



Student Information (Please print clearly.)

First and last name: Rachel McClure	Student ID: 101294644
CU Boulder email address: rachel.mcclure@colorado.edu	Major you are writing a thesis in: Astrophysics/Astro-Planetary Sciences

Honors Information and Requirements (Please initial all applicable boxes.)

<input type="checkbox"/>	All students: I have attached a prospectus, bibliography, and timeline of my project.
<input type="checkbox"/>	Departmental Honors students: I am writing a thesis in my major and not in a minor.
<input type="checkbox"/>	General Honors Students: I have attached my General Honors Eligibility Worksheet to this form.
<input type="checkbox"/>	Concurrent Bachelor's/Masters Degree students: I am an undergraduate student who will have earned under 130 credits by my thesis defense.

Thesis Committee: Thesis committees require at least three members of the CU Boulder faculty. To be eligible to serve on a thesis committee one must be a regular full-time faculty member or a multi-year contract instructor involved in an instructional program at the University of Colorado Boulder. In terms of rank, this means Professor, Associate Professor, Assistant Professor, Senior Instructor, or Instructor.

Faculty Name (please print)	Department	Teaching Rank
Thesis advisor: Mark Rast	APS	Assistant Professor
Honors Council representative: Ann-Marie Madigan	APS	Assistant Professor
Third member/outside reader: Graham Oddie	Philosophy	Professor
Additional member (optional):		

Signatures

<p>Thesis Advisor: I have discussed the project proposal with the student and agree to provide the necessary help and direction for the project.</p> <p style="text-align: right;">Signature _____</p>
<p>Honors Council Representative: I have met with the student and give my department's approval for them to pursue Latin honors. I agree to serve on the thesis defense committee.</p> <p style="text-align: right;">Signature _____</p>
<p>Student: I have consulted with my department and/or the Honors Program and have completed/am completing the requirements that they have established. If I choose to defer my project to another semester or withdraw from the thesis process, I will inform the Honors Program Office.</p> <p style="text-align: right;">Signature _____</p>

Prospectus

Title: The coincident coherence of extreme Doppler velocity events with P-mode patches in the solar photosphere.

Observations of the solar photosphere show many spatially compact Doppler velocity events with short life spans and extreme values. The striking flashes in the intergranule lanes and the complementary outstanding values in the centers of granules are evident in the spectropolarimetric inversions of SUNRISE IMaX data from the first flight of the SUNRISE balloon in 2009. Using the Fast Fourier Transform, I will produce the power spectrum of the spatial wave frequencies and their corresponding frequency in time to create a k-omega diagram which allows distinction of the P-Modes from the granulation. Subsequently, I will set a filter velocity and separate the P-Modes from the granulation in each image and test for correlation between the P-Mode Doppler velocities and the granulation velocities at previously identified events. This will allow me to analyze the possibility of a relationship or interaction between the granules and the P-Modes.

Timeline

- **September**
 - Get approval from honors chair – Dr. Ann-Marie Madigan, Astrophysical and Planetary Sciences
 - Confirm advisor's intent and availability –Dr. Mark Rast, Astrophysical and Planetary Sciences & Lab for Atmospheric Space Physics
 - Secure exterior reviewer – Professor Graham Oddie, Philosophy
 - Fill out all the paperwork
 - Layout timeline
 - Compile sources for tentative bibliography
- **October**
 - Work at LASP 8 hours a week on research with Mark
- **November**
 - Work at LASP 8 hours a week on research with Mark
 - Begin work towards final results
- **December**
 - Work at LASP 8 hours a week on research with Mark
- **January**
 - Write thesis and meet with Mark once a week
- **February**
 - Write thesis and meet with Mark once a week
- **March**
 - FINAL DRAFT FINISHED
 - Turn in Final Version to Honors Council Representative
- **April**
 - Confirm dates for defense with my board
 - Defend my thesis

Preliminary Bibliography

- Barthol P., Gandorfer A., Solanki S. K. *et al* 2011 *SoPh* 268 1
- Bello González N., Franz M., Martínez Pillet V. *et al* 2010 *ApJL* 723 L134
- Berkefeld T., Schmidt W., Soltau D. *et al* 2011 *SoPh* 268 103
- Bonet J. A., Márquez I., Sánchez Almeida J. *et al* 2010 *ApJL* 723 L139
- Borrero J. M., Martínez-Pillet V., Schlichenmaier R. *et al* 2010 *ApJL* 723 L144
- Danilovic S., Beeck B., Pietarila A. *et al* 2010 *ApJL* 723 L149
- Danilovic S., Hirzberger J., Riethmüller T. L. *et al* 2014 *ApJ* 784 20
- Hirzberger J., Feller A., Riethmüller T. L., Gandorfer A. and Solanki S. K. 2011 *A&A* 529 A132
- Joshi J., Pietarila A., Hirzberger J. *et al* 2011a *ApJL* 734 L18
- Joshi J., Pietarila A., Hirzberger J. *et al* 2011b *ApJL* 740 L55
- Katsukawa Y., Berger T. E., Ichimoto K. *et al* 2007 *Sci* 318 1594
- Lagg A., Solanki S. K., Riethmüller T. L. *et al* 2010 *ApJL* 723 L164
- Martínez Pillet V., del Toro Iniesta J. C., Álvarez-Herrero A. *et al* 2011a *SoPh* 268 57
- Martínez Pillet V., Del Toro Iniesta J. C. and Quintero Noda C. 2011b *A&A* 530 A111
- Mehlretter J. P. 1974 *SoPh* 38 43
- Pietarila A., Hirzberger J., Zakharov V. and Solanki S. K. 2009 *A&A* 502 647
- Rayleigh Lord, F. R. S. 1879 *PMag* 8 261
- Requerey I., Del Toro Iniesta J. C., Bellot Rubio L. R. *et al* 2017a *ApJS* 229 14
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- Riethmüller T. L., Solanki S. K., Barthol P. *et al* 2017 *ApJS* 229 16
- Riethmüller T. L., Solanki S. K., Martínez Pillet V. *et al* 2010 *ApJL* 723 L169
- Scharmer G. B., Henriques V. M. J., Kiselman D. and de la Cruz Rodríguez J. 2011 *Sci* 333 316
- Solanki S. K., Barthol P., Danilovic S. *et al* 2010 *ApJL* 723 L127
- Steiner O., Franz M., Bello González N. *et al* 2010 *ApJL* 723 L180
- van Noort M., Lagg A., Tiwari S. K. and Solanki S. K. 2013 *A&A* 557 A24
- Yelles Chaouche L., Moreno-Insertis F., Martínez Pillet V. *et al* 2011 *ApJL* 727 L30