Cardiovascular Magnetic Resonance Evaluation of Aortic Stenosis Severity using Single Plane Measurement of Effective Orifice Area

Complementary Information

J. Garcia[1, 2], O. R. Marrufo[3], A.O. Rodriguez[3], E. Larose[1], P. Pibarot[1], L. Kadem[2§]

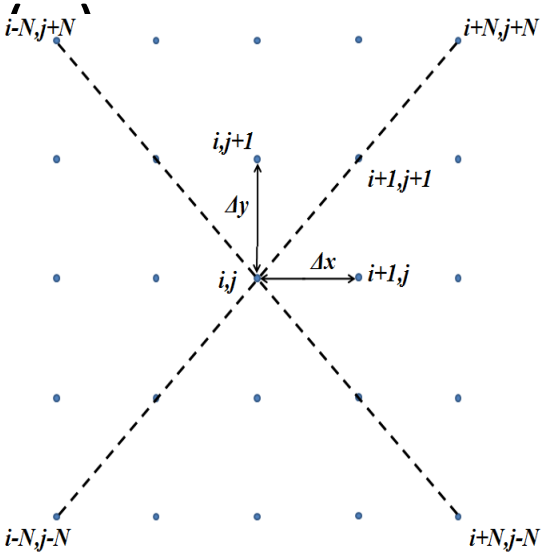
[1] Québec Heart & Lung Institute, Laval University, Québec, Canada.

[2] Laboratory of Cardiovascular Fluid Dynamics, Concordia University, Montréal, Canada.

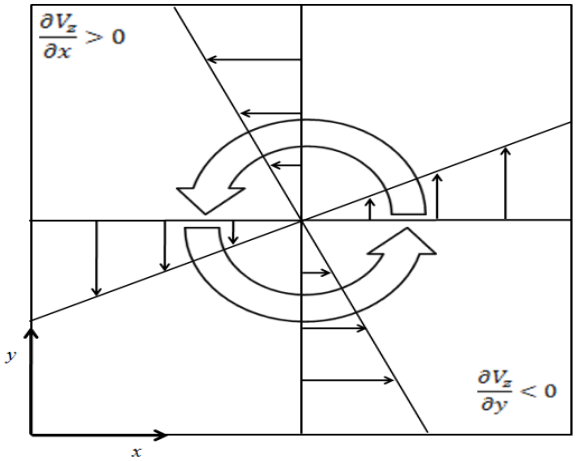
[3] Department of Electrical Engineering, Universidad Autonoma Metropolitana, Mexico DF, Mexico.

Acoustical Source Term Computation (AST)

- AST is given by the term: $[\nabla \cdot (\omega \wedge V)]$
- AST maps determine the flow regions responsible for the sound generated by unsteady fluid motion and require the determination of velocity (*V*) and vorticity (ω) maps
- AST computation considers that velocity is known only at discrete locations (voxel) on a 2D plane to compute vorticity

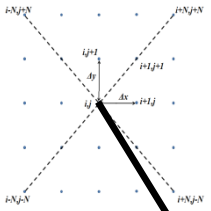


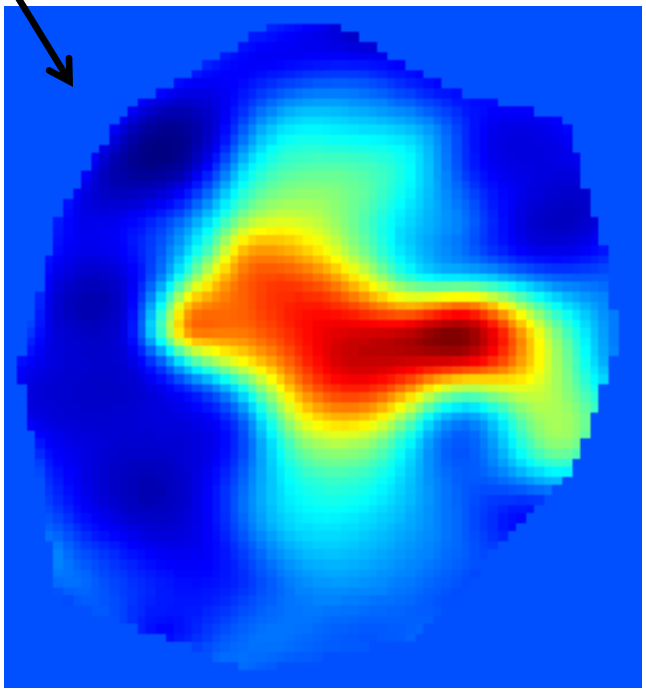
$$\omega = \left(\frac{\partial V_z}{\partial x} - \frac{\partial V_z}{\partial y}\right)$$



Acoustical Source Term Computation (AST)

- Computation of vorticity from CMR velocity field:





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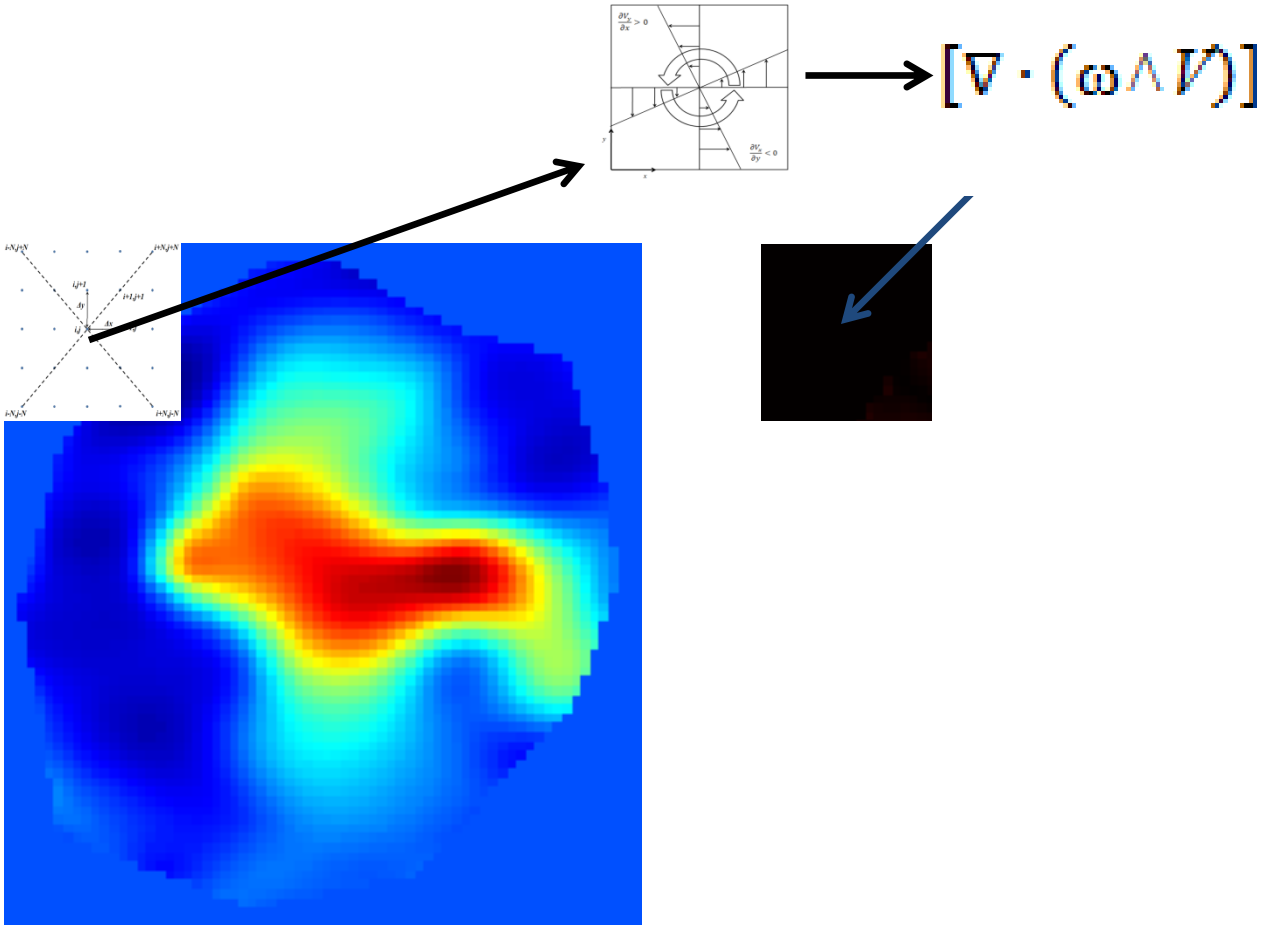

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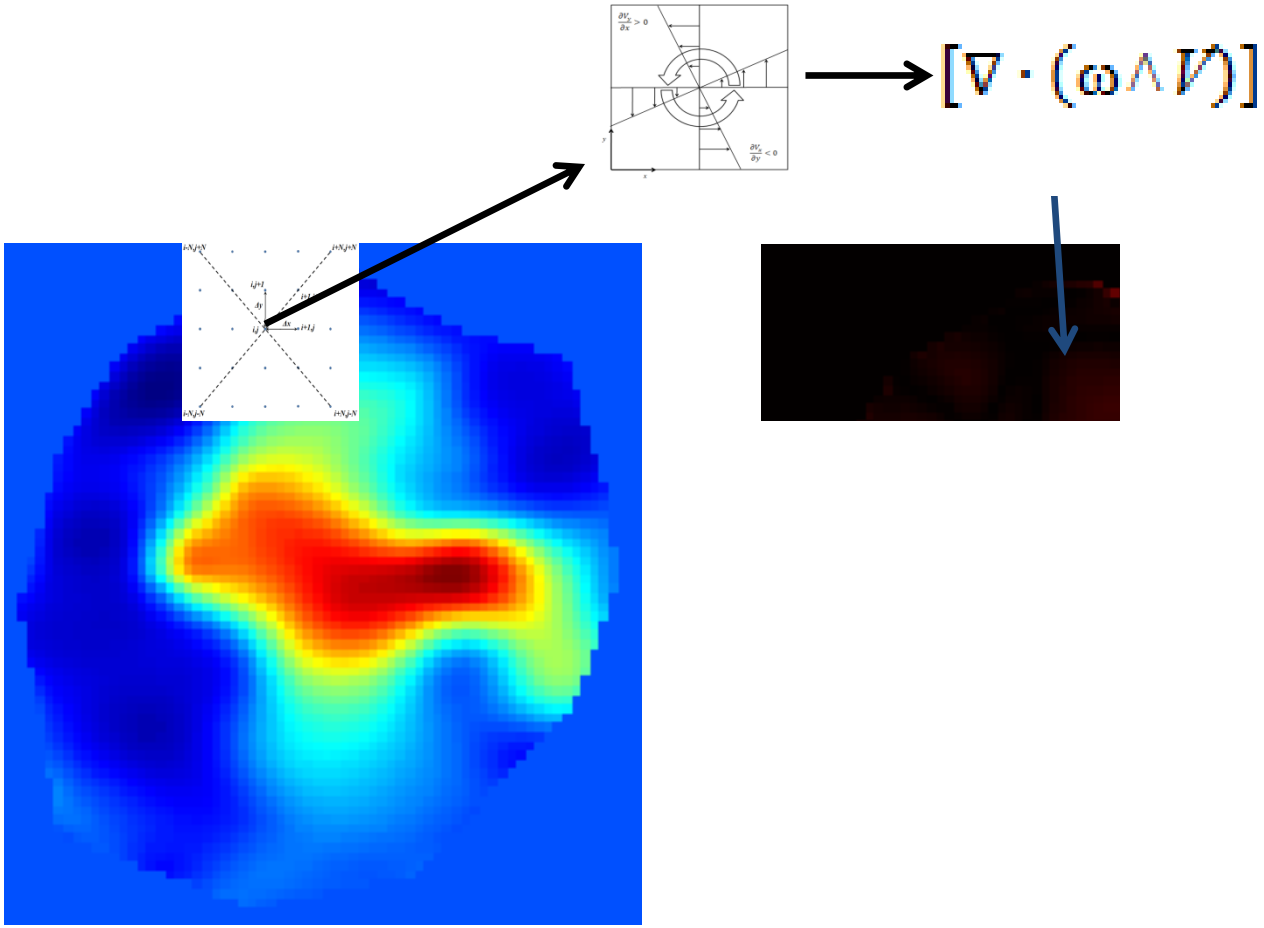

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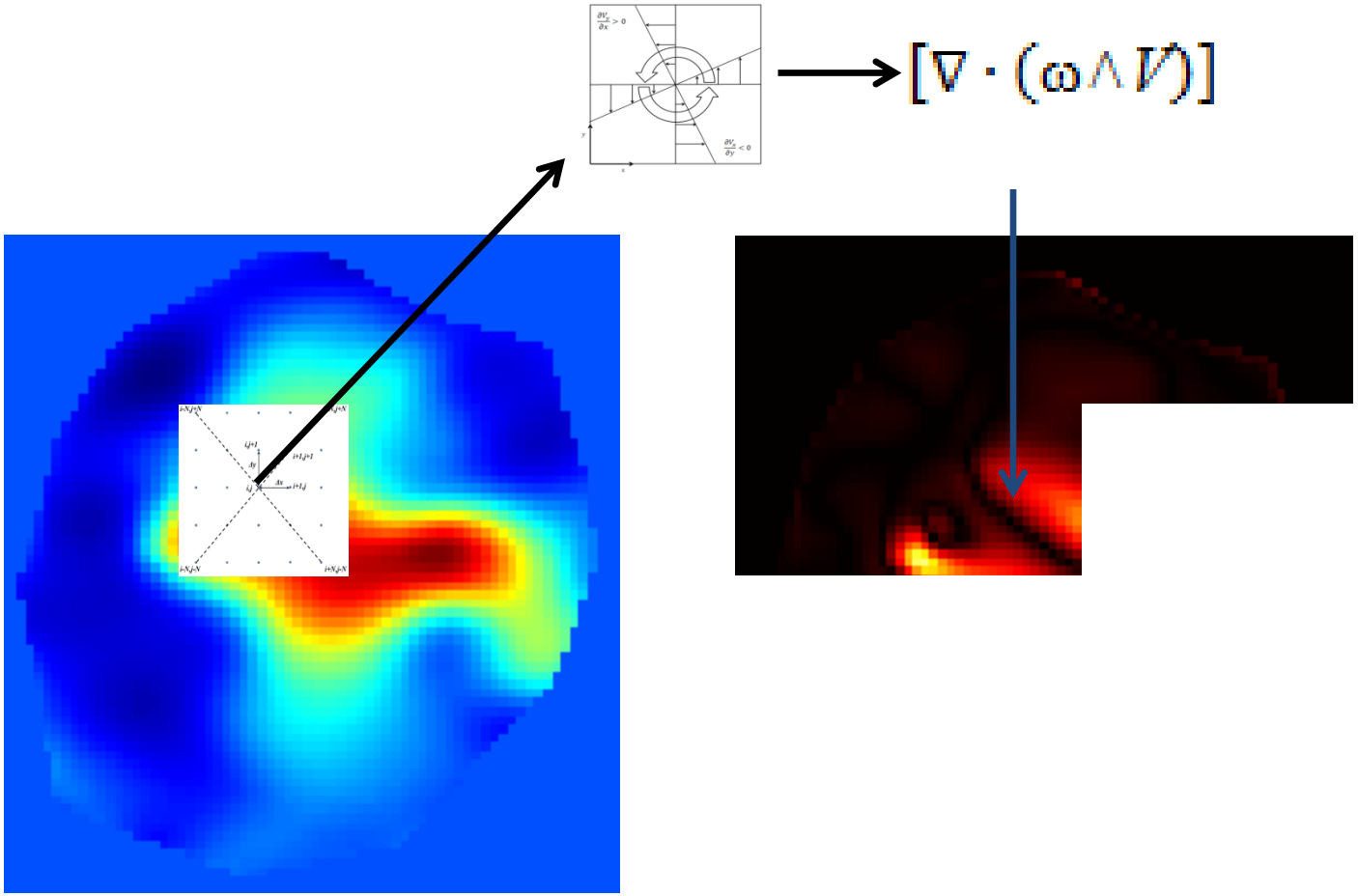

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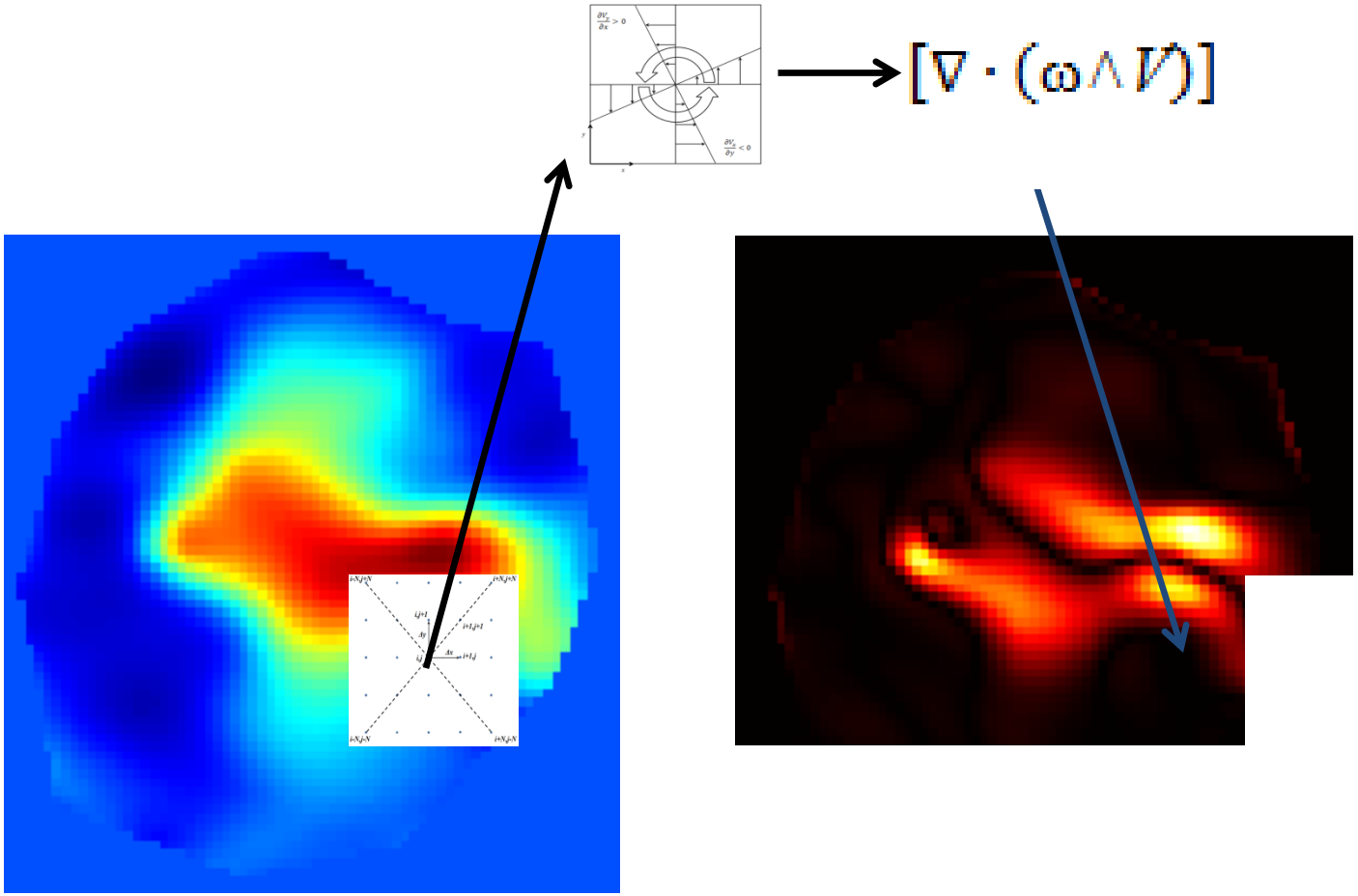

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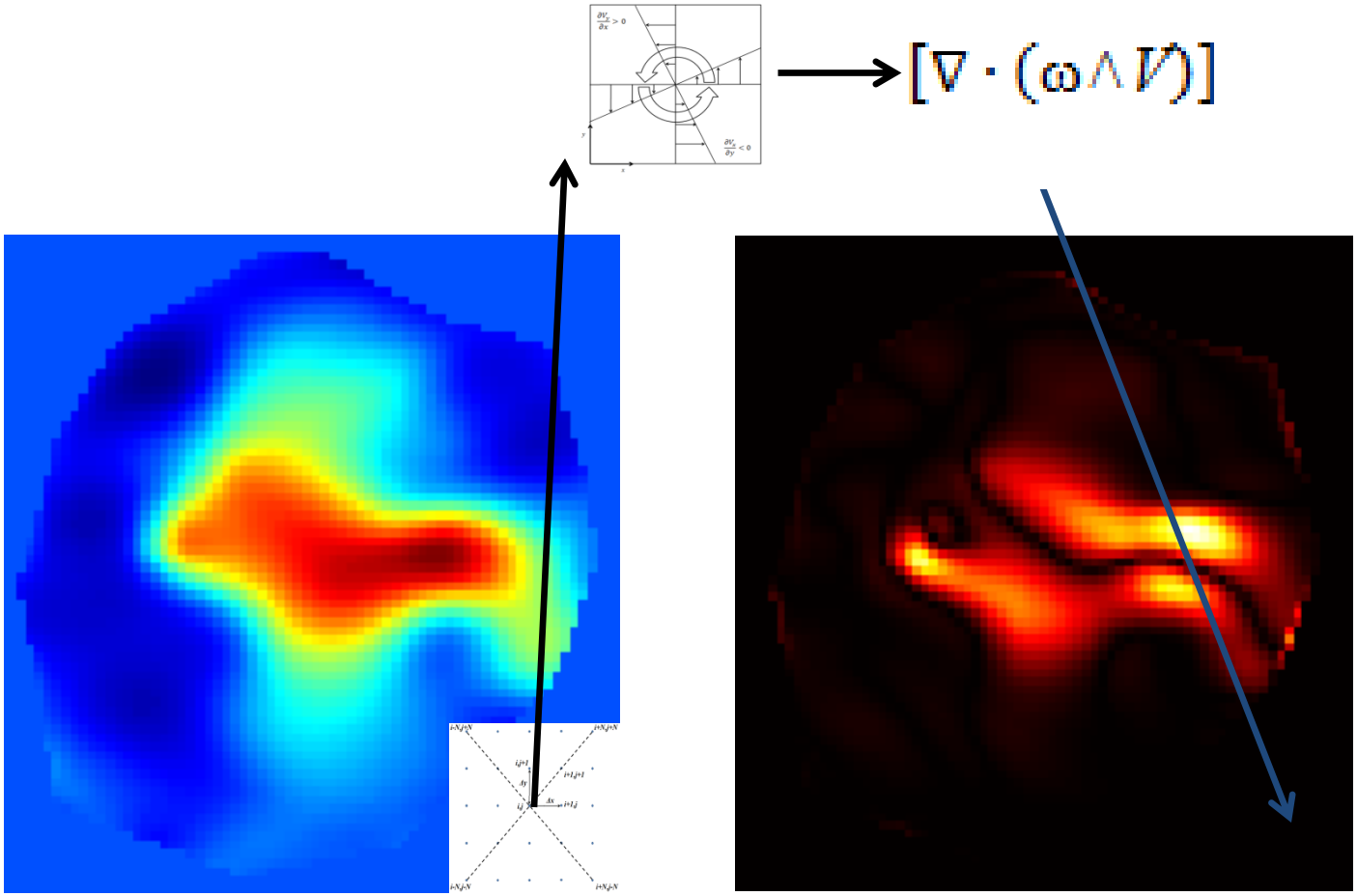
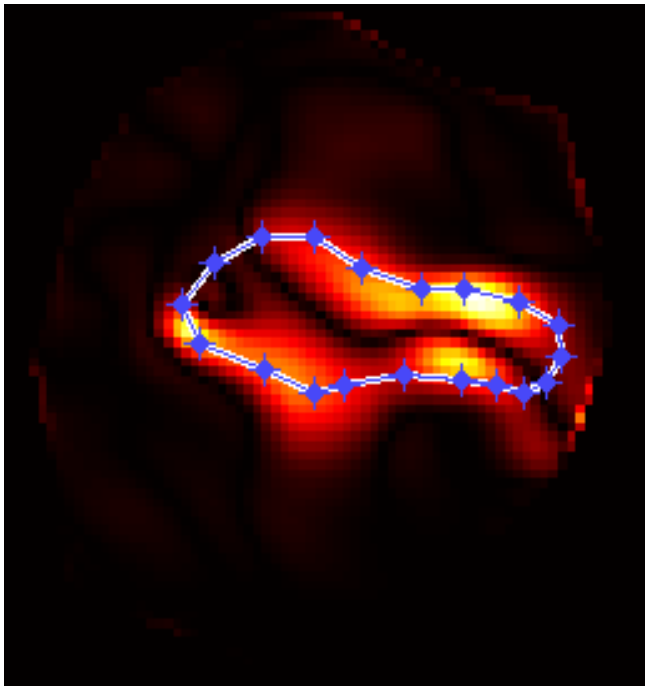


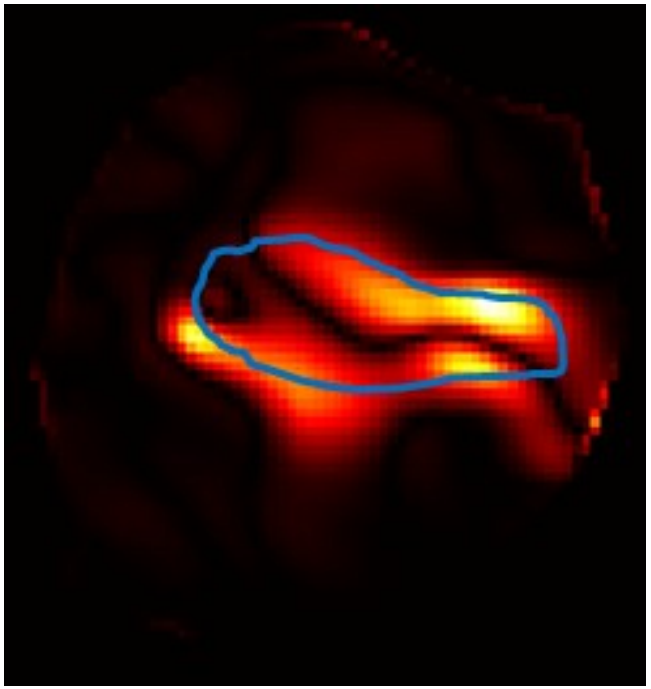
Acoustical Source Term Computation (AST)

• Once vorticity and AST maps are computed, a jet shear layer detection (JSLD) contour algorithm is applied to estimate effective orifice area (EOA)

JSLD initial contour



JSLD EOA



Acoustical Source Term Computation (AST)

- A Matlab application with all EOA methods used on this paper can be downloaded for free from our web site:

http://users.encs.concordia.ca/~kadem/Research.html

- This application is compatible with Philips 1.5T and 3T DICOM formats