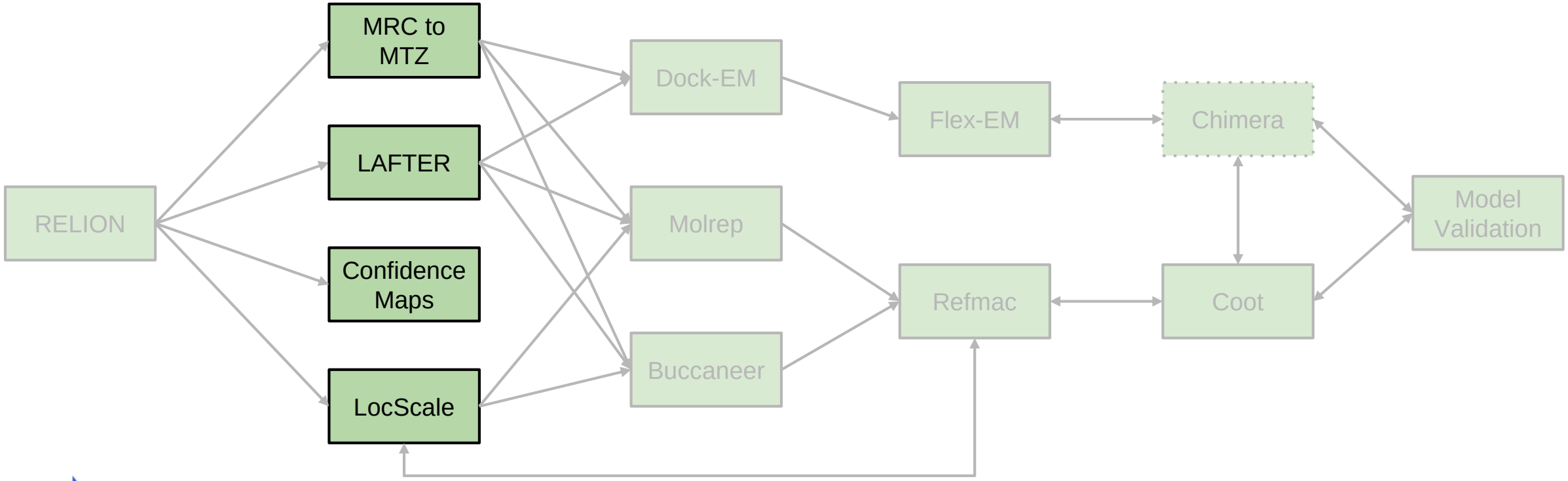
CCP-EM workflow

Single Particle Reconstruction | **Map Optimisation** | Docking / Model Building | Automated Refinement | Interactive Refinement | Validation



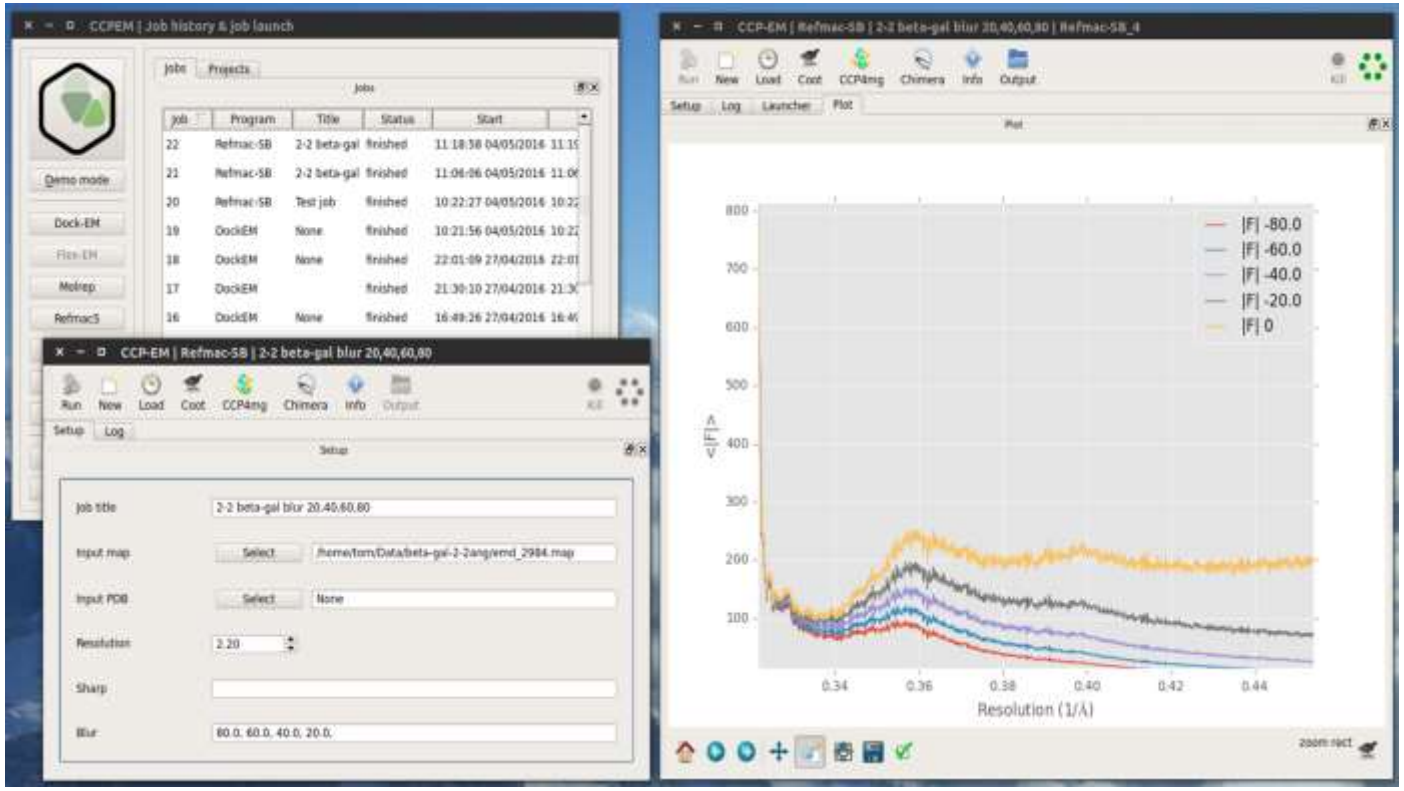
Science and Technology Facilities Council

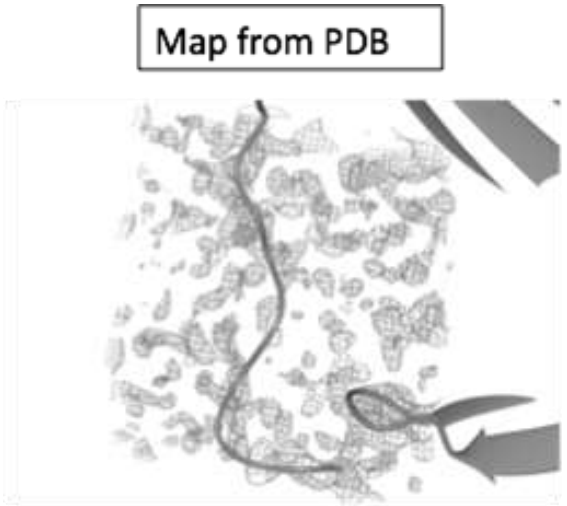
Map sharpening

MRC to MTZ

Global map sharpening / blurring

Try an array of sharpening factors





Science and Technology Facilities Council

Garib Murshudov

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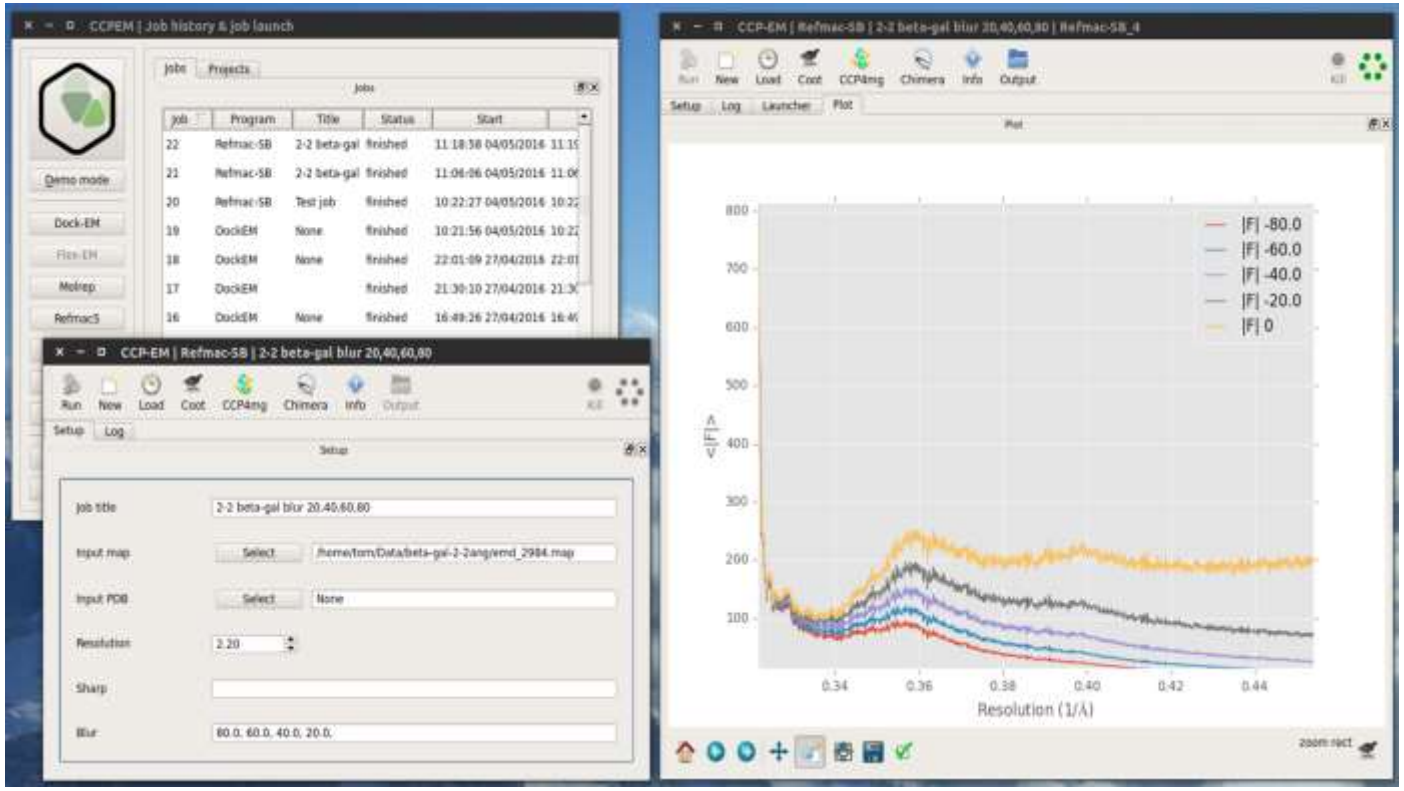
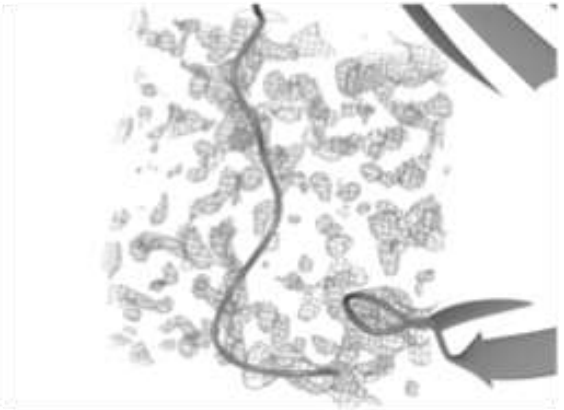
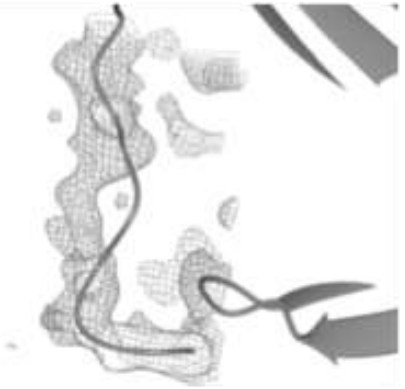


Map from PDB



Blurred: B = 60



Model refined against blurred map

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Map sharpening

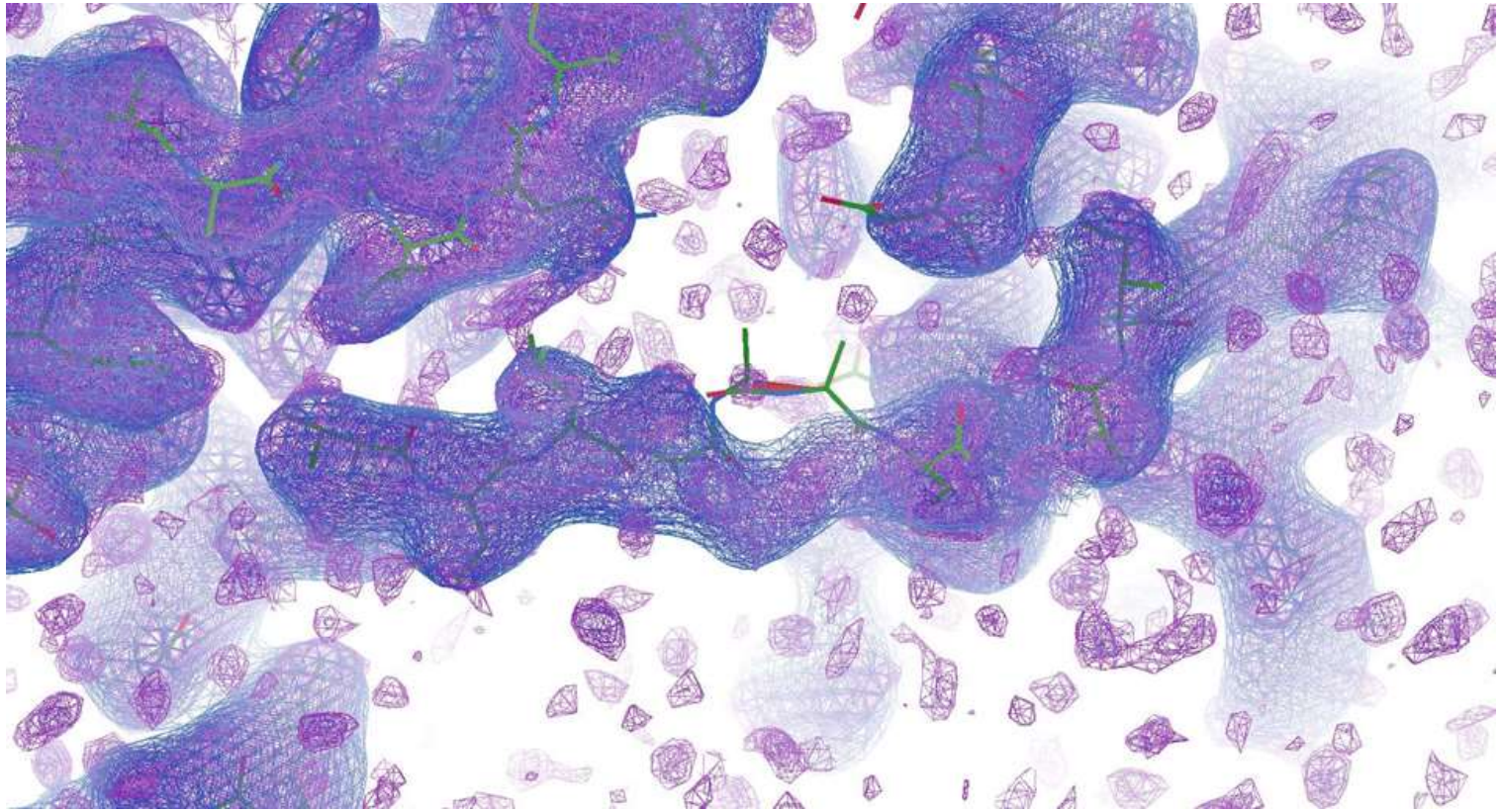
MRC to MTZ

Global map sharpening / blurring

Try an array of sharpening factors

Visualise multiple sharpened / blurred maps in Coot

Expect local variation...



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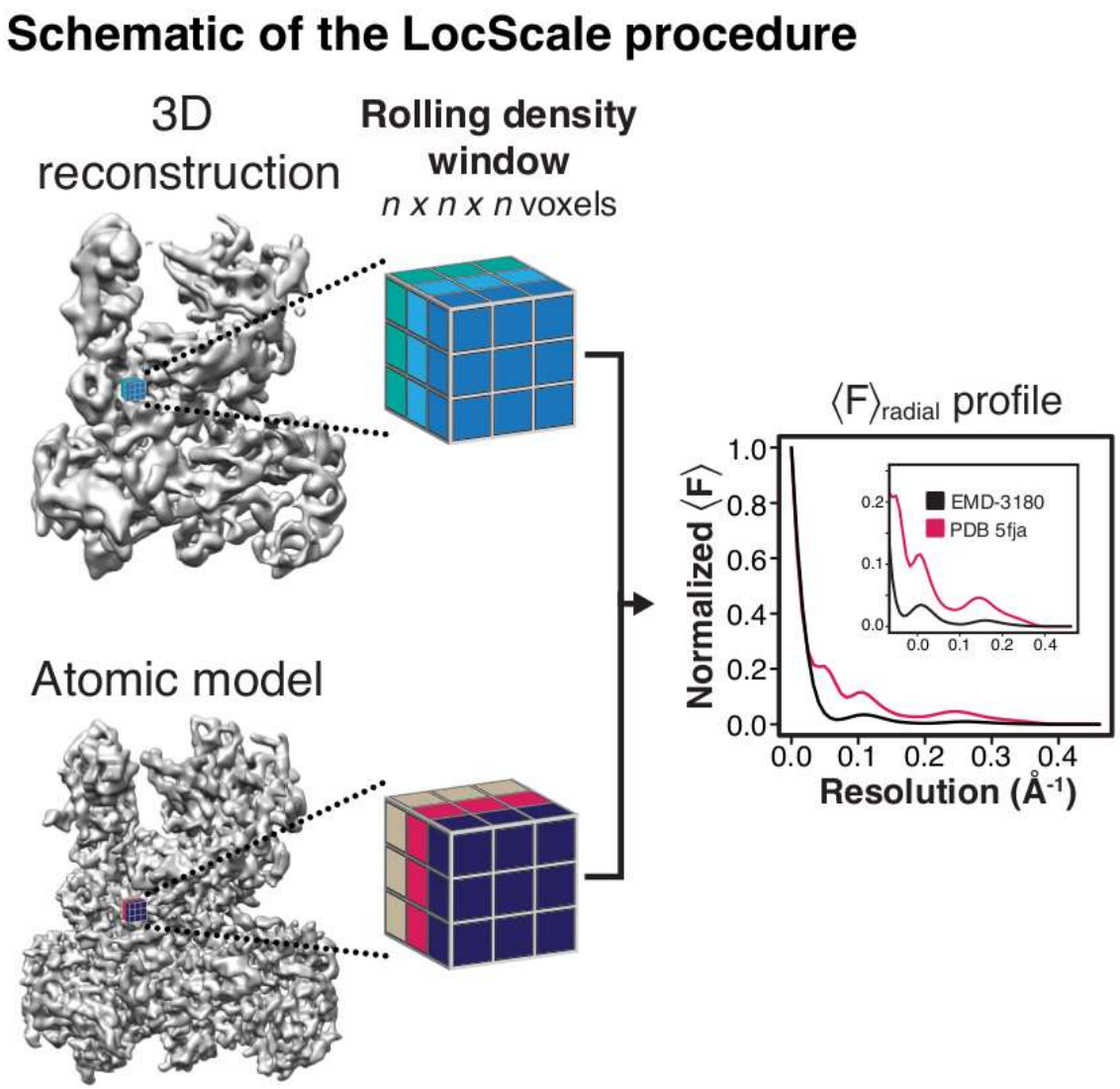
LocScale

Locally adaptive map sharpening

Fits experimental map to local amplitude profile from atomic model B-factors

Requires a refined model (for now!)

Iterative process of model building and map improvement



Science and Technology Facilities Council

Arjen Jakobi

Jakobi et al. eLife (2017) 6:e27131

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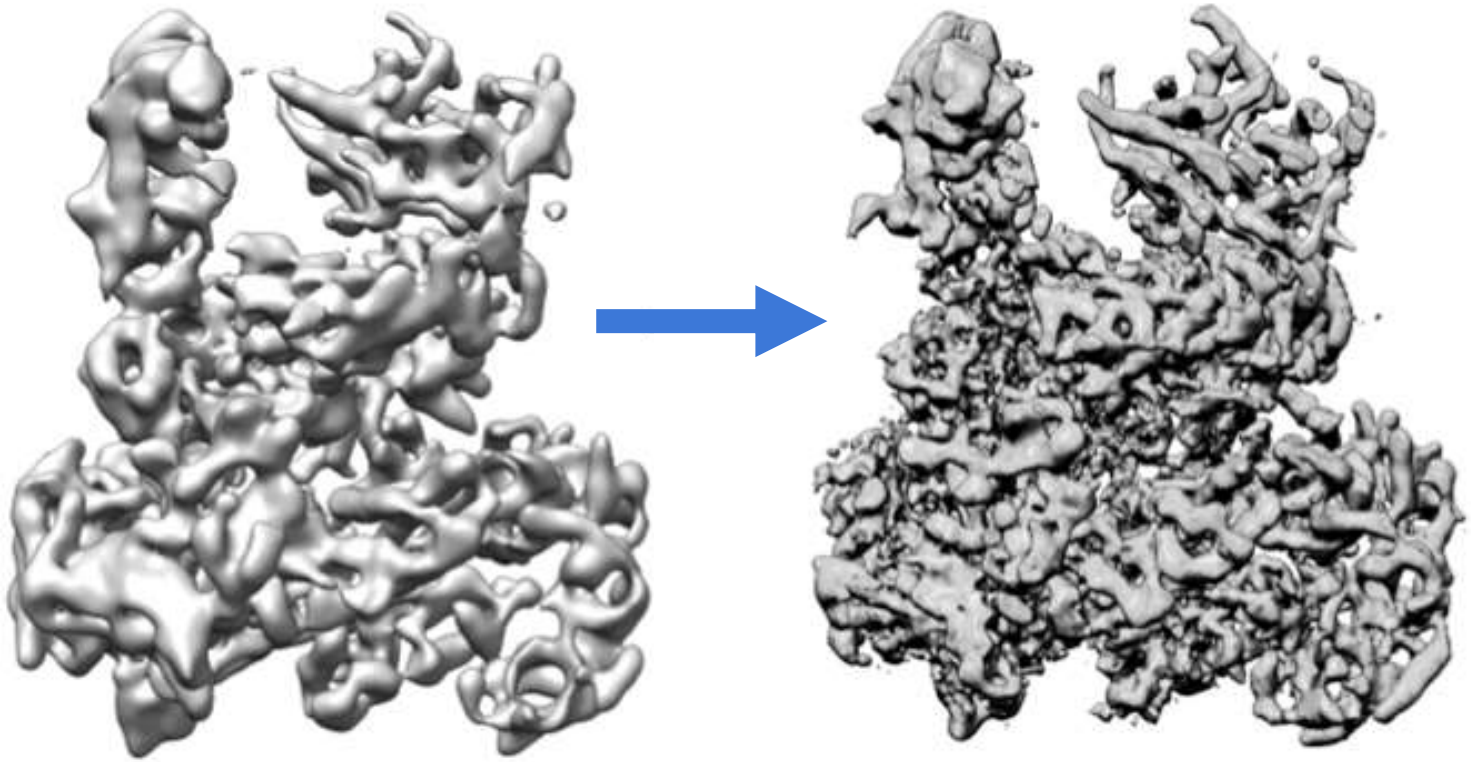

RNA Pol-III

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Arjen Jakobi

Jakobi et al. eLife (2017) 6:e27131

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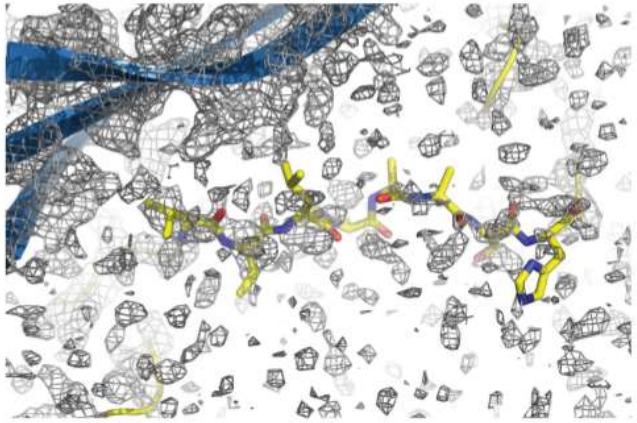
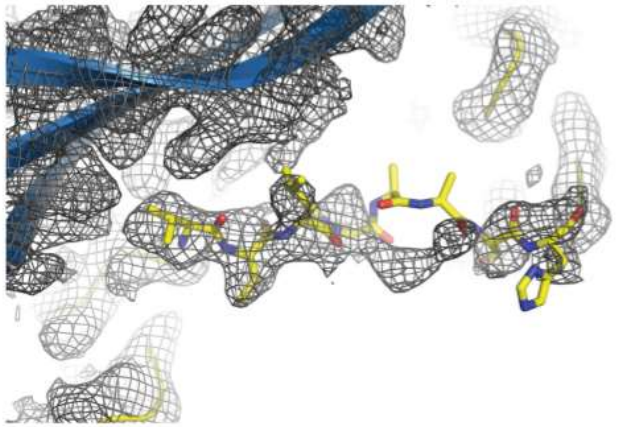
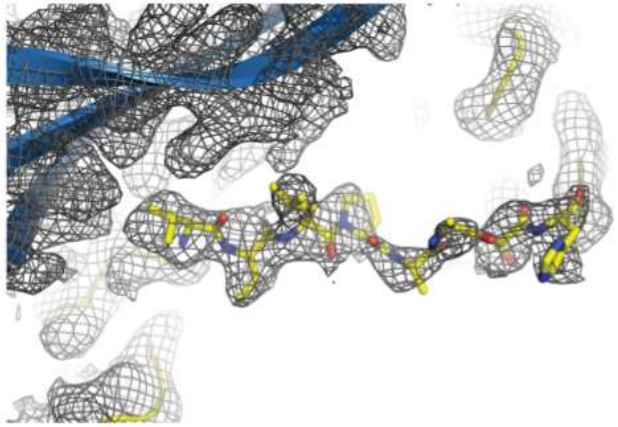


EMD-2984 / PDB 5a1a



LocScale / PDB 5a1a



LocScale / rebuilt

Arjen Jakobi

Science and Technology Facilities Council

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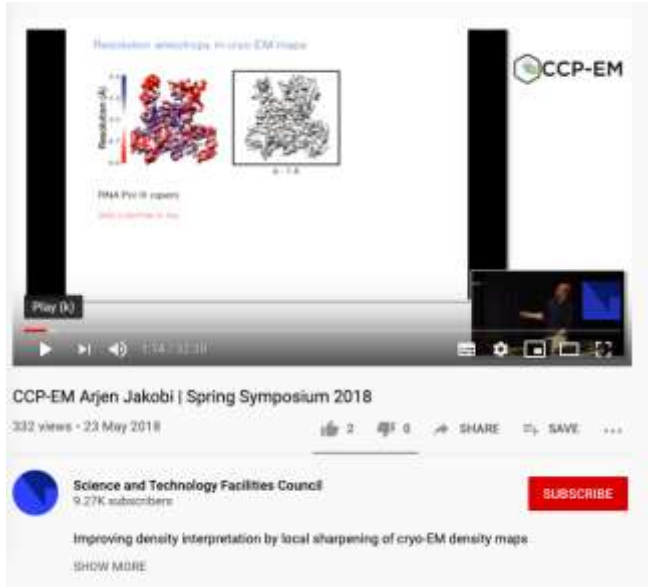
LocScale

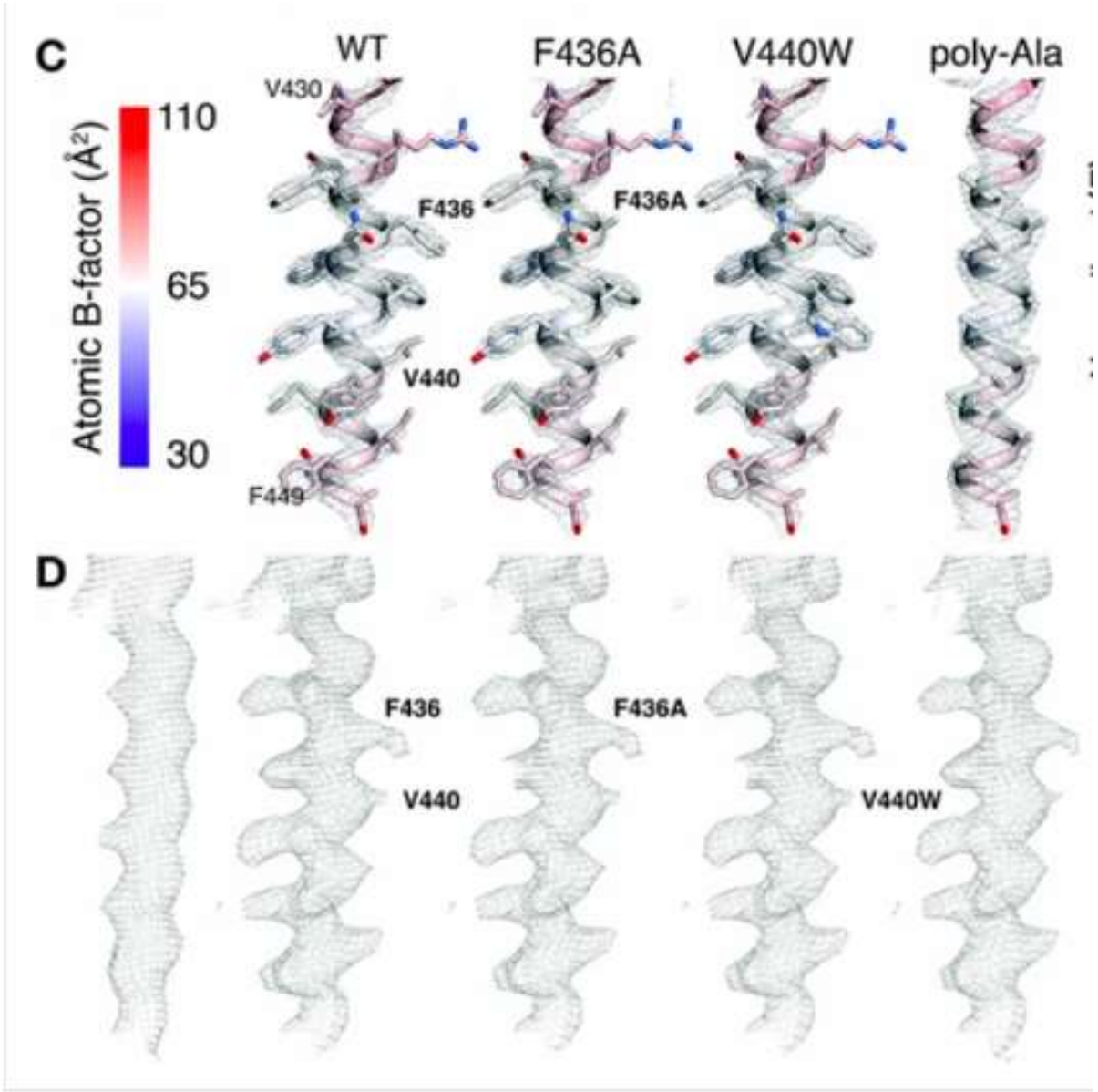
eLIFE HOME MAGAZINE INNOVATION

STRUCTURAL BIOLOGY AND MOLECULAR BIOPHYSICS

Model-based local density sharpening of cryo-EM maps

Arjen J Jakobi, Matthias Wilmanns, Carsten Sachse
European Molecular Biology Laboratory, Germany; The Hamburg Centre for Ultrafast Imaging, Germany





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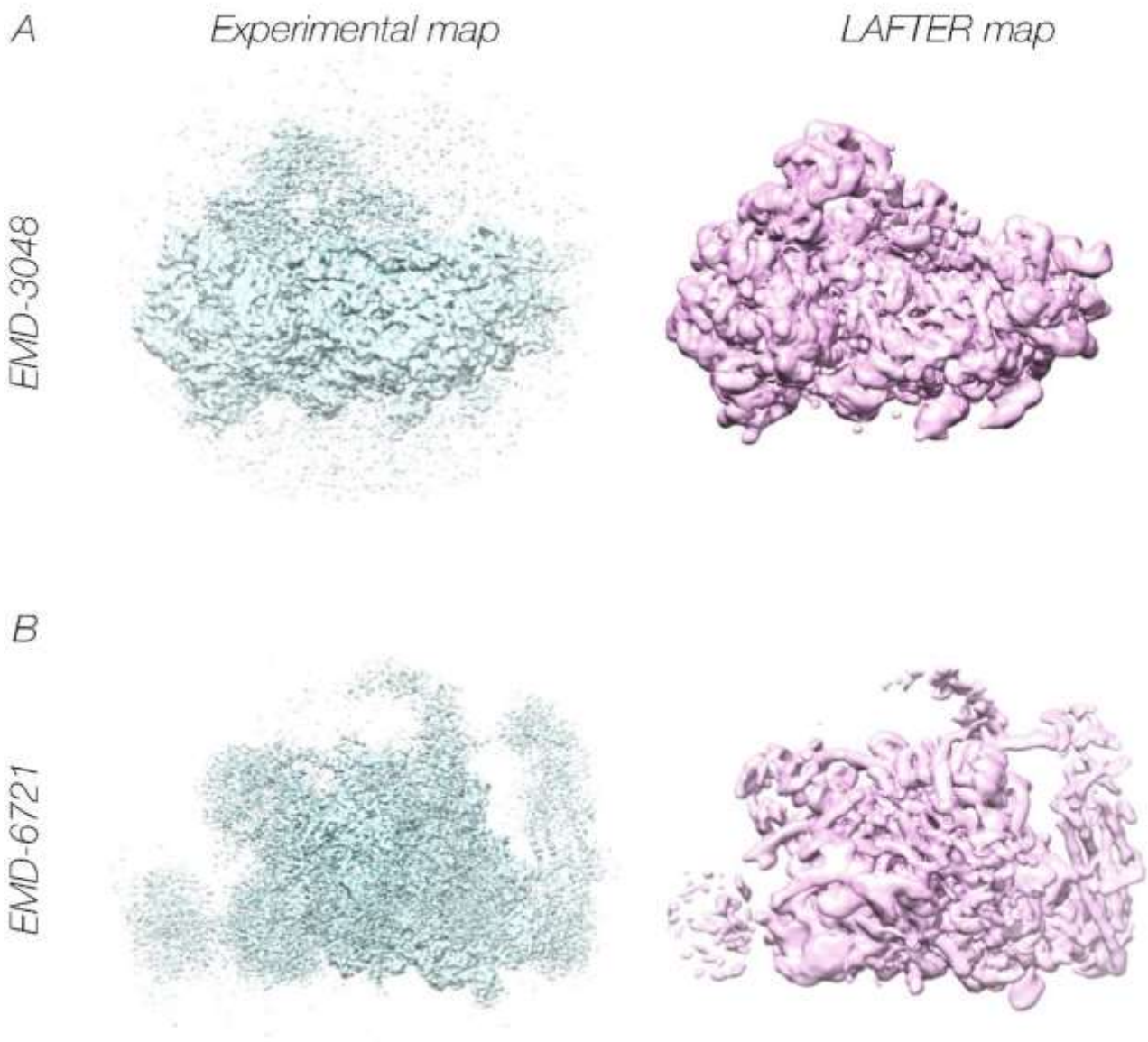
Jakobi et al. eLife (2017) 6:e27131

LAFTER

Local **A**greement **F**ilter for **T**ransmission **E**M **R**econstructions

Compares band-passed half maps to identify locally-shared features

Preserves shared signal, suppresses noise



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Chris Aylett

Ramlaul, Palmer & Aylett (2019) J. Struct. Biol 205:30–40

LAFTER

Local **A**greement **F**ilter for **T**ransmission **E**M **R**econstructions

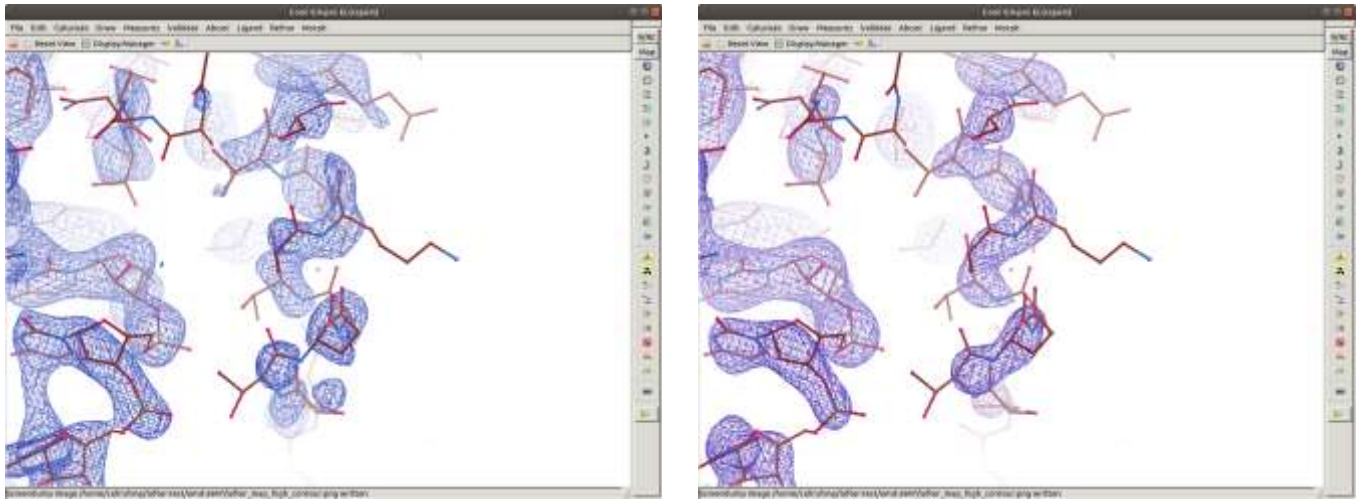
Compares band-passed half maps to identify locally-shared features

Preserves shared signal, suppresses noise

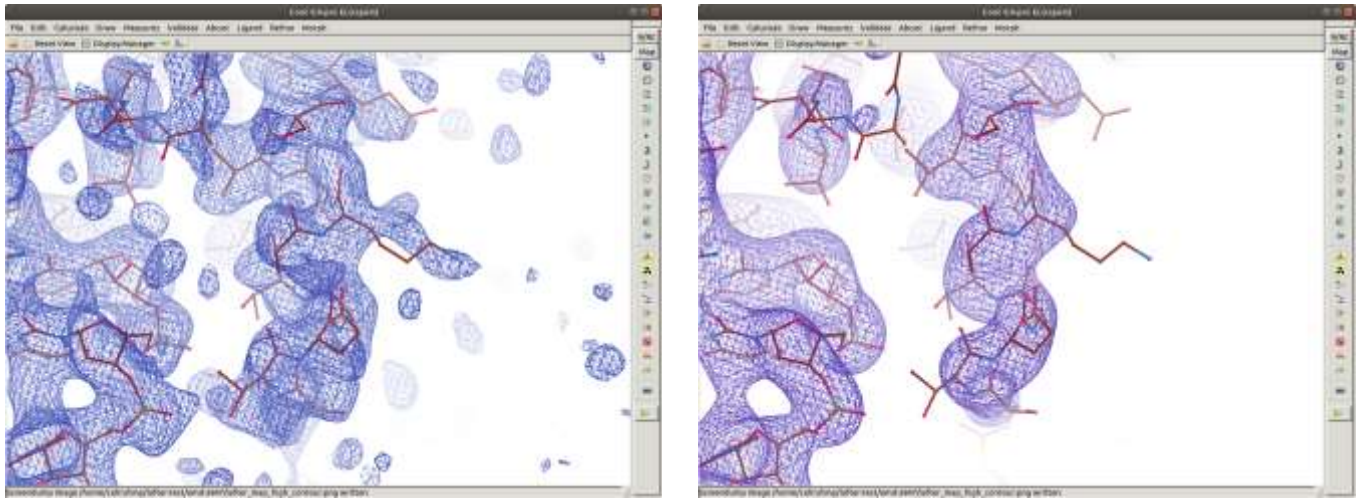
High contour: strong features remain similar

Low contour: weak noise features are removed

Original EMD-2847 | LAFTER filtered



High contour



Low contour

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Chris Aylett

Ramlaul, Palmer & Aylett (2019) J. Struct. Biol 205:30–40

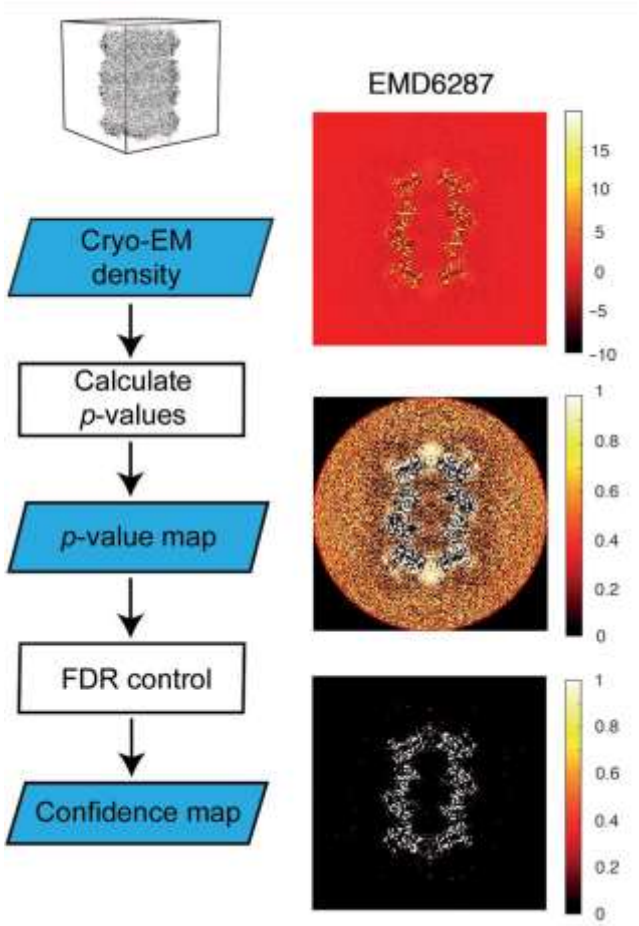
Confidence Maps

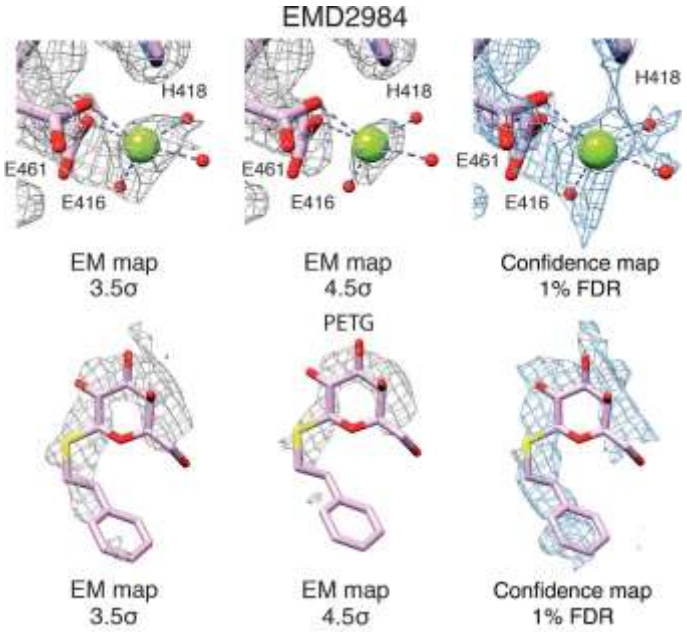
Applies multiple hypothesis testing to cryo-EM maps

p-values adjusted for control of False Discovery Rate

Voxel values give a measure of confidence that we can discriminate signal from noise

At a threshold of 0.99 (1% FDR), at least 99% of the voxels truly indicate positive density signal in the map





Max Beckers

Science and Technology Facilities Council

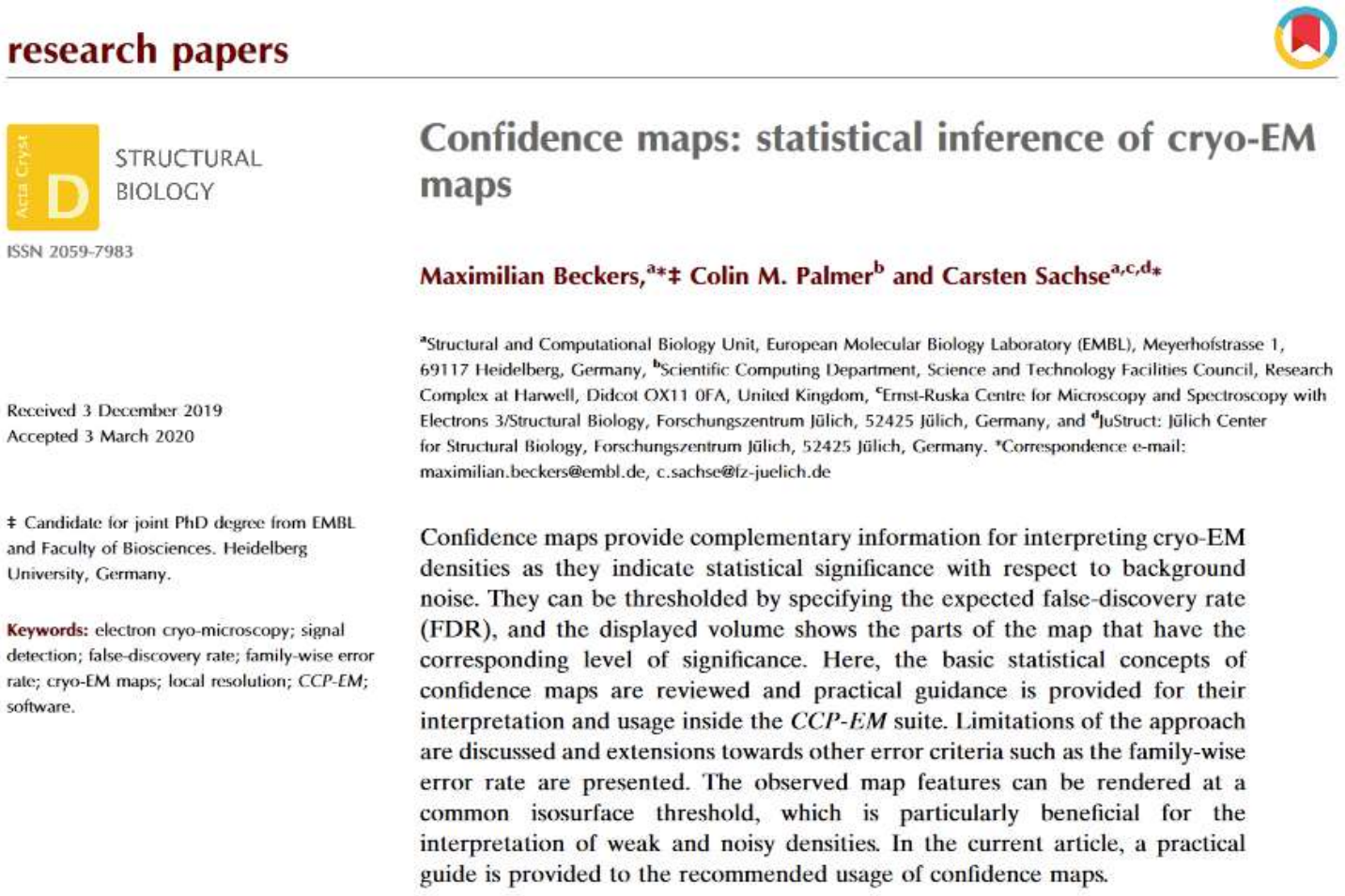
Beckers, Jakobi & Sachse (2019)

Confidence Maps

New paper out recently in *Acta D*

Practical guidance for use and interpretation

doi:10.1107/S2059798320002995



research papers

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Confidence maps: statistical inference of cryo-EM maps

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Keywords: electron cryo-microscopy; signal detection; false-discovery rate; family-wise error rate; cryo-EM maps; local resolution; *CCP-EM*; software.

Confidence maps provide complementary information for interpreting cryo-EM densities as they indicate statistical significance with respect to background noise. They can be thresholded by specifying the expected false-discovery rate (FDR), and the displayed volume shows the parts of the map that have the corresponding level of significance. Here, the basic statistical concepts of confidence maps are reviewed and practical guidance is provided for their interpretation and usage inside the *CCP-EM* suite. Limitations of the approach are discussed and extensions towards other error criteria such as the family-wise error rate are presented. The observed map features can be rendered at a common isosurface threshold, which is particularly beneficial for the interpretation of weak and noisy densities. In the current article, a practical guide is provided to the recommended usage of confidence maps.

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