DENISE THORSEN
University of Alaska
Department of Electrical and Computer Engineering
Geophysical Institute
Fairbanks, AK 99775
(907) 474-7052
ffdt@uaf.edu

EDUCATION

Ph.D Electrical Engineering, University of Illinois, 1996
Atmospheric radar remote sensing.

M.S. Electrical Engineering, University of Illinois, 1991
Radar systems, data acquisition, communications.

B.S. Electrical Engineering, University of Illinois 1985
Analog/digital circuit design

RESEARCH INTERESTS

Development of digital instrumentation and computer interfaces for acquisition of radar backscatter data.

Scattering mechanisms and propagation of radio signals through random media.

Radar techniques for observing the middle atmosphere, including neutral atmospheric wind motions, turbulence, temperature, and electron densities.

Wave dynamics and their interaction with the background atmosphere, including coupling of atmospheric regions, interactions between large-scale and small-scale wave motions, and global scale energy flux distributions.

PROFESSIONAL EXPERIENCE

Assistant Professor, University of Alaska, Fairbanks, 2001-present
Instruction in undergraduate circuits, digital system design, and computer architecture.
Research in radar instrumentation and measurements of the upper atmosphere.

Research Scientist, University of Colorado, CIRES, 1996-2000
Research in wave dynamics and their interaction with the background atmosphere.
Research in radar techniques for remote sensing of the middle atmosphere.
Site manager for the Platteville Atmospheric Observatory.
Develop hardware and software tools for acquisition and assimilation of radar data.
Manage research accounts, write proposals, mentor students.

Lecturer, University of Colorado, 1996, 1998, 1999

Research Assistant, University of Illinois, Wave Propagation Lab, 1987-1996
Research in radar remote sensing. Advisor: Dr. Steven J. Franke
Developed radar and data acquisition hardware presently used by UAO radars.
Developed processing techniques for analysis of MF radar data.

Independent Engineering Consultant , 1991-1992
Build radar controller data acquisition system, Chung Li Radar, Taiwan.

Teaching Assistant , University of Illinois, 1989-1992, 1996

Staff Engineer , Hughes Aircraft, Space and Communications Group, 1985-1987.
Principle design engineer of military satellite subsystem.
Design and testing of analog circuitry DC to UHF.
Coordination of technicians for fabrication and testing of engineering models.

Independent Engineering Consultant , 1984
Wrote diagnostics for Patriot Missile Guidance sub-system, Raytheon.

Cooperative Engineering Student , Raytheon, Missile Systems Division, 3 terms, 1983-1984.
Diagnostic fault mapping of Patriot Missile Guidance sub-system.
Computer aided component level troubleshooting of missile guidance boards.

RESEARCH SUPPORT

NSF grant, IIS-0434156, "Energy Efficiency in Distributed Sensor Networks"; August 1, 2004 - July 31, 2006; $299,660. (Dejan Raskovic, PI)

CNT internal funding, "Development of the Electrical Design and Analysis Lab"; June 1, 2003 - December 15, 2004; $151,469.

NSF grant, ATM-01013643, "Collaborative Research: Equatorial studies of the Mesopause region using Meteor radars"; September 1, 2001 - August 31, 2003; $43,345.

NSF grant, ATM-9872814, "An Intensive Co-located Intercomparison of Radar and Optical Wind and Temperature Measurements in the Mesopause Region"; January 1, 1999 - December 31, 2000; $31,390.

NSF grant, ATM-9714741, "A Comparitive Study of Mesospheric Gravity Wave Activity Observed from a Chain of Sub-tropical to Mid-latitude MF Radars"; January 1, 1998 - December 31, 2001; $92,449.

NSF grant, ATM-9724570, "Development of the Platteville Atmospheric Observatory"; October 1, 1997 - September 30, 2000; $699,745. (Susan Avery, PI).

HONORS AND AWARDS

Nominated Harold L. Olesen Award (1991):
"Excellence in undergraduate teaching by graduate students"
Included in "List of teachers ranked excellent by their students"
CEDAR 1993 student poster prize.

PROFESSIONAL ORGANIZATIONS

Institute of Electrical and Electronic Engineers, Member
American Geophysical Union, Member
URSI - Commission G, Member
American Society for Engineering Education

COURSES TAUGHT

Introduction to Electrical Engineering (EE102 University of Alaska)
This course provides an introduction to basic modern devices, concepts, technical skills and instruments of electrical engineering.

Applied Engineering Electromagnetics (EE311 University of Alaska)
This is the core electromagnetics course seen by electrical engineering students. This course explores the analysis and design of transmission lines and distributed linear circuits using impedance concepts. Developes the electromagnetic field equations and their relation to circuit models. Explores magnetostatics and the magnetic circuit, electromagnetic wave propagation, and the application of the wave equation to engineering systems.

High Frequency Lab (EE331 University of Alaska)
Laboratory experiments in transmission lines, impedances, bridges, scattering parameters, hybrids, and waveguides.

Physical Electronics (EE333 University of Alaska)
Basic properties of semiconductors. Principles of semiconductor devices, diodes, transistors and integrated circuits.

Electronic Circuit Design (EE334 University of Alaska)
This course focuses on the application of semiconductor devices in circuit design in computation, automatic control, and communications. Theoretical discussions include both ideal and non-ideal models for semiconductor devices. The associated laboratory provides defined experiments and the student selected course project.

Digital Systems Analysis and Design (EE341 & EE343 University of Alaska)
EE341 is a service course taught for the Computer Science program. EE343 is a core course in Electrical and Computer Engineering. These courses focus on the fundamental principles and practices of digital design. Students analyze, design and implement combinational and sequential logic machines. The course provides and introduction to microprocessor architecture and microprocessor programming. Students design with traditional and hardware description language (HDL) techniques.

Computer Engineering Analysis and Design (EE342 & EE443 University of Alaska)
EE342 is a service course taught for the Computer Science program. EE443 is required course for the Digital option in Electrical and Computer Engineering. These courses focus on advanced digital design and principles and proctices of computer engineering. Students explore the design, evolution, and operation of modern processors, including CISC and RISC devices. The advantages of pipelined, superscalar, and specialized architectures are discussed. Peripheral interfaces and bus design are considered in microprocessor systems. Low-level programming of classic Intel processors are explored in some detail.

Embedded Systems Design (EE693 University of Alaska)
This course focuses on issues surronding the design and construction of a microcontroller evaluation board. Issues include hardware architecture and glue logic, circuit design and circuit layout, hardware/firmware partitioning, firmware architecture and firmware design. Includes building a wire wrapped evaluation board and then extending the capabilities of that board in a significant project.

Circuits/Electronics 2 (ECEN2260 University of Colorado)
This course is the second in the series on basic circuit analysis. Topics include RLC circuits, Lapalce transform techniques, the transfer function, and convolution. Frequency response, Bode diagrams, resonant circuits, filter design, Fourier series explansions. A hands-on laboratory experience in included.

Radar Systems and Remote Sensing (ECEN5254 University of Colorado)
This course provides detailed knowledge of radar systems and their application to remote sensing of the atmosphere, sea, and earth. Specific topics include: basic radar concepts (pulsed Doppler, FM-CW, chirp, and synthetic aperture radars), signal processing techniques, propagation through different media, and scattering by various surfaces.

Digital Communications Lab. (ECE371 University of Illinois)
The focus of this laboratory course is to provide an opportunity to gain hands-on experience in the configuration and performance evaluation of digital radio communications systems which use commonly employed digital modulation and demodulations schemes. Measured parameters include BER vs Eb/No for optimum and sub-optimum filters, clock timing error, delay error, carrier phase error, eye-patterns, amplitude and phase imbalances, signal constellation, etc.

Radio Communication Circuits Lab. (ECE353 University of Illinois)
This course focuses on the design of a radio system for transmission of information; types of receivers, matching techniques, oscillators, design using 2-port network parameters, receiver and antenna noise, non-linear effects, frequency synthesis. The lab projects include high-frequency models of components, and the design, construction, matching and testing of a crystal oscillator and radio-frequency amplifier ($\approx$ 50 MHz). Instruments used: vector impedance meter, spectrum analyzer, network analyzer, frequency synthesizer. In addition to teaching the lab I developed new lab projects and lab demonstrations.

PAPERS PUBLISHED (JOURNALS)

1. Chshyolkova, T., A. H. Manson, C. E. Meek, S. K. Avery, D. Thorsen, J. W. MacDougall, W. Hocking, Y. Murayama, K. Igarashi, "Planetary wave coupling processes in the middle atmosphere (20-90 km): a CUJO study involving TOMS, UKMO and MF radar data", *Ann Geophysicae*, Vol. 23, pp 1103-1121, 6-3-2005.

2. Manson, A. H., C. E. Meek, T. Chshyolkova, S. Avery, D. Thorsen, J. MacDougall, W. Hocking, Y. Murayama, K. Igarashi, "Wave activity (planetary, tidal) throughout the middle atmosphere (20-100km) over the CUJO network: Satellite (TOMS) and Medium Frequency (MF) radar observations", *Ann Geophysicae*, Vol. 23, pp 305-323, 2-28-2005.

3. Manson, A. , C. Meek, T. Chshyolkova, S. Avery, D. Thorsen, J. MacDougall, W. Hocking, Y. Murayama, K. Igarashi, S. Namboothiri, and P. Kishore, "Longitudinal and latitudinal

variations in dynamic characteristics of the MLT (70-95km): a study involving the CUJO network", *Ann. Geophysicae*, Vol. 22, pp 347-365, 1-1-2004.

4. Manson A. H., C. E. Meek, J. W. MacDougall, W. K. Hocking, D. Thorsen, "Comment on "Climatology of neutral winds in the lower thermosphere over Millstone Hill (42.6N) observed from ground and from space" by Zhang et al.", *J. Geophys. Res.*, 108 (A12), 1471, doi:10.1029/2003JA010102, 2003.

5. Manson A. H., C. E. Meek, S. K. Avery, D. Thorsen, "Ionospheric and dynamical characteristics of the mesosphere-lower thermosphere region over Platteville (40°N, 105°W) and comparisons with the region over Saskatoon (52N, 107W),*J. Geophys. Res.*, 108 (D13), 4398, doi:10.1029/2002JD002835, 2003.

6. Thorsen, D., S. J. Franke, E. Kudeki, Statistics of momentum flux estimation using the dual coplanar beam technique, *Geophys. Res. Lett.*, 27(19), 3193-3196, 10.1029/1999GL011196, 2000.

7. Thorsen, D., S. J. Franke, Climatology of mesospheric gravity wave activity over Urbana, Illinois (40°N, 88°W), *J. Geophys. Res.*, 103(D4), 3767-3780, 10.1029/97JD03548, 1998.

8. Collins, R. L., D. Thorsen, S. J. Franke, Comparative MF radar and Na lidar measurements of fluctuating winds in the mesopause region, *J. Geophys. Res.*, 102(D14), 16583-16592, 10.1029/97JD00766, 1997.

9. Thorsen, D., S. J. Franke, E. Kudeki, A new approach to MF radar interferometry for estimating mean winds and momentum flux, *Radio Sci.*, 32(2), 707-726, 10.1029/96RS03422, 1997.

10. Franke, S. J., D. Thorsen, Mean winds and tides in the upper middle atmosphere at Urbana (40N, 88W) during 1991 - 1992, *J. Geophys. Res.*, 98(D10), 18607-18616, 10.1029/93JD01840, 1993.

11. Franke, P. M., D. Thorsen, M. Champion, S. J. Franke, E. Kudeki, Comparison of time- and frequency-domain techniques for wind velocity estimation using multiple-receiver MF radar data, *Geophys. Res. Lett.*, 17(12), 2193-2196, 10.1029/90GL01891, 1990.

12. Franke, S. J., T. Beatty, D. Thorsen, C. H. Liu, C. S. Gardner, F. L. Roesler, J. Harlander, Simultaneous Na lidar and HF radar observations of vertical velocities in the mesosphere above Urbana, Illinois, *Geophys. Res. Lett.*, 17(1), 69-72, 10.1029/89GL03595, 1990.

CONFERENCE PRESENTATIONS

1. S. Vemula and D. Thorsen, "Tidal Analysis of Platteville MF Radar Data", *CEDAR Workshop*, Santa Fe, NM, June 2004

2. A. Kolatkar and D. Thorsen "A microcontroller based generic radar controller", *CEDAR Workshop*, Longmont, CO, June 2003.

3. A. Kolatkar and D. Thorsen "A microcontroller based generic radar controller", *MST*, Piura, Peru, May 2003.

4. M. Kelley, C. Ramos, D. Thorsen and T. Blix, "On the relationship between medium frequency scatter and polar mesospheric summer echoes", *Fall AGU*, December 2002.

5. S. M. Irfan Azeem, S. E. Palo, D. Thorsen, G. G. Sivjee and C. Y. She, "Co-located intercomparison of radar and optial wind and temperature measurements in the mesosphere", *PSMOS*, October 2002.

6. S. M. Irfan Azeem, S. E. Palo, D. Thorsen, C. Y. She and G. G. Sivjee, "Co-located intercomparison of radar and optial wind and temperature measurements in the mesosphere", *Fall AGU*, December 2001.

7. M. Kelley, C. Ramos, D. Thorsen and T. Blix, "On the relationship between medium frequency scatter and polar mesospheric summer echoes", *URSI General Assembly*, Netherlands, August 2001.

8. D. Thorsen and S. J. Franke, "Climatology of mesospheric gravity wave activity, observations and model results", *COSPAR Scientific Assembly*, Nagoya, Japan, July 1998.

9. D. Thorsen and A. Tangborn, "Wavelet denoising techniques applied to meteor echoes", *URSI National Radio Science Meeting*, Boulder, CO, January 1998.

10. D. Thorsen and S. J. Franke, "A new approach to MF radar interferometry for estimating mean winds and momentum flux", *URSI North America Radio Science Meeting*, Montreal, Canada, July 1997.

11. D. Thorsen and S. J. Franke, "Five year climatology of gravity wave activity over Urbana", *Twelfth NSF CEDAR Workshop*, Boulder, CO, June 1997.

12. D. Thorsen and S. J. Franke, "A technique for estimation of mesospheric winds using MF radar interferometry", *Proceedings of the Seventh Workshop on Technical and Scientific Aspects of MST Radar*, Hilton Head, SC, November 1995.

13. D. Thorsen and E. Chapin, "MF observations of meteors over Urbana", *Ninth NSF CEDAR Workshop*, Boulder, CO, June 1994.

14. R. Collins and D. Thorsen, "MF radar and sodium lidar observations of mesopause gravity waves", *Ninth NSF CEDAR Workshop*, Boulder, CO, June 1994.

15. D. Thorsen and S. J. Franke, "Statistical characteristics of gravity waves in the mesosphere at Urbana", *Canadian Network for Space Research's international conference on Gravity Waves in the Atmosphere*, Lake Louise, Canada, March 1994.

16. D. Thorsen and S. J. Franke, "Seasonal variations and statistical characterization of gravity waves in the mesosphere at Urbana", *Proceedings of the Sixth Workshop on Technical and Scientific Aspects of MST Radar*, Chung-Li, Taiwan, August, 1993.

17. D. Thorsen and S. J. Franke, "Radar observations of mean winds and gravity waves", *Eighth NSF CEDAR Workshop*, Boulder, CO, June 1993. (Student Paper Prize)

18. S. J. Franke and D. Thorsen, "Mean winds and tides", *AGU Chapman Conference*, Asilomar, CA, November 1992.

PROFESSIONAL SERVICE

1. Reviewer - National Research Council, National Science Foundation, Radio Sci., Geophys. Res. Lett., Earth, Planets, and Space.

2. URSI Commission G Executive Committee, 1997-2000.
3. URSI National Radio Science Meeting Steering Committee, 1998-2000.
4. Participate in GUVI science working group meetings.
5. Participate in TIMED/CEDAR working group meetings.
6. Presented ECE Graduate Seminar: "Environmental Impacts on Engineering Design", 1998.
7. Planning and participation in Earthworks: Educating teachers in Earth systems science, a summer workshop for K-12 teachers to learn about Earth systems science, sponsored by CIRES outreach, 1998.
8. Mentored students in MCEN 4045 Senior Design Project. The group designed an antenna support structure which is economical, easy to construct in the field, and will withstand adverse environmental conditions, fall 1997.
9. Mentored graduate students.
10. Mentored "Summer Miority Access to Research Training" (SMART) student, 1997.
11. Organized the participation of a high school student, Todd Abel, and high school teacher, Chuck Kim, in our Greeland campaign as part of the NSF program "Teacher/student research experiences in the Arctic", 1997.
12. Guest lectured at local elementary schools on radars and radar measurements during National Engineers Week, 1997.
13. Tutor for high school physics, University of Illinois volunteer services, 1992.