Stanford

John Eaton

Charles Lee Powell Foundation Professor in the School of Engineering, Emeritus

Mechanical Engineering

CONTACT INFORMATION

- **Alternate Contact**

  Susan Dorman - Administrative Assistant

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Bio

BIO

Eaton uses experiments and computational simulations to study the flow and heat transfer in complex turbulent flows, especially those relevant to turbomachinery, particle-laden flows, and separated flows, and to develop new techniques for precise control of gas and surface temperature during manufacturing processes.

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Mechanical Engineering
- Member, Maternal & Child Health Research Institute (MCHRI)

HONORS AND AWARDS

- Perin Award for Undergraduate Teaching, Stanford University (2013)
- Fellow, American Society of Mechanical Engineers (2013)
- Presidential Young Investigator Award, National Science Foundation (2013)
- Tau Beta Pi Award for Excellence in Undergraduate Teaching, Stanford University (2013)
- Three-Year Graduate Fellowship, National Science Foundation (2013)
- Silver Medal Award, Royal Society of the Arts (2013)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- member, Editorial Advisory Board of International Journal of Heat and Fluid Flow (2013 - present)
- member, Tau Beta Pi (2013 - present)
- member, Phi Beta Kappa (2013 - present)
- member, Sigma Xi (2013 - present)

PROFESSIONAL EDUCATION

- PhD, Stanford University , Mechanical Engineering (1980)

Publications

PUBLICATIONS

- **Assessing the Impact of Cardiac Output and Valve Orientation on Bioprosthetic Pulmonary Valve Hemodynamics Using In Vitro 4D-Flow MRI and High-Speed Imaging.** *Cardiovascular engineering and technology*
  Schiavone, N. K., Nair, P. J., Elkins, C. J., McElhinney, D. B., Ennis, D. B., Eaton, J. K., Marsden, A. L.
  2024
- **Comparison of Immersed Boundary Simulations of Heart Valve Hemodynamics Against In Vitro 4D Flow MRI Data.** *Annals of biomedical engineering*
  Kaiser, A. D., Schiavone, N. K., Elkins, C. J., McElhinney, D. B., Eaton, J. K., Marsden, A. L.
  2023
- **A coupled framework for symbolic turbulence models from deep-learning** *INTERNATIONAL JOURNAL OF HEAT AND FLUID FLOW*
  Lav, C., Banko, A. J., Waschkowski, F., Zhao, Y., Elkins, C. J., Eaton, J. K., Sandberg, R. D.
  2023; 101
- **Experimental investigation of particle aggregation in a humid and turbulent environment** *INTERNATIONAL JOURNAL OF MULTIPHASE FLOW*
  Hoffman, D. W., Eaton, J. K.
  2023; 163
- **MRV challenge 2: phase locked turbulent measurements in a roughness array** *EXPERIMENTS IN FLUIDS*
  Benson, M. J., Banko, A. J., Elkins, C. J., An, D., Song, S., Bruschewski, M., Grundmann, S., Bandopadhyay, T., Roca, L., Sutton, B., Han, K., Hwang, W., Eaton, et al
  2023; 64 (1)
- **Magnetic Resonance Imaging measurements of scalar dispersion for a scaled urban transient release** *BUILDING AND ENVIRONMENT*
  Homan, T. A., Benson, M. J., Banko, A. J., Elkins, C. J., Chung, D. H., Rhee, J., Mooradian, L. D., Eaton, J. K.
  2021; 205
- **On the generality of tensor basis neural networks for turbulent scalar flux modeling** *INTERNATIONAL COMMUNICATIONS IN HEAT AND MASS TRANSFER*
  Milani, P. M., Ling, J., Eaton, J. K.
  2021; 128
- **Isotropic turbulence apparatus with a large vertical extent** *EXPERIMENTS IN FLUIDS*
  Hoffman, D. W., Eaton, J. K.
  2021; 62 (10)
- **Velocity and concentration field measurements and large eddy simulation of a shaped film cooling hole** *INTERNATIONAL JOURNAL OF HEAT AND FLUID FLOW*
  Gunady, I. E., Milani, P. M., Banko, A. J., Elkins, C. J., Eaton, J. K.
  2021; 90
- **Conjugate Heat Transfer Analysis Using the Discrete Green's Function** *JOURNAL OF HEAT TRANSFER-TRANSACTIONS OF THE ASME*
  Hoffman, D. W., Eaton, J. K.
  2021; 143 (3)
- **In Vitro Assessment of Right Ventricular Outflow Tract Anatomy and Valve Orientation Effects on Bioprosthetic Pulmonary Valve Hemodynamics.** *Cardiovascular engineering and technology*
  Schiavone, N. K., Elkins, C. J., McElhinney, D. B., Eaton, J. K., Marsden, A. L.
  2021
- **Turbulent scalar flux in inclined jets in crossflow: counter gradient transport and deep learning modelling** *JOURNAL OF FLUID MECHANICS*
  Milani, P. M., Ling, J., Eaton, J. K.
  2020; 906

- **The Discrete Green's Function for Convective Heat Transfer-Part 1: Definition and Physical Understanding** *JOURNAL OF HEAT TRANSFER-TRANSACTIONS OF THE ASME*
  Eaton, J. K.
  2020; 142 (10)
- **Experimental Analysis of a Particle Separator Design With Full-Field Three-Dimensional Measurements** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Borup, D. D., Elkins, C. J., Eaton, J. K.
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- **The Discrete Green's Function for Convective Heat Transfer-Part 2: Semi-Analytical Estimates of Boundary Layer Discrete Green's Function** *JOURNAL OF HEAT TRANSFER-TRANSACTIONS OF THE ASME*
  Eaton, J. K., Milani, P. M.
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- **Temperature statistics in a radiatively heated particle-laden turbulent square duct flow**
  Banko, A. J., Villafane, L., Kim, J., Eaton, J. K.
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- **The 2019 MRV challenge: turbulent flow through a U-bend** *EXPERIMENTS IN FLUIDS*
  Benson, M. J., Banko, A. J., Elkins, C. J., An, D., Song, S., Bruschewski, M., Grundmann, S., Borup, D. D., Eaton, J. K.
  2020; 61 (6)
- **Experimental Study of Flow Inside a Centrifugal Fan Using Magnetic Resonance Velocimetry** *JOURNAL OF ENGINEERING FOR GAS TURBINES AND POWER-TRANSACTIONS OF THE ASME*
  Hoffman, D. W., Villafane, L., Elkins, C. J., Eaton, J. K.
  2020; 142 (4)
- **Large-eddy simulation study of unsteady wake dynamics and geometric sensitivity on a skewed bump** *JOURNAL OF FLUID MECHANICS*
  Ching, D. S., Eaton, J. K.
  2020; 885
- **Shear layer of inclined jets in crossflow studied with spectral proper orthogonal decomposition and spectral transfer entropy** *INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER*
  Milani, P. M., Ching, D. S., Banko, A. J., Eaton, J. K.
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- **An improved three-dimensional concentration measurement technique using magnetic resonance imaging** *EXPERIMENTS IN FLUIDS*
  Banko, A. J., Benson, M. J., Gunady, I. E., Elkins, C. J., Eaton, J. K.
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- **Transport and dispersion of particle-Laden streaks in a standardized human nasal geometry** *EXPERIMENTS IN FLUIDS*
  Borup, D. D., Engel, L. E., Elkins, C. J., Eaton, J. K.
  2020; 61 (2)
- **Generalization of Machine-Learned Turbulent Heat Flux Models Applied to Film Cooling Flows** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Milani, P. M., Ling, J., Eaton, J. K.
  2020; 142 (1)
- **Enriching MRI mean flow data of inclined jets in crossflow with Large Eddy Simulations** *INTERNATIONAL JOURNAL OF HEAT AND FLUID FLOW*
  Milani, P. M., Gunady, I. E., Ching, D. S., Banko, A. J., Elkins, C. J., Eaton, J. K.
  2019; 80
- **3D MRI measurements of the effects of wind direction on flow characteristics and contaminant dispersion in a model urban canopy** *ENVIRONMENTAL FLUID MECHANICS*
  Shim, G., Prasad, D., Elkins, C. J., Eaton, J. K., Benson, M. J.
  2019; 19 (4): 851–78
- **Effects of motion on MRI signal decay from micron-scale particles.** *Journal of magnetic resonance (San Diego, Calif. : 1997)*

Borup, D. D., Elkins, C. J., Eaton, J. K.
2019; 305: 152–61

- **Experimental Study of Periodic Free Stream Unsteadiness Effects on Discrete Hole Film Cooling in Two Geometries** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Borup, D. D., Fan, D., Elkins, C. J., Eaton, J. K.
  2019; 141 (6)
- **Stochastic modeling of direct radiation transmission in particle-laden turbulent flow** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
  Banko, A. J., Villafane, L., Kim, J., Esmaily, M., Eaton, J. K.
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- **Physical Interpretation of Machine Learning Models Applied to Film Cooling Flows** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Milani, P. M., Ling, J., Eaton, J. K.
  2019; 141 (1)
- **GENERALIZATION OF MACHINE-LEARNED TURBULENT HEAT FLUX MODELS APPLIED TO FILM COOLING FLOWS**
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  Gunady, I. E., Borup, D. D., Banko, A. J., Elkins, C. J., Eaton, J. K., ASME
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- **EXPERIMENTAL STUDY OF FLOW INSIDE A CENTRIFUGAL FAN USING MAGNETIC RESONANCE VELOCIMETRY**
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- **EXPERIMENTAL ANALYSIS OF A PARTICLE SEPARATOR DESIGN WITH FULL-FIELD 3D MEASUREMENTS**
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- **Unsteady vortex structures in the wake of nonaxisymmetric bumps using spiral MRV** *EXPERIMENTS IN FLUIDS*
  Ching, D. S., Elkins, C. J., Alley, M. T., Eaton, J. K.
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  Ching, D. S., Elkins, C. J., Eaton, J. K.
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- **Development and validation of an MRI-based method for 3D particle concentration measurement**
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- **3D Measurements of coupled freestream turbulence and secondary flow effects on film cooling** *EXPERIMENTS IN FLUIDS*
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- **Measurements in discrete hole film cooling behavior with periodic freestream unsteadiness** *EXPERIMENTS IN FLUIDS*
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- **A Machine Learning Approach for Determining the Turbulent Diffusivity in Film Cooling Flows** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Milani, P. M., Ling, J., Saez-Mischlich, G., Bodart, J., Eaton, J. K.
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- **EXPERIMENTAL STUDY OF PERIODIC FREE STREAM UNSTEADINESS EFFECTS ON DISCRETE HOLE FILM COOLING IN TWO GEOMETRIES**

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AMER SOC MECHANICAL ENGINEERS.2018: 327–41

- **PHYSICAL INTERPRETATION OF MACHINE LEARNING MODELS APPLIED TO FILM COOLING FLOWS**
  Milani, P. M., Ling, J., Eaton, J. K., ASME
  AMER SOC MECHANICAL ENGINEERS.2018
- **Turbulent Scalar Mixing in a Skewed Jet in Crossflow: Experiments and Modeling** *FLOW TURBULENCE AND COMBUSTION*
  Ryan, K. J., Bodart, J., Folkersma, M., Elkins, C. J., Eaton, J. K.
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- **TRANSPORT OF MICROPARTICLES IN A TURBULATED SERPENTINE PASSAGE**
  Borup, D. D., Elkins, C. J., Eaton, J. K., ASME
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- **MAGNETIC RESONANCE THERMOMETRY EXPERIMENTAL SETUP: A PORTABLE HEAT TRANSFER EXPERIMENT**
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- **A MACHINE LEARNING APPROACH FOR DETERMINING THE TURBULENT DIFFUSIVITY IN FILM COOLING FLOWS**
  Milani, P. M., Ling, J., Saez-Mischlich, G., Bodart, J., Eaton, J. K., ASME
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- **Validation of magnetic resonance concentration measurements with adiabatic wall temperature measurements** *EXPERIMENTS IN FLUIDS*
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- **Oscillatory flow in the human airways from the mouth through several bronchial generations** *INTERNATIONAL JOURNAL OF HEAT AND FLUID FLOW*
  Banko, A. J., Coletti, F., Elkins, C. J., Eaton, J. K.
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- **Film Cooling Effectiveness Improvements Using a Nondiffusing Oval Hole** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Issakhanian, E., Elkins, C. J., Eaton, J. K.
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- **Three-dimensional flow field around and downstream of a subscale model rotating vertical axis wind turbine** *EXPERIMENTS IN FLUIDS*
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- **Analysis of Turbulent Scalar Flux Models for a Discrete Hole Film Cooling Flow** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Ling, J., Ryan, K. J., Bodart, J., Eaton, J. K.
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- **The Effect of Land Taper Angle on Trailing Edge Slot Film Cooling** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Ling, J., Elkins, C. J., Eaton, J. K.
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- **Optimal Turbulent Schmidt Number for RANS Modeling of Trailing Edge Slot Film Cooling** *JOURNAL OF ENGINEERING FOR GAS TURBINES AND POWER-TRANSACTIONS OF THE ASME*
  Ling, J., Elkins, C. J., Eaton, J. K.
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- **Three-dimensional inspiratory flow in the upper and central human airways** *EXPERIMENTS IN FLUIDS*
  Banko, A. J., Coletti, F., Schiavazzi, D., Elkins, C. J., Eaton, J. K.
  2015; 56 (6)
- **Near Wall Modeling for Trailing Edge Slot Film Cooling** *JOURNAL OF FLUIDS ENGINEERING-TRANSACTIONS OF THE ASME*

Ling, J., Rossi, R., Eaton, J. K.
2015; 137 (2)

- **Shock boundary layer interactions in a low aspect ratio duct** *INTERNATIONAL JOURNAL OF HEAT AND FLUID FLOW*
  Campo, L. M., Eaton, J. K.
  2015; 51: 353-371

- **BUILDING BLOCK EXPERIMENTS IN DISCRETE HOLE FILM COOLING**
  Ryan, K. J., Coletti, F., Elkins, C. J., Eaton, J. K., ASME
  AMER SOC MECHANICAL ENGINEERS.2015

- **A COMPARISON OF SHADOWGRAPHY AND X-RAY COMPUTED TOMOGRAPHY IN LIQUID SPRAY ANALYSIS**
  Lee, Z., Eichner, D., Tennis, J., Ryan, M., Sowell, T., Benson, M., Van Poppel, B., Nelson, T., Guzman, P., Fahrig, R., Eaton, J., Kurman, M. S., Kweon, et al
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- **ANALYSIS OF TURBULENT SCALAR FLUX MODELS FOR A DISCRETE HOLE FILM COOLING FLOW**
  Ling, J., Ryan, K. J., Bodart, J., Eaton, J. K., ASME
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- **FILM COOLING EFFECTIVENESS IMPROVEMENTS USING A NON-DIFFUSING OVAL HOLE**
  Issakhanian, E., Elkins, C. J., Eaton, J. K., ASME
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- **QUANTITATIVE MRI MEASUREMENTS OF HOT STREAK DEVELOPMENT IN A TURBINE VANE CASCADE**
  Yapa, S. D., Elkins, C. J., Eaton, J. K., ASME
  AMER SOC MECHANICAL ENGINEERS.2015

- **Confinement effects in shock wave/turbulent boundary layer interactions through wall-modelled large-eddy simulations** *JOURNAL OF FLUID MECHANICS*
  Bermejo-Moreno, I., Campo, L., Larsson, J., Bodart, J., Helmer, D., Eaton, J. K.
  2014; 758: 5-62

- **Comparison of magnetic resonance concentration measurements in water to temperature measurements in compressible air flows** *EXPERIMENTS IN FLUIDS*
  Yapa, S. D., D'Atri, J. L., Schoech, J. M., Elkins, C. J., Eaton, J. K.
  2014; 55 (11)

- **Sensitivity of an asymmetric, three-dimensional diffuser to inlet condition perturbations** *INTERNATIONAL JOURNAL OF HEAT AND FLUID FLOW*
  Sayles, E. L., Eaton, J. K.
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- **Three-Dimensional Mass Fraction Distribution of a Spray Measured by X-Ray Computed Tomography** *JOURNAL OF ENGINEERING FOR GAS TURBINES AND POWER-TRANSACTIONS OF THE ASME*
  Coletti, F., Benson, M. J., Sagues, A. L., Miller, B. H., Fahrig, R., Eaton, J. K.
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- **A matching pursuit approach to solenoidal filtering of three-dimensional velocity measurements** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Schiavazzi, D., Coletti, F., Iaccarino, G., Eaton, J. K.
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- **Analysis of Oxide (Al2O3, CuO, and ZnO) and CNT Nanoparticles Disaggregation Effect on the Thermal Conductivity and the Viscosity of Nanofluids** *INTERNATIONAL JOURNAL OF PRECISION ENGINEERING AND MANUFACTURING*
  Lee, J., Yoon, Y., Eaton, J. K., Goodson, K. E., Bai, S. J.
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- **A comprehensive model of magnetic particle motion during magnetic drug targeting** *INTERNATIONAL JOURNAL OF MULTIPHASE FLOW*
  Cherry, E. M., Eaton, J. K.
  2014; 59: 173-185
- **THE EFFECT OF LAND TAPER ANGLE ON TRAILING EDGE SLOT FILM COOLING**
  Ling, J., Elkins, C. J., Eaton, J. K., ASME
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- **Heat Transfer Coefficient Measurements on the Film-Cooled Pressure Surface of a Transonic Airfoil** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Kodzwa, P. M., Eaton, J. K.
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- **Turbulent transport in an inclined jet in crossflow** *7th International Symposium on Turbulence Heat and Mass Transfer (THMT)*
  Coletti, F., Benson, M. J., Ling, J., Elkins, C. J., Eaton, J. K.
  ELSEVIER SCIENCE INC.2013: 149–160
- **An inclined jet in crossflow under the effect of streamwise pressure gradients** *EXPERIMENTS IN FLUIDS*
  Coletti, F., Elkins, C. J., Eaton, J. K.
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- **Local mass transfer measurements for corals and other complex geometries using gypsum dissolution** *EXPERIMENTS IN FLUIDS*
  Chang, S., Elkins, C., Eaton, J. K., Monismith, S.
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- **Experimental-Based Redesigns for Trailing Edge Film Cooling of Gas Turbine Blades** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Benson, M., Yapa, S. D., Elkins, C., Eaton, J. K.
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- **Shear thinning effects on blood flow in straight and curved tubes** *PHYSICS OF FLUIDS*
  Cherry, E. M., Eaton, J. K.
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- **Three-Dimensional Velocity and Scalar Field Measurements of an Airfoil Trailing Edge With Slot Film Cooling: The Effect of an Internal Structure in the Slot** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
  Ling, J., Yapa, S. D., Benson, M. J., Elkins, C. J., Eaton, J. K.
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  Lo, K. P., Elkins, C. J., Eaton, J. K.
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- **Film-Cooled Trailing Edge Measurements: 3D Velocity and Scalar Field** *JOURNAL OF TURBOMACHINERY-TRANSACTIONS OF THE ASME*
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- **MEASUREMENTS OF A TRAILING EDGE SLOT FILM COOLING GEOMETRY DESIGNED FOR REDUCED COOLANT FLOWRATE AND HIGH SURFACE EFFECTIVENESS**
  Ling, J., Elkins, C. J., Benson, M. J., Yapa, S. D., Eaton, J. K., ASME
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  Ling, J., Coletti, F., Yapa, S., D., Eaton, J., K.
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  Benson, M., Yapa, S., Elkins, C., Eaton, J. K., ASME
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