

# Pressure Fluctuations in a High-Reynolds-Number Turbulent Boundary Layer over Rough Surfaces of Different Configurations

Liselle A. Joseph

Dissertation submitted to the Faculty of the  
Virginia Polytechnic Institute and State University  
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy  
in  
Aerospace Engineering

William J. Devenport, Chair  
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August 23, 2017  
Blacksburg, Virginia

Keywords: turbulent boundary layer, pressure spectra, zero-pressure gradient, rough walls,  
scaling laws

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**Liselle A. Joseph**

---

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Hi Liselle,

Yes, you have my written permission to use a version of Figure 26 from my M.S thesis titled "High Reynolds Number Turbulent Boundary Layer Flow over Small Forward Facing Steps" in your PhD dissertation.

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Manuj

On Fri, Sep 29, 2017 at 9:26 AM, Liselle A. Joseph <[liselle@vt.edu](mailto:liselle@vt.edu)> wrote:

Hi Manuj,

May I have your written permission to use a version of Figure 26 (BL profile comparisons with law of the wall at 30 m/s) from your work "High Reynolds Number Turbulent Boundary Layer Flow over Small Forward Facing Steps" in my PhD dissertation?

Thank you,

Liselle

=====

*Liselle A. Joseph*

*PhD Candidate*

*Center for Renewable Energy and Aerodynamic Technology*

*(CREATe) Department of Aerospace and Ocean Engineering*

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I am a student at Virginia Tech and the title of my dissertation is “Pressure Fluctuations in a High-Reynolds-Number Turbulent Boundary layer over Rough Surfaces of Different Configurations”.

The papers and corresponding figures are outlined below:

<i>Title:</i>	<i>The wall-pressure spectrum of high-Reynolds-number turbulent boundary-layer flows over rough surface</i>
<i>Author:</i>	<i>Timothy Meyers, Jonathan B. Forest, William J. Devenport</i>
<i>Publication:</i>	<i>The Journal of Fluid Mechanics</i>
<i>Publisher:</i>	<i>Cambridge University Press</i>
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<i>Author:</i>	<i>Qin Yang, Meng Wang</i>
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<i>Author:</i>	<i>S. J. Kline, W. C. Reynolds, F. A. Schraub, and P. W. Runstadler</i>
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*PhD Candidate*  
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**Sent:** Friday, September 29, 2017 4:11 AM  
**To:** Liselle A. Joseph  
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Dear Ms. Joseph,

You are welcome to use any of the figures from my 1990 NASA report, as long as you send me a pdf of your dissertation when you are done.

Good luck with the writing process – you are almost finished!

Best,  
Prof. Robinson

Stephen K. Robinson Ph.D.  
Professor and Chair, Dept. of Mechanical and Aerospace Engineering  
Director, UC Davis Center for Human-Systems Engineering  
Principal Investigator, Human/Robotics/Vehicle Integration and Performance Lab  
NASA Astronaut (Retired)

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**From:** Liselle A. Joseph [mailto:[liselle@vt.edu](mailto:liselle@vt.edu)]  
**Sent:** Thursday, September 28, 2017 4:54 PM  
**To:** Stephen K Robinson <stephen.k.robinson@ucdavis.edu>  
**Subject:** Request for Permission to use figure

Dr. Robinson,

I hereby request your written permission to use a version of Figure 2 (Generation of both ejections and sweeps by a single near-wall quasi-streamwise vortex.) from your 1990 technical report, "A perspective on coherent structures and conceptual models for turbulent boundary layer physics", in my PhD dissertation.

I look forward to your response.

Best regards,  
Liselle

=====  
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Hi Liselle,

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Thanks,  
-Nathaniel

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Dr. Varano,

I hereby request your written permission to use a version of Figure 1.2 (Effect of a Rough Surface on the Mean Flow) from your PhD dissertation in my PhD dissertation.

I look forward to your response.

Best regards,

Liselle

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Hi Liselle,

Sure, you are most welcome to use the figure in your dissertation (if my permission is all you need).

Best wishes,

--- Meng

Meng Wang  
Aerospace & Mechanical Engineering  
105 Hessert Laboratory  
University of Notre Dame  
Notre Dame, IN 46556  
574-631-6608 (phone) 574-631-8355 (fax)  
[m.wang@nd.edu](mailto:m.wang@nd.edu)

On Thu, Sep 28, 2017 at 9:58 PM, Liselle A. Joseph <[liselle@vt.edu](mailto:liselle@vt.edu)> wrote:

Dr. Wang,

I hereby request your written permission to use a version of Figure 4 (Iso-contours of instantaneous vorticity magnitude...) from your 2011 paper "Statistical analysis of acoustic-source field in rough-wall boundary Layers" in my PhD dissertation.

I look forward to your response.

Best regards,

Liselle

=====

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## Liselle A. Joseph

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Hi Liselle,  
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Sure, you have my permission to use the figure.  
Best wishes, Jacob

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I hereby request your written permission to use a version of Figure 3.7(b) (Semi-log contours of streamwise vorticity) from your PhD dissertation in my PhD dissertation.

I look forward to your response.

Best regards,

Liselle

=====

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Roger Simpson

On Sep 29, 2017 9:37 AM, "Liselle Joseph" <[liselle@vt.edu](mailto:liselle@vt.edu)> wrote:

Dr. Simpson,

I hereby request your written permission, on behalf of Dr. Michael Goody, to use versions of figures 30-36 from your 1990 technical report/ Dr. Goody's dissertation in my PhD dissertation.

I look forward to your response.

Best regards,  
Liselle

~~~~~  
*Liselle A. Joseph*  
*PhD Candidate*  
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*Department of Aerospace and Ocean Engineering*  
*Virginia Tech*

*Office: 616 McBryde Hall*  
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**Liselle A. Joseph**

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-Jon

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Jonathan Forest  
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Carderock Division, Code 7250  
(301) 227-1704  
jonathan.forest@navy.mil

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Liselle

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=====  
***Liselle A. Joseph***

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*Virginia Tech*

*Office: 616 McBryde Hall*

*Email: [liselle@vt.edu](mailto:liselle@vt.edu)*

=====

## Liselle A. Joseph

---

**From:** Jeremy Bennington <jeremybennington@yahoo.com>  
**Sent:** Sunday, October 01, 2017 2:34 PM  
**To:** Liselle A. Joseph  
**Subject:** Re: Request for Permission to use figure

Sure, you can use Figure 2.12 in your dissertation. Who are you working with on your research? Tell Dr. Lowe hello. I worked with him during our time as graduate students working with Dr. Roger Simpson.

Jeremy Bennington

Sent from my iPhone

On Sep 30, 2017, at 7:51 PM, Liselle A. Joseph <[liselle@vt.edu](mailto:liselle@vt.edu)> wrote:

Hi Mr. Bennington,

I hereby request your written permission to use a version of Figure 2.12 (Three-Dimensional drawings of single element cases) from your MS thesis, in my PhD dissertation.

I look forward to your response.

Best regards,  
Liselle

=====  
***Liselle A. Joseph***

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# Bibliography

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- [3] M. R. Head and P. Bandyopadhyay. New aspects of turbulent boundary-layer structure. *Journal of Fluid Mechanics*, 107(1):297–338, 1981.
- [4] I. Marusic, J. P. Monty, M. Hultmark, and A. J. Smits. On the logarithmic region in wall turbulence. *Journal of Fluid Mechanics*, 716:np–np, 2013.
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- [6] Q. Yang and M. Wang. Boundary-layer noise induced by arrays of roughness elements. *Journal of Fluid Mechanics*, 727:282–317, 2013.
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- [8] C. C. Chu and R. E. Falco. Vortex ring/viscous wall layer interaction model of the turbulence production process near walls. *Experiments in Fluids*, 6(5):305–315, 1988.
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