Electronic Supplementary Information (ESI)

Development of Abel's Inversion Method to Extract Radially Resolved Optical Emission Maps from Spectral Data Cubes Collected via Push-Broom Hyperspectral Imaging with Sub-pixel Shifting Sampling

Songyue Shi, Kevin Finch, Yue She, Gerardo Gamez*

Texas Tech University, Department of Chemistry and Biochemistry, Lubbock, TX, 79409-41061, USA.

*Corresponding author. Phone: (806) 834-8946 Email: gerardo.gamez@ttu.edu

This material includes supplemental information to the primary manuscript.

Table of content:

Section 1

The shape of three different types (convex, flat, and concave) of model spatial profiles are shown in Fig. S1a to S1c, respectively, representing the different monochromatic emission intensity distribution patterns along the x-dimension at certain y- positions.

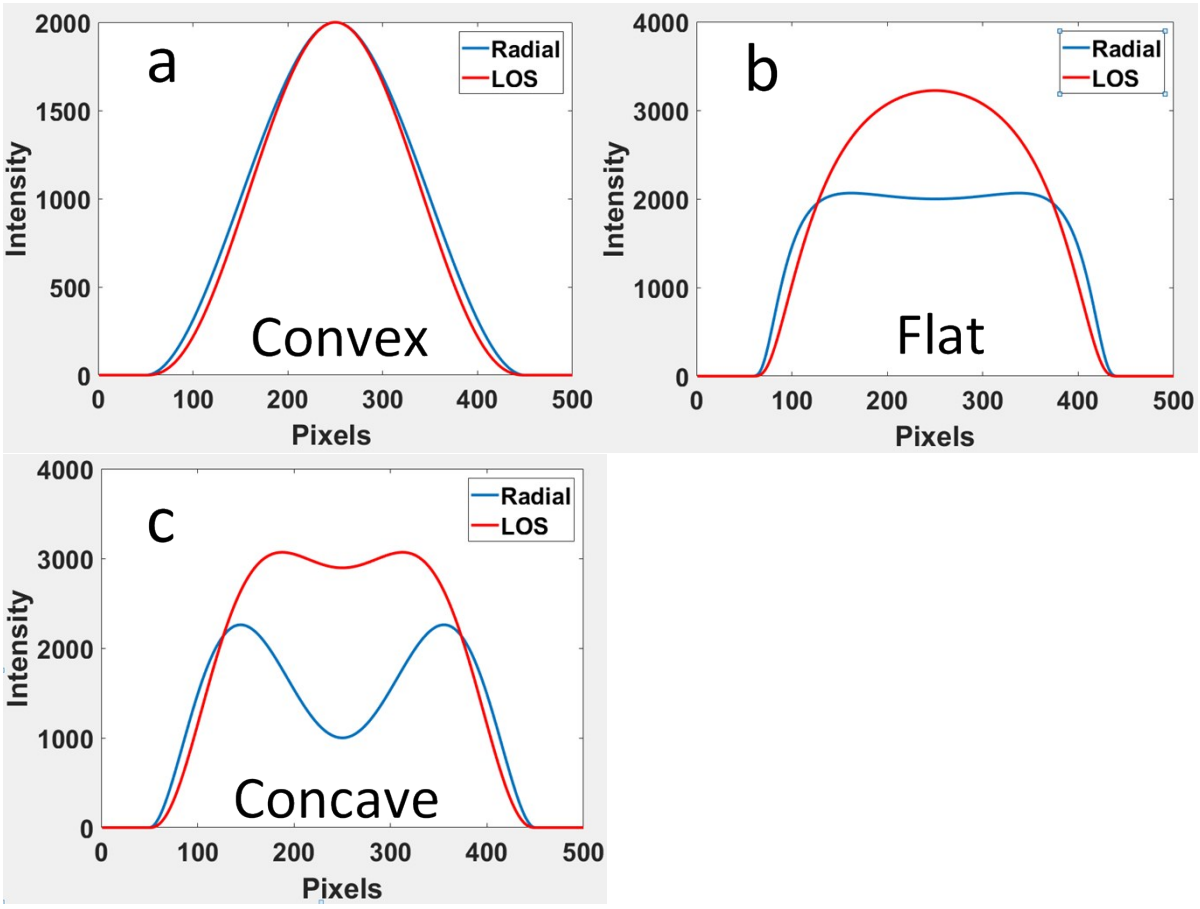

Figure S1. The radial profile (blue) and its corresponding LOS profile (red) with 3 different distribution shapes: a) convex, b) flat, and c) concave.

Section 2

Comparison of the original concave model radial profile (c.f. Figure S1c) to the radial profile reconstructed from the corresponding LOS profile with no noise added, and with 15% edge-focused noise added. The results show that the reconstructed radial profile will have the same shape as the original radial profile in the absence of noise added to the corresponding LOS profile, which validates the Fourier-based Abel's inversion algorithm protocol.

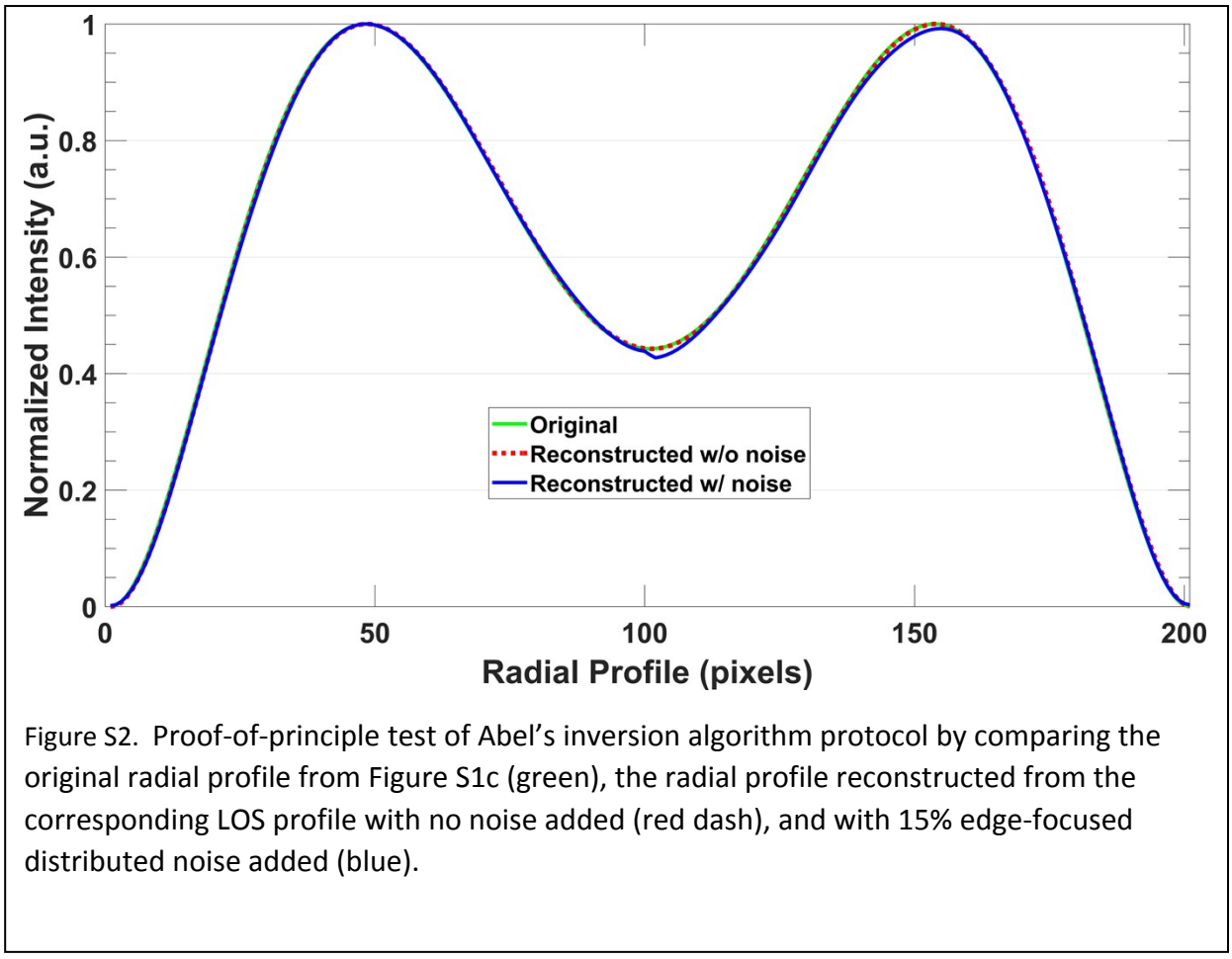

Figure S2. Proof-of-principle test of Abel's inversion algorithm protocol by comparing the original radial profile from Figure S1c (green), the radial profile reconstructed from the corresponding LOS profile with no noise added (red dash), and with 15% edge-focused distributed noise added (blue).

Section 3

The absolute residual between the reconstructed radial profile after Abel's inversion algorithm and the original radial profile as a function of the radial position. The signal profile radius is 100 and a homogenously distributed error of 3% is added. It is evident that the error from the reconstruction is distributed along the radius instead of accumulated at the axial position (r/R=0).

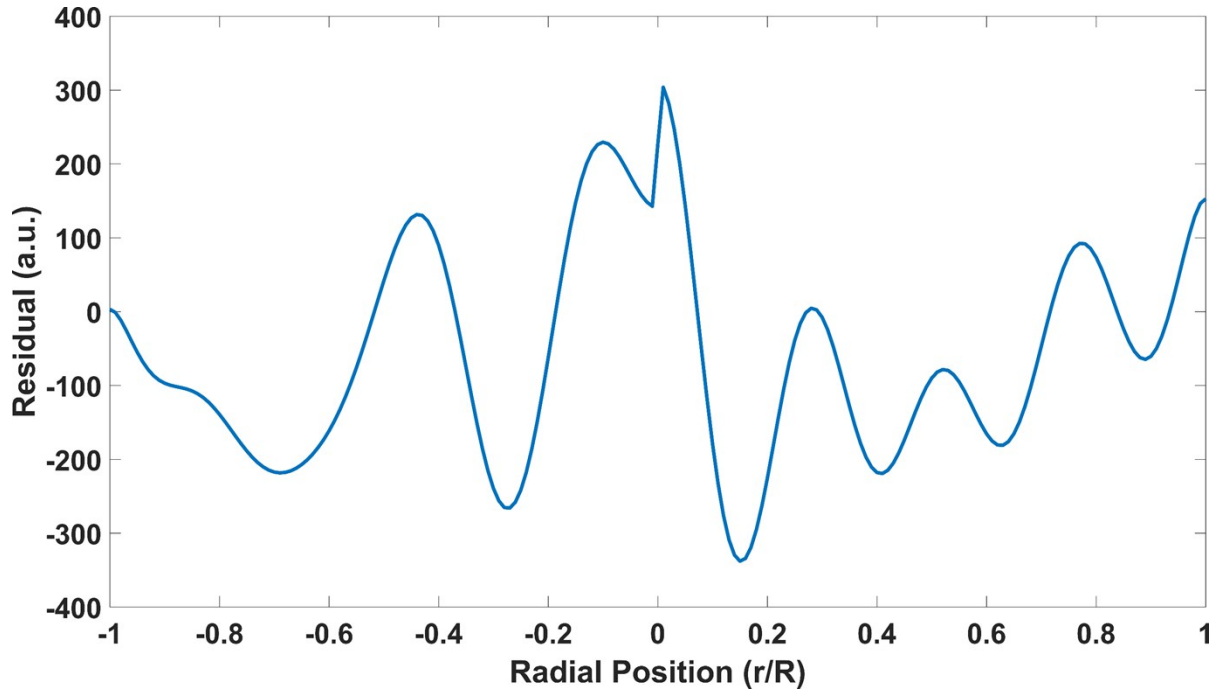

Figure S3. Absolute residual between the reconstructed radial profile after Abel's inversion algorithm and the original radial profile as a function of the radial position, with 3% homogenously distributed error added and a radius of 100 pixels.