relatively constant intensity (flat bottom and flat top) over at least twice the estimated diameter of the probe size. See: Michael, J.R. and D.B. Williams, A consistent definition of probe size and spatial resolution in the analytical electron microscope. *Journal of Microscopy*, 1987. **147** Pt. 3: p. 289-303.