

## UMRAN S. INAN

Professor of Electrical Engineering  
Director, Space, Telecommunications and Radioscience (STAR) Laboratory  
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### EDUCATION

Middle/High School: T. E. D. Ankara College, Ankara, Turkey (1968)  
B.S.E.E. Middle East Technical University, Ankara, Turkey (1972)  
M.S.E.E. Middle East Technical University, Ankara, Turkey (1973)  
Ph.D. Stanford University (1977)  
'Non-linear gyroresonant interactions of energetic particles and coherent VLF waves in the magnetosphere', Advisor: Prof. R. A. Helliwell

### PROFESSIONAL EXPERIENCE

9/97- Director, Space, Telecommunications and Radioscience (STAR) Laboratory  
9/92- Professor of Electrical Engineering, Stanford University  
9/85-8/92 Associate Professor of EE, Stanford University  
9/82-8/85 Assistant Professor of EE, Stanford University  
4/81-8/82 Acting Assistant Professor of EE, Stanford University  
2/81-3/81 Research Associate, EE Dept., Stanford University  
9/80-1/81 Assistant Professor of EE, Bogazici University, Istanbul, Turkey  
9/78-8/80 Acting Assistant Professor of EE, Stanford University  
9/77-8/78 Research Affiliate & Post-doctoral Fellow, EE Dept., Stanford University  
9/73-8/77 Graduate Student Research Assistant & PhD Candidate, Stanford University

### BOOKS

*Engineering Electromagnetics*, Addison Wesley, July 1998  
*Electromagnetic Waves*, Prentice Hall, August 1999

### PATENTS

U.S. Patent No. 7,288,892 B2 "*Plasma Display Panel with Improved Cell Geometry*" [2007]

### HONORS AND AWARDS

#### Major Honors & Awards:

Appleton Prize of the International Union of Radio Science and Royal Society of London, July 2008  
Allan Cox Medal of Stanford for Faculty Excellence in Fostering Undergraduate Research, June 2007  
Fellow of the American Geophysical Union (AGU), December 2006  
Fellow of the Institute of Electrical and Electronics Engineers (IEEE), November 2006  
European Space Agency (ESA) Certificate of Recognition (CLUSTER), September 2005  
Stanford Tau Beta Pi Award for Excellence in Undergraduate Teaching, June 1998  
Antarctic Mountain Named "Inan Peak" (78.333 S, 162.633 E) in Recognition of Service, 1994  
Outstanding Service Award of the EE Department for Excellence in Teaching, June 1978

### **Other Honors & Awards:**

NASA Group Achievement Award (CLUSTER), August 2004  
Ionospheric Effects Symposium, Most Outstanding Paper Award, May 1999  
Designated as Freshman Advisor of Distinction, Stanford University, May 1999  
NASA Group Achievement Award (POLAR), June 1998  
NSF and Department of the Navy Antarctic Service Medal, August 1993  
Young Scientist Award of the International Union of Radio Science (URSI), September 1984  
NASA Group Achievement Award (Dynamics Explorer), October 1983

### **PROFESSIONAL ORGANIZATIONS AND SERVICE OUTSIDE STANFORD**

Vice-President of the International Union of Radio Science (URSI)  
Immediate Past Chair of the United States National Committee (USNC) of URSI  
Fellow, American Geophysical Union (AGU)  
Fellow, Institute of Electrical and Electronics Engineers (IEEE)  
International Chairman of Commission H (Waves in Plasmas) of the International Scientific Radio Union (URSI), 2002-2005  
Chairman, U. S. National Committee (USNC) of URSI, 2002-2005  
Chairman, Commission H (Waves in Space Plasmas) of USNC/URSI, 1996-1999  
U. S. Representative to the Solar Terrestrial and Astrophysical Research Working Group of the Scientific Committee for Antarctic Research (SCAR), 1998-2004  
Member, American Physical Society  
Member, The Electromagnetics Academy, Sigma Xi, Tau Beta Pi

### **UNIVERSITY SERVICE**

Member, Executive Committee of Electrical Engineering Department, 1997-present  
Director, Space, Telecommunications and Radioscience Laboratory, 1997-present  
Elected First Alternate Member, Stanford University Senate, 2008-2010  
Chairman, Broad Area Faculty Search Committee for EE Department, 2002-2003  
Elected Member, Stanford University Senate, 2004-06  
Chair, Broad Area Faculty Search Committee of the EE Department, 2002-04  
Chairman, Committee on Research of the Academic Council, 1998-2000  
Member, Committee on Research of the Academic Council, 1996-1998

### **RESEARCH ACTIVITIES**

Principal investigator on several research grants sponsored by Office of Naval Research (ONR), NSF Division of Polar Programs, NSF Division of Atmospheric Sciences, NASA Space Physics Division, Air Force Office of Scientific Research, and the Air Force Geophysics Laboratory. Current research projects include: (i) optical observations of high altitude plasma discharges and optical emissions known as sprites and elves, (ii) ground based VLF remote sensing of lightning-Induced disturbances in ionospheric plasma and precipitation of energetic electrons at multiple sites across the United States, Canada and Antarctica, (iii) studies of HF radio wave heating of ionospheric plasma, (iv) interpretation of plasma wave and energetic particle data from low and high altitude satellites, (v) theoretical modeling of gyroresonant wave-particle interactions in the magnetosphere, (vi) ELF/VLF observations of plasma waves at unmanned observatories in Antarctica and on ocean-based autonomous buoys, and (vii) investigations and computer simulation of energy efficiency of plasma display panels.

Professor Inan's research group (<http://nova.stanford.edu/~vlf/people.html>) consists of ~40 people including ~25 PhD students, several undergraduates, 3 Senior Research Associates, 3 Research Associates, several Consulting Faculty, and two Administrative Assistants. The overall research portfolio of the group totals \$5M to \$6M/yr, with grants and contracts from a wide range of government agencies, as well as private companies.

Additional details of Professor Inan's research activities, including unusual project management experiences, and administrative experiences are provided in a separate attached page.

## STUDENTS AND TEACHING

Principal Dissertation Advisor for 29 students who received PhD degrees (in EE, Physics, & Applied Physics) since 1990. Currently supervising 19 PhD candidates and 6 MS/PhD students. Two more students expected to complete their PhD theses before 1 October 2008.

**Student Awards:** Two students received the First Prize in the URSI/USNC Student Prize Paper Competitions in 1999 and 1998. One student received AGU F. L. Scarf Award for his PhD dissertation work. Two PhD students were selected as NSF/CEDAR post-doc fellows and another two students were selected as NSF/GEM post-doc fellows. Seventeen students received American Geophysical Union (AGU) Best Student Paper Awards since 1993. One student received the First Prize in the Student Paper Competition at the North American Radio Science Conference, Ottawa, Canada, and July 2007.

**Teaching:** Currently teaches courses on Engineering Electromagnetics (EE141), Electromagnetic Waves (EE242), Elementary Plasma Physics (EE356), and Numerical Electromagnetics (EE256). In previous years he has also taught a number of other courses, including Fourier Transforms and Applications (EE261), Microwave Engineering (EE246), Antennas for Telecommunications and Remote Sensing (EE252), and Statistical Signal Processing (EE278).

## PHD DISSERTATIONS SUPERVISED AS PRINCIPAL ADVISOR

- 06/08 **Andrew Gibby**  
Saturation Effects in VLF Triggered Emissions
- 10/07 **Timothy Chevalier**  
Near-field Characteristics of Electric Dipole Antennas in the Inner Magnetosphere
- 08/07 **Joseph Payne**  
Spatial Structure of Very Low Frequency Modulated Ionospheric Currents
- 03/07 **Robert Moore**  
ELF/VLF wave generation by modulated HF heating of the auroral electrojet
- 02/07 **William Peter**  
Measurement of Lightning-Induced Electron Precipitation Using VLF Remote Sensing
- 12/06 **Michael Chevalier**  
Advances in the PML Boundary Condition and Efficient Long Path Propagation
- 10/06 **Manuel Platino**  
Aspects of ELF/VLF Chorus Generation Mechanism: Source Location and Motion
- 12/04 **Troy Wood**  
Geo-location of Individual Lightning Discharges Using VLF Electromagnetic Impulses
- 05/04 **Jacob Bortnik**  
Precipitation of Radiation Belt Electrons by Lightning-Generated MR Whistlers
- 10/03 **Maria Spasojevic**  
Global Dynamics of the Earth's Plasmasphere
- 07/03 **Elizabeth Gerken**  
Telescopic Imaging of Streamer and Diffuse Glow Dynamics in Sprites

- 06/02 **Georgios Veronis**  
Design of PDP Cells: Multi-fluid Kinetic Model of Electrical Micro discharges
- 10/00 **Christopher Barrington-Leigh**  
Fast Photometric Imaging of High Altitude Optical Flashes Above Thunderstorms
- 09/00 **Michael Johnson**  
VLF Imaging of Lightning-Induced Ionospheric Disturbances
- 03/99 **Nikolai Lehtinen**  
Relativistic Runaway Electrons Above Thunderstorms
- 09/99 **Mehmet Demirkol**  
VLF Remote Sensing of the Ambient and Modified Lower Ionosphere
- 06/99 **Craig Heinselman**  
Auroral Effects on Meteoric Metals in the Upper Atmosphere
- 10/99 **David Lauben**  
Precipitation of Radiation Belt Electrons by Obliquely-Propagating Lightning-Generated Whistlers Waves
- 06/98 **Steven Reising**  
Remote Sensing of Electrodynamical Coupling of Thunderstorms and Lower Ionosphere
- 08/97 **Steven Cummer**  
Lightning and Ionospheric Remote Sensing Using VLF/ELF Radio Atmospherics
- 07/96 **Victor Pasko**  
Dynamic Coupling of Quasi-Electrostatic Thundercloud Fields to the Lower Ionosphere
- 07/94 **David Shafer**  
Spread-Spectrum VLF Remote Sensing of the Ionosphere
- 06/94 **Juan Rodriguez**  
Modification of the Earth's Ionosphere by Very-Low-Frequency Transmitters
- 09/93 **Yuri Taranenko**  
Interaction with the Lower Ionosphere of Electromagnetic Pulses from Lightning
- 09/93 **Alexandr Draganov**  
The Origin and k-Spectrum of Magnetospheric Hiss
- 05/93 **Jasna. Ristic-Djurovic**  
Gyroresonant Scattering of Radiation Belt Electrons by Oblique Whistler Waves
- 03/93 **William Burgess**  
Lightning-induced Coupling of Radiation Belts to Conjugate Ionospheres
- 11/91 **William Poulsen**  
Modeling of VLF Propagation and Scattering within the Earth-Ionosphere Waveguide
- 01/90 **Thomas Wolf**  
Remote Sensing of Ionospheric Effects of Lightning Using VLF Radio Signals

## REFEREED PUBLICATIONS

Author of 271 refereed scientific/technical papers  
5251 citations, Average Citation per item ~19, *h*-index=40, ~450 citations in 2007  
1st author on 51 papers; 2nd author on 159 papers (mostly with PhD student as first author)

### List of publications in 2008:

1. Cohen, M. B., U. S. Inan, M. A. Golkowski (2008), Geometric Modulation: A more effective method of steerable ELF/VLF wave generation with continuous HF heating of the lower ionosphere. *Geophys. Res. Lett.*, 35, 12101, doi: 10.1029/2008GL034061.
2. Chevalier, T. W., U. S. Inan, T. F. Bell (2008), Terminal impedance and antenna current distribution of a VLF electric dipole antenna in the inner magnetosphere, (in press), *IEEE Transactions on Antennas & Propagation*.
3. Gibby, A., U. S. Inan, T. F. Bell (2008), Saturation Effects in the VLF Triggered Emission Process, (in press), *J. Geophys. Res.*

4. Golkowski, M., **U. S. Inan** (2008), Multi- station observations of ELF/VLF whistler mode chorus. *J. Geophys. Res.*, 113, A08210, doi: 10.1029/2007JA012977.
5. Marshall, R. A., R. T. Newsome, and **U. S. Inan** (2008b), Photometric Imaging using Orthogonal Linear Photometer Arrays, (in press), *IEEE Transactions on Geoscience and Remote Sensing*.
6. Newsome, R. T. and **U. S. Inan** (2008), High-frame-rate reconstruction of a dynamic 2-D scene from continuous orthogonal projections, in press, *IEEE Transactions on Geoscience and Remote Sensing*.
7. Golkowski, M. A., **U. S. Inan**, A. Gibby, and M.B. Cohen (2008), Magnetospheric amplification and emission triggering by ELF/VLF waves injected by the 3.6 MW HAARP ionospheric heater, (in press), *J. Geophys. Res.*, doi: 10.1029/2008JA013157.
8. Harriman, S. K. Paschal, E, and **U.S. Inan** (2008), Magnetic Sensor Design for Femto-Tesla Low-Frequency Signals, (in press), *IEEE Transactions on Geoscience and Remote Sensing*.
9. Carlson, B. E., N. G. Lehtinen, and U.S. Inan (2008), Runaway Relativistic Electron Avalanche Seeding in the Earth's Atmosphere, (in press), *J. Geophys. Res.*, doi: 10.1029/2008JA013210ss.
10. M. Parrot, **U. S. Inan**, N. Lehtinen, E. Blanc, J.L. Pinçon (2008), HF Signatures of Powerful Lightning Recorded on DEMETER, (in press), *Geophys. Res. Lett.*
11. D. Piddiyachiy, **U. S. Inan**, T. F. Bell, N. G. Lehtinen, and M. Parrot (2008), DEMETER Observations of an Intense Up-going Column of ELF/VLF Radiation Excited by the HAARP HF Heater, (in press), *Geophys. Res. Lett.*
12. M. Parrot, **U. S. Inan**, and N. Lehtinen (2008), V-shaped VLF Streaks recorded on DEMETER above powerful thunderstorms, (in press), *Geophys. Res. Lett.*
13. Cohen, M. B., M. Golkowski, and **U. S. Inan** (2008), Orientation of the HAARP ELF ionospheric dipole and the auroral electrojet, (in press), *Geophys. Res. Lett.*, 35, L02806, doi: 10.1029/2007GL032424.

#### List of publications in 2007:

14. **Inan, U.S.**, N. G. Lehtinen, R. C. Moore, K. Hurley, S. Boggs, D. M. Smith, G. Fishman (2007). Massive disturbance of the daytime lower ionosphere by the giant  $\gamma$ -ray flare from Magnetar SGR 1806-20, *Geophys. Res. Lett.*, 34, L08103, doi:10.1029/2006GL029145.
15. **Inan, U. S.**, D. Piddiyachiy, W. B. Peter, J. A. Sauvaud, M. Parrot (2007), DEMETER satellite observations of lightning-induced electron precipitation, *Geophys. Res. Lett.*, 34, L07103, doi:10.1029/2006GL029238.
16. Lehtinen, N. G., and **U. S. Inan** (2007), Possible persistent ionization caused by giant blue jets, *Geophys. Res. Lett.*, 34, L08804, doi:10.1029/2006GL029051.
17. R. C. Moore, **U. S. Inan**, T. F. Bell, E. J. Kennedy, P. A. Kossey, ELF waves generated by modulated HF heating of the auroral electrojet and observed at a ground distance of  $\sim$ 4400 km, *J. Geophys. Res.*, 112, A05309, doi:10.1029/2006JA012063.
18. M. W. Chevalier, and **U. S. Inan** (2007), A technique for efficiently modeling long path propagation for use in FDTD and FDFD, *IEEE Antennas and Wireless Propagation Lett.*, p.525-528, doi: 10.1109/LAWP.2006.887551.

19. R. A. Marshall and **U. S. Inan**, Possible direct cloud-to-ionosphere current evidenced by sprite-initiated TLEs (2007), *Geophys. Res. Lett.* **34**, L02106, doi:10.1029/2006GL028511.
20. **Inan, U. S.**, M. Golkowski, M. K. Casey, R. C. Moore, W. Peter, P. Kulkarni, P. Kossey, E. Kennedy (2007), Subionospheric VLF Observations of Transmitter-Induced Precipitation of Inner Radiation Belt Electrons, *Geophys. Res. Lett.* **34**, L02106, doi:10.1029/2006GL028494.
21. Carlson, B. E., Lehtinen, N. G., **Inan, U. S.** (2007) Constraints on terrestrial gamma ray flash production from satellite observation, *Geophys. Res. Lett.*, **34**, L08809, doi:10.1029/2006GL029229.
22. Cotts, B. R. T., and **U. S. Inan** (2007). VLF observation of long ionospheric recovery events, *Geophys. Res. Lett.*, **34**, L14809, doi:10.1029/2007GL030094.
23. Payne, J. A., **U. S. Inan**, F. R. Foust, T. W. Chevalier, and T. F. Bell (2007), HF modulated ionospheric currents, *Geophys. Res. Lett.*, **34**, L23101, doi:10.1029/2007GL031724.
24. Marshall, R. A., **U. S. Inan**, and W. A. Lyons (2007), Very-Low-Frequency Sferic Bursts, Sprites and Intra-cloud Lightning Activity, *J. Geophys. Res.*, **112** (in review).
25. Marshall, R. A. and **U. S. Inan** (2007), Early VLF Perturbations Caused by Lightning EMP-Driven Dissociative Attachment, *Geophys. Res. Lett.*, **34** (in review).
26. Kulkarni, P., **U.S. Inan**, T.F. Bell, and J. Bortnik (2007), Precipitation Signatures of Ground-Based VLF Transmitters, *J. Geophys. Res.*, **112** (in review).

#### **List of publications in 2006:**

27. Peter, W. B., M. W. Chevalier, and **U. S. Inan** (2006), Perturbations of mid-latitude subionospheric VLF signals associated with lower ionospheric disturbances during major geomagnetic storms, *J. Geophys. Res.*, **111**, A03301, doi:10.1029/2005JA011346.
28. Marshall, R. A., and **U. S. Inan** (2006), High-speed measurements of small-scale features in sprites: Sizes and lifetimes, *Radio Sci.*, **41**, RS6S43, doi:10.1029/2005RS003353.
29. Platino M., **U. S. Inan**, T. F. Bell, J. S. Pickett, P. Canu (2006), Rapidly Moving Sources of upper-band ELF/VLF Chorus near the Magnetic Equator, *J. Geophys. Res.*, **111**, A09218, doi:10.1029/2005JA011468.
30. Chevalier, T. W., **U. S. Inan**, and T. F. Bell (2006), Characterization of terminal impedance and radiation properties of a horizontal VLF antenna over Antarctic ice, *Radio Sci.*, **41**, RS6001, doi:10.1029/2005RS003298
31. Bortnik, J., **U. S. Inan**, and T. F. Bell (2006), Landau damping and resultant unidirectional propagation of chorus waves, *Geophys. Res. Lett.*, **33**, L03102, doi:10.1029/2005GL024553.
32. Bell T. F., **U. S. Inan**, T. Chevalier (2006), Current distribution of a VLF electric dipole antenna in the plasmasphere, *Radio Sci.*, **41**, RS2009, doi:10.1029/2005RS003260.
33. Moore, R. C., **U. S. Inan**, and T. F. Bell (2006), Observations of amplitude saturation in ELF/VLF wave generation by modulated HF heating of the auroral electrojet, *Geophys. Res. Lett.*, **33**, L12106, doi:10.1029/2006GL025934.

34. Platino, M., **U. S. Inan**, T. F. Bell, M. Parrot, and E. J. Kennedy (2006), DEMETER observations of ELF waves injected with the HAARP HF transmitter, *Geophys. Res. Lett.*, *33*, L16101, doi:10.1029/2006GL026462.
35. **Inan, U. S.**, M. B. Cohen, R. K. Said, D. M. Smith, and L. I. Lopez (2006), Terrestrial gamma ray flashes and lightning discharges, *Geophys. Res. Lett.*, *33*, L18802, doi:10.1029/2006GL027085.
36. Haldoupis, C., R. J. Steiner, Á. Mika, S. Shalimov, R. A. Marshall, **U. S. Inan**, T. Bösinger, and T. Neubert (2006), “Early/slow” events: A new category of VLF perturbations observed in relation with sprites, *J. Geophys. Res.*, *111*, A11321, doi:10.1029/2006JA011960.
37. Marshall, R. A., **U. S. Inan**, and W. A. Lyons (2006), on the association of early/fast very low frequency perturbations with sprites and rare examples of VLF backscatter, *J. Geophys. Res.*, *111*, D19108, doi:10.1029/2006JD007219.
38. M. B. Cohen, **U. S. Inan**, G. R. Fishman (2006), Terrestrial Gamma Ray Flashes Observed Aboard Compton Gamma Ray Observatory/Burst And Transient Source Experiment and ELF/VLF Radio Atmospherics. *J. Geophys. Research*, *111*, D24109, doi:10.1029/2005JD006987.

#### **List of publications in 2005:**

39. Marshall, R. A., and **U. S. Inan** (2005), High-speed telescopic imaging of sprites, *Geophys. Res. Lett.*, *32*, L05804, doi:10.1029/2004GL021988.
40. Veronis, G., and **U. S. Inan** (2005), Improvement of the efficiency of plasma display panels by combining waveform and cell geometry design, *IEEE Transactions on Plasma Science*, *33*, 147.
41. Veronis, G., and **U. S. Inan** (2005), Simulation of self-erase discharge waveforms in plasma display panels, *IEEE Transactions on Plasma Science*, *33*, 516.
42. Peter, W. B., and **U. S. Inan** (2005), Electron precipitation events driven by lightning in hurricanes, *J. Geophys. Res.*, *110*, A05305, doi:10.1029/2004JA010899.
43. Gerken, E., and **U. S. Inan** (2005), Streamers and Diffuse Glow Observed in Upper Atmospheric Electrical Discharges, *IEEE Transactions on Plasma Science*, *33*, 2.
44. Peter, W. B., M. Chevalier, and **U. S. Inan** (2005), Subionospheric VLF measurements of the effects of geomagnetic storms on the mid-latitude D-region, *11th International Ionosphere Effects Symposium, A070, May 3-5, 2005*, pp. 1-8, 2005.
45. Spasojevic, M., and **U. S. Inan** (2005), Ground based VLF observations near  $L = 2.5$  during the Halloween 2003 storm, *Geophys. Res. Lett.*, *32*, L21103, doi:10.1029/2005GL024377.
46. **Inan, U. S.**, and N. G. Lehtinen (2005), Production of terrestrial gamma-ray flashes by an electromagnetic pulse from a lightning return stroke, *Geophys. Res. Lett.*, *32*, L19818, doi:10.1029/2005GL023702.
47. Platino, M., **U. S. Inan**, T.F. Bell, D.A. Gurnett, J.S. Pickett, P. Canu and P.M.E. Decreau, (2005), Whistlers observed by the Cluster spacecraft outside the plasmasphere *J. Geophys. Res.* *110*, No. A3, A03212 10.1029/2004JA010730.
48. Mika, A., C. Haldoupis, R. A. Marshall, T. Neubert, **U. S. Inan** (2005), Subionospheric VLF signatures and their association with sprites observed during EuroSprite-2003, *J. Atmos. Solar-Terrest. Phys.*, *67*, 16.

49. Marshall, R.A., **U. S. Inan**, T. Neubert, A. Hughes, G. Satori, J. Bor, A. Collier, and T.H. Allin (2005), Optical observations geomagnetically conjugate to sprite-producing lightning discharges, *Annales Geophysicae*, Vol. 23, pp 2231-2237.
50. Neubert, T., T. H. Allin, E. Blanc, T. Farges, C. Haldoupis, A. Mika, S. Soula, L. Knutsson, O. van der Velde, R. A. Marshall, **U. S. Inan**, G. Satori, J. Bor, A. Hughes, A. Collier, S. Laursen, and I. L. Rasmussen (2005), Co-ordinated observations of transient luminous events during the EuroSprite2003 campaign, *J. Atm. Solar Terr. Phys.*, 67, 807-820.

**List of publications in 2004:**

51. Engebretson, M. J., J. L. Posch, A. J. Halford, G. A. Shelburne, A. J. Smith, M. Spasojevic, **U. S. Inan**, and R. L. Arnoldy (2004), Latitudinal and seasonal variations of quasiperiodic and periodic VLF emissions in the outer magnetosphere, *J. Geophys. Res.*, 109, A05216, doi:10.1029/2003JA010335.
52. Haldoupis, C., T. Neubert, **U. S. Inan**, A. Mika, T. H. Allin, and R. A. Marshall (2004), Subionospheric early VLF signal perturbations observed in one-to-one association with sprites, *J. Geophys. Res.*, 109, A10303, doi:10.1029/2004JA010651.
53. Wood, T. G., and **U. S. Inan** (2004), Localization of individual lightning discharges via directional and temporal triangulation of sferic measurements at two distant sites, *J. Geophys. Res.*, 109, D21109, doi:10.1029/2004JD005204.
54. **Inan, U. S.**, M. Golkowski, D. L. Carpenter, N. Reddell, R. C. Moore, T. F. Bell, E. Paschal, P. Kossey, E. Kennedy, and S. Z. Meth (2004), Multi-hop whistler-mode ELF/VLF signals and triggered emissions excited by the HAARP HF heater, *Geophys. Res. Lett.*, 31, L24805, doi:10.1029/2004GL021647.
55. Sonwalkar, V. S., D. L. Carpenter, T. F. Bell, M. Spasojevic, **U. S. Inan** J. Li, X. Chen, A. Venkatasubramanian, J. Harikumar, R. F. Benson, W. W. L. Taylor, and B. W. Reinisch (2004), Diagnostics of magnetospheric electron density and irregularities at altitudes <5000 km using whistler and Z mode echoes from radio sounding on the IMAGE satellite, *J. Geophys. Res.*, 109, A11212, doi:10.1029/2004JA010471.
56. Spasojevic, M., H. U. Frey, M. F. Thomsen, S. A. Fuselier, S. P. Gary, B. R. Sandel, and **U. S. Inan** (2004), The link between a detached subauroral proton arc and a plasmaspheric plume, *Geophys. Res. Lett.*, 31, L04803, doi:10.1029/2003GL018389.
57. Bell, T.F., **U. S. Inan**, M. Platino, J.S. Pickett, P.A. Kossey, and E.J. Kennedy (2004), CLUSTER observations of lower hybrid waves excited at high altitudes by electromagnetic whistler mode signals from the HAARP facility, *Geophys. Res. Lett.*, 31, L06811, doi:10.1029/2003GL018855.
58. **Inan, U. S.**, M. Platino, T.F. Bell, D.A. Gurnett, and J.S. Pickett (2004), Cluster measurements of rapidly moving sources of ELF/VLF chorus, *J. Geophys. Res.*, 109, A05214, doi:10.1029/2003JA010289.
59. Peter, W. B., and **U. S. Inan** (2004), on the occurrence and spatial extent of electron precipitation induced by oblique nonducted whistler waves, *J. Geophys. Res.*, 109, A12215, doi:10.1029/2004JA010412.
60. Chevalier, M. W. and **U. S. Inan** (2004), A PML using a convolutional curl operator and a numerical reflection coefficient for general linear media, *IEEE Trans. Antennas Propagat.*, 52, 7, 1647-57.

61. Gerken, E. A., and **U. S. Inan** (2004), Comparison of photometric measurements and charge moment estimations in two sprite-producing storms, *Geophys. Res. Lett.*, *31*, L03107, doi:10.1029/2003GL018751.
62. Platino, M., **U.S. Inan**, T.F. Bell, J.S. Pickett, E.J. Kennedy, J.G. Trotignon, J.L. Rauch, and P. Canu (2004), Cluster observations of ELF/VLF signals generated by modulated heating of the lower ionosphere with the HAARP HF transmitter *Annales Geophysicae*, *22*: 2643-2653.

#### **List of publications in 2003:**

63. Bortnik, J., **U. S. Inan**, and T. F. Bell (2003), Frequency-time spectra of magnetospherically reflecting whistlers in the plasmasphere, *J. Geophys. Res.*, *108*, (A1), 1030, doi:10.1029/2002JA009387.
64. Gerken, E. A and **U. S. Inan** (2003), Observations of decameter-scale morphologies in sprites, *J. Atmos. and Solar-Terrestrial Physics*, *65*, 567-572.
65. **Inan, U. S.**, T. F. Bell and J. Bortnik (2003), Controlled precipitation of radiation belt electrons, *J. Geophys. Res.*, *108*, (A5), 1186, doi:1029/2002JA009580.
66. Bortnik J., **U. S. Inan** and T. F. Bell (2003), Energy distribution and lifetime of magnetospherically reflecting whistlers in the plasmasphere, *J. Geophys. Res.*, *108*, (A5), 1199, doi:1029/2002JA009316.
67. Bainbridge, G., and **U. S. Inan** (2003), Ionospheric *D* region electron density profiles derived from the measured interference pattern of VLF waveguide modes, *Radio Science*, *38*, (4), 1077, doi:10.1029/2002RS002686.
68. Spasojevic, M., J. Goldstein, D. L. Carpenter, **U. S. Inan**, B. R. Sandel, M. B. Moldwin, and B. W. Reinisch (2003), Global response of the plasmasphere to a geomagnetic disturbance, *J. of Geophys. Res.*, *108*, (A9), 1340, doi:10.1029/2003JA009987.
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72. Veronis, G., **U. S. Inan** (2002), Simulation studies of the coplanar electrode and other plasma display panel cell designs, *J. Applied Phys.*, *91*, (12), 9502-9512.
73. Carpenter, D. L., M. A. Spasojevic, T. F. Bell, **U. S. Inan**, B. W. Reinisch, I. A. Galkin, R. F. Benson, J. L. Green, S. F. Fung and S. A. Boardsen (2002), Small-scale field-aligned plasmaspheric density structures inferred from the radio plasma imager on image, *J. Geophys. Res.*, *107*, (A9), 1258, doi:1029/2001JA009199.

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77. **Inan, U. S.** (2002), Lightning effects at high altitudes: sprites, elves, and terrestrial gamma ray flashes, *Applied Physics*, S1631-0705, 1411-1421.
78. Bortnik, J., **U. S. Inan** and T. F. Bell (2002), *L* dependence of energetic electron precipitation driven by magnetospherically reflecting whistler waves, *J. Geophys Res.*, 107, (A8), doi:10.1029/2001JA000303.
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82. Gerken, E. A., and **U. S. Inan** (2002), A survey of streamer and diffuse glow dynamics observed in sprites using telescopic imagery, *J. Geophys. Res.*, 107, (A11), 1344, doi:10.1029/2002JA009248.

#### List of publications in 2001:

83. Veronis, G., **Inan, U. S.**, and Pasko, V.P. (2001), He-Xe microdischarges: Comparison of simulation results with experimental data, *Applied Physics Letters*, 78, 25-27.
84. Barrington-Leigh, C. P., **Inan, U. S.** (2001), Identification of sprites and elves with intensified video and broadband array photometry, *J. Geophys. Res.*, 106, (A2), 1741-1750.
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94. Pasko, V. P., **U. S. Inan**, and T. F. Bell (2000), Fractal structure of sprites, *Geophys. Res. Lett.*, *27*, (4), 497-500.
95. Salvati, M. A., **U. S. Inan**, T. J. Rosenberg, and A. T. Weatherwax (2000), Solar wind control of polar chorus, *Geophys. Res. Lett.*, *27*, (5), 649-652.
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97. Sampath H. T., **U. S. Inan**, and M. P. Johnson (2000), Recovery signatures and occurrence properties of lightning-associated subionospheric VLF perturbations, *J. Geophys. Res.*, *105*, (A1), 183-192.
98. Lehtinen, N. G., **U. S. Inan**, T. F. Bell (2000), Trapped energetic electron curtains produced by thunderstorm driven relativistic runaway electrons, *Geophys. Res. Lett.*, *27*, (8), 1095-1098.
99. Johnson, M. P. and **U. S. Inan** (2000), Spheric clusters associated with early/fast VLF events, *Geophys. Res. Lett.*, *27*, (9), 1391-1394.
100. Gerken, E. A., **U. S. Inan** and C. P. Barrington-Leigh (2000), Telescopic imaging of sprites, *Geophys. Res. Lett.*, *27*, (17), 2637-2640.
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104. Johnson M. P., **U. S. Inan**, and D. S. Lauben, Subionospheric VLF signatures of oblique (nonducted) whistler-induced electron precipitation, *Geophys. Res. Lett.*, *26*, 3569, 1999.
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115. Draganov, A. B., **U. S. Inan**, V. S. Sonwalkar, and T. F. Bell, Magnetospherically reflected whistlers as a source of plasmaspheric hiss, *Geophys. Res. Lett.*, *19*, 233-236, 1992.
116. **Inan, U. S.**, T. F. Bell, and J. V. Rodriguez, Heating and Ionization of the Lower Ionosphere by Lightning Discharges, *Geophys. Res. Lett.*, *18*, pp. 705-708, 1991.
117. **Inan, U. S.**, VLF Heating of the Lower Ionosphere, *Geophys. Res. Lett.*, *17*, pp. 729-732, 1990.
118. **Inan, U. S.**, M. Walt, H. Voss, and W. Imhof, Energy Spectra and Pitch Angle Distribution of Lightning-Induced Electron Precipitation: Analysis of an Event Observed on the S81-1 (SEEP) Satellite, *J. Geophys. Res.*, *94*, pp. 1379-1401, 1989.
119. **Inan, U. S.**, W. C. Burgess, T. G. Wolf, D. C. Shafer, and R. E. Orville, Lightning-Associated Precipitation of MeV Electrons From the Inner Radiation Belt, *Geophys. Res. Lett.*, *15*, pp. 172-175, 1988.

120. Fishman, G.J., and **U.S. Inan**, Observation of an ionospheric disturbance caused by a gamma-ray burst, *Nature*, 331, pp. 418-420, 1988.
121. Sonwalkar, V.S., and **U.S. Inan**, Wave Normal Direction and Spectral Properties of Whistler Mode Hiss Observed on the DE-1 Satellite, *J. Geophys. Res.*, 93, pp. 7493-7514, 1988.
122. Gurnett, D.A., and **U.S. Inan**, Review of Plasma Wave Observations With the Dynamics Explorer 1 Spacecraft, *Rev. of Geophys.*, 26, pp. 285-316, 1988.
123. **Inan, U.S.**, D.C. Shafer, W.Y. Yip, and R.E. Orville, Subionospheric VLF Signatures of Nighttime D Region Perturbations in the Vicinity of Lightning Discharges, *J. Geophys. Res.*, 93, pp. 11455-11472, 1988.
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125. **Inan, U. S.**, Gyroresonant Pitch Angle Scattering by Coherent and Incoherent Whistler-Mode Waves in the Magnetosphere, *J. Geophys. Res.*, 92, pp.127-142, 1987.
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127. **Inan, U. S.**, Jovian VLF Chorus and Io Torus Aurora, *J. Geophys. Res.*, 91, pp. 4543-4550, 1986.
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129. **Inan, U. S.**, H. Chang, R. Helliwell, W. Imhof, J. Reagan, and M. Walt, Precipitation of Radiation Belt Electrons by Man-Made Waves: A Comparison of Theory and Measurement, *J. Geophys. Res.*, 90, pp. 359-369, 1985.
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132. **Inan, U. S.**, T. F. Bell, and H. C. Chang, Particle Precipitation Induced by Short-Duration VLF Waves in the Magnetosphere, *J. Geophys. Res.*, 87, pp. 6243-6264, 1982.
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134. **Inan, U. S.**, T. F. Bell, R. A. Helliwell, and J. P. Katsufakis, A VLF Transmitter on the Space Shuttle, *Adv. Space Res.*, 1, pp. 235-239, 1981.
135. **Inan, U. S.**, T. F. Bell, and R. A. Helliwell, Nonlinear Pitch Angle Scattering of Energetic Electrons by Coherent VLF Waves in the Magnetosphere, *J. Geophys. Res.*, 83, pp. 3235-3253, 1978.



**UMRAN S. INAN**  
**INVITED PAPERS & CONFERENCE PRESENTATIONS**  
**[For the last 10-years: September 1, 1998 to present]**

**SUMMARY:**

60 Invited Papers & Presentations

204 Other Talks & Presentations (43 as 1<sup>st</sup> author; most others as 2<sup>nd</sup> author with PhD student)

**Invited Talks & Presentations**

- 1) **Inan, U. S.**, ELF/VLF Wave-injection experiments and magnetospheric probing with HAARP, presented at the *XXIX General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 2) **Inan, U. S.**, M. Parrot, J. -A., Sauvaud, D. Piddyachiy, K. Graf, DEMETER Observations of electron precipitation by lightning-generated whistlers and VLF transmitter signals, presented at the *XXIX General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 3) **Inan, U. S.**, Very Low Frequency (VLF) studies of the ionosphere and the magnetosphere from Antarctica, presented at the *Open Science Conference in association with XXXth Scientific Committee on Antarctic Research (SCAR) Meeting* held in Saint Petersburg, Russia, July 8-11<sup>th</sup>, 2008.
- 4) **Inan, U. S.**, Lightning-induced effects in the ionosphere and the radiation belts, presented at the *International Workshop on Coupling of Thunderstorms and Lightning Discharges to near-Earth Space*, held at University of Corsica, Corte, France, June 23-27, 2008.
- 5) **Inan, U. S.**, S. Bijoor, M. Cohen, P. H. Scherrer, D. Scherrer, Space science capacity building with AWESOME ELF/VLF receivers, presented at *UN/ESA/NASA/JAXA Workshop on the International Heliophysical Year 2007 and United Nations Basic Space Science Instrumentation (UNBSS)*, held at Sozopol, Bulgaria, June 2-6, 2008.
- 6) **Inan, U. S.**, Subionospheric VLF measurements of lightning-induced ionospheric disturbances, presented at the *Japan Geosciences Union Meeting*, held in Chiba City, Japan, May 29 – June 1<sup>st</sup>, 2008.
- 7) **Inan, U. S.**, A compact low power ELF/VLF micro-receiver for small satellites, presented at the *Japan Geosciences Union Meeting*, held in Chiba City, Japan, May 29 – June 1<sup>st</sup>, 2008.
- 8) **Inan, U. S.**, Lower and middle atmospheric electrodynamics, Invited Tutorial presented at the *12<sup>th</sup> International Symposium on Equatorial Aeronomy*, held in Crete, Greece, May 18-24, 2008.
- 9) **Inan, U. S.**, *Distinguished Sackler Lecturer at Telaviv University*, Telaviv, Israel: Three lectures (one open to public at large) presented during April 28-May 2, 2008:
  - a. Lec#1: Lightning-ionosphere interactions: Sprites, gamma-rays, jets and electron precipitation
  - b. Lec#2: Electromagnetic waves and energetic particles in the near-Earth space environment
  - c. Lec#3: Very low frequency wave phenomena in near-Earth space
- 10) **Inan, U. S.**, Inner belt and slot region electron losses due to lightning-generated whistlers and VLF transmitter signals, presented at the *General Assembly of the European Geosciences Union (EGU)*, held in Vienna, Austria, April 13-18, 2008.

- 11) **Inan, U. S.**, Whistler-mode waves and wave-particle interactions in the plasmasphere, presented at the *ESA CLUSTER Workshop* in Tenerife, Canary, Islands, Spain, March 9-15, 2008.
- 12) **Inan, U. S.**, ELF/VLF wave-injection experiments and magnetospheric probing with HAARP, presented at *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, and Jan 3-6, 2008.
- 13) **Inan, U. S.**, Ground- and Satellite-based observations of energetic electron precipitation induced by lightning discharges and VLF transmitters, presented at *2nd VERSIM Workshop on ELF/VLF Radio Phenomena: generation, propagation and consequences in observations, theory and modeling*, Sodankylä, Finland, 26th - 30th September 2006.
- 14) **Inan, U. S.**, M. Cohen, P. Scherrer, and D. Scherrer, VLF Remote sensing of the lower ionosphere with AWESOME: solar flares, lightning-induced electron precipitation, sudden ionospheric disturbances, sprites, gravity waves and gamma-ray flares, presented at *Second UN/NASA Workshop on the International Heliophysical year and Basic Space Science*, Bangalore, India, November 27 - December 1, 2006.
- 15) **Inan, U. S.**, Very Low Frequency (VLF) measurements of magnetospheric waves and energetic electron precipitation effects, presented at *Greenland International Polar Year 2007 Space Science Symposium (GSSS-2007)*, Kangerlussuaq, Greenland, May 4 - 9, 2007.
- 16) **Inan, U. S.**, Ground- and Satellite-based studies of magnetospheric wave propagation, amplification and wave-induced electron precipitation, presented at *the RF Ionospheric Interactions Workshop*, Santa Fe, New Mexico, 22 - 25 April 2007.
- 17) **Inan, U. S.**, ELF/VLF wave-injection experiments with HAARP, presented at *the 2007 Joint Assembly of the American Geophysical Union (AGU)*, Acapulco, Mexico, 22-25 May 2007.
- 18) **Inan, U. S.**, Energetic electron precipitation induced by lightning-generated whistlers and VLF transmitter signals, presented at *the North American Radio Science Meeting*, Ottawa, Canada, and July 22-26, 2007.
- 19) **Inan, U. S.**, Causative lightning discharges and their ionospheric effects, presented at *the North American Radio Science Meeting*, Ottawa, Canada, July 22-26, 2007.
- 20) **Inan, U. S.**, IONOSPHERIC AND MAGNETOSPHERIC EFFECTS OF LIGHTNING DISCHARGES, presented at the XXVIIIth General Assembly of the International Union of Radio Science (URSI), New Delhi, India, October 23-29, 2005.
- 21) **Inan, U. S.**, ELF/VLF Wave-injection and Magnetospheric Probing with HAARP presented at the XXVIIIth General Assembly of the International Union of Radio Science (URSI), New Delhi, India, and October 23-29, 2005.
- 22) **Inan, U. S.**, Ionospheric Effects of Electrodynamical Pulses Radiated by Lightning Return Strokes, presented at the Annual Meeting of the United States National Committee of the International Union of Radio Science (USNC/URSI), Boulder, Colorado, January 3-7, 2006.
- 23) **Inan, U. S.**, M. Cohen, N. G. Lehtinen, R. Said, D. M. Smith, and L. I. Lopez, Terrestrial Gamma-ray Flashes and Lightning Discharges, presented at the Fall Meeting of the American Geophysical Union (AGU), San Francisco, December 5-9, 2005.
- 24) **Inan, U. S.**, Electrodynamical Effects of Lightning Discharges on the Ionosphere and the Magnetosphere, presented at the 86th Annual Meeting of the American Meteorological Society, Atlanta, Georgia, Jan 29-Feb 2, 2006.

- 25) **Inan, U. S.**, IONOSPHERIC DISTURBANCES FROM THE GIANT FLARE FROM MAGNETAR SGR 1806-20, presented at the Annual Meeting of the American Association for the Advancement of Science (AAAS), St. Louis, Missouri, Feb 16-20, 2006.
- 26) **Inan, U. S.**, M. Cohen, and J. Tan, Atmospheric Weather Educational System for Observation and Modeling of Effects (AWESOME), presented at United Nations/European Space Agency/NASA Workshop on the International Heliophysical Year (IHY), Abu-Dhabi/AI-Ain, United Arab Emirates, and Nov 20-23, 2006.
- 27) **Inan, U. S.**, Gyroresonant Interactions Between Coherent Whistler-mode Waves and Radiation Belt Electrons, *International School on Space Simulations (ISSS-7)*, Kyoto, Japan, March 2005.
- 28) **Inan, U. S.**, ELF/VLF Wave-injection Experiments and Magnetospheric Probing with HAARP, *RF Ionospheric Interactions Workshop*, Santa Fe, New Mexico, 17-20 April 2005.
- 29) **Inan, U. S.**, M. Cohen, R. Said, D. Smith and L. Lopez, Terrestrial Gamma-ray Flashes, and Radio Atmospherics, *Scientific Assembly of the International Association of Geomagnetism and Aeronomy (IAGA)*, Toulouse, France, 18-29 July, 2005.
- 30) **Inan, U. S.**, Wave-driven coupling of mesosphere-ionosphere-magnetosphere via particle precipitation from the radiation belts and thunderstorms and lightning discharges from the troposphere, Invited Paper presented at the *Workshop on Interhemispherical Conjugacy Effects in Solar-Terrestrial and Aeronomy Research*, Villafranche, France, April 22-23<sup>rd</sup>, 2004.
- 31) **Inan, U. S.**, VLF whistler-mode waves and wave-particle interactions in the ionosphere and magnetosphere, Invited Paper presented at the *Workshop on High Frequency Waves in Geospace*, Ringberg Castle, Bavaria, Germany, and July 11-14<sup>th</sup>, 2004.
- 32) **Inan, U. S.**, VLF wave-injection for controlled precipitation of radiation belt particles, presented at the *35<sup>th</sup> Scientific Assembly of the Committee on Space Research (COSPAR)*, Paris, France, July 18-25<sup>th</sup>, 2004.
- 33) **Inan, U. S.**, VLF studies of lightning-induced effects in the ionosphere and radiation belts, Invited Paper & Lecture presented at the *NATO Advanced Study Institute on Sprites, Elves, and Intense Lightning Discharges*, Corte, Corsica, July 24-31<sup>st</sup>, 2004.
- 34) **Inan, U. S.**, VLF remote sensing of lightning- and VLF transmitter-induced precipitation of energetic radiation belt electrons, presented at the *2004 Western Pacific Geophysics Meeting*, Honolulu, Hawaii, August 16-20<sup>th</sup>, 2004.
- 35) **Inan, U. S.**, Lightning-driven electrodynamic effects of the middle atmosphere, invited keynote paper, *12<sup>th</sup> International Conference on Atmospheric Electricity (ICAE)*, Versailles, France, and June 9-13, 2003.
- 36) **Inan, U. S.**, Lightning-driven electrodynamic effects in near-earth space, presented at the *Space Weather and the Earth's Weather and Climate (SPECIAL)* workshop held in Cambridge, United Kingdom, Jan. 3-6, 2002.
- 37) **Inan, U. S.**, Controlled precipitation of radiation belt electrons, *NATO Advanced Research Workshop on Effects of Space Weather on Technology Infrastructure*, Rhodes, Greece, March 25-29, 2003.
- 38) **Inan, U. S.**, Multi-point measurements of the source structure and motion of discrete electromagnetic waves, *International Workshop on Spatio-Temporal Analysis and Multipoint Measurements in Space*, Orleans, France, May 12-16, 2003.

- 39) **Inan, U. S.**, Lightning effects at high altitudes: sprites, elves, and terrestrial gamma ray flashes, presented at the ONERA workshop on the physics of thundercloud and lightning discharges, *Onera, Chatillon (Paris)*, November 5th, 2001.
- 40) **Inan, U. S.**, Lightning-driven electro dynamic effects in near-earth space, presented at Space Weather and the Earth's Weather and Climate (SPECIAL) workshop held in *Cambridge, United Kingdom*, January 3-6, 2002.
- 41) **Inan, U. S.**, ELF/VLF wave propagation in the magnetosphere, presented at the RF ionospheric interactions workshop held in *Santa Fe, New Mexico*, April 2002.
- 42) **Inan, U. S.**, Subionospheric VLF imaging of transient ionospheric disturbances: early/fast and lightning-induced electron precipitation (LEP) events, presented at the XXVIIIth triennial General Assembly of the International Union of Radio Science, *Maastricht, Netherlands*, August 17-24, 2002.
- 43) **Inan, U. S.**, ELF/VLF wave-injection via modulated HF heating of the ionosphere, presented at the XXVIIIth triennial General Assembly of the International Union of Radio Science, *Maastricht, Netherlands*, August 17-24, 2002.
- 44) **Inan, U. S.**, Natural and man-made whistler-mode waves in the ionosphere and magnetosphere, presented at the XXVIIIth triennial General Assembly of the International Union of Radio Science, *Maastricht, Netherlands*, August 17-24, 2002.
- 45) **Inan, U. S.**, Lightning-driven electro dynamic effects in near-earth space, presented as part of the Jones Seminar series on Science, Technology and Society at *Dartmouth College*, October 26, 2002.
- 46) **Inan, U.S.**, Upper Atmospheric Heating, Ionization and Optical Emissions Induced by Lightning Discharges, presented at the 53<sup>rd</sup> Annual Gaseous Electronics Conference, Houston, Texas, October 24-27, 2000.
- 47) **Inan, U. S.**, Sprites, Elves, Runaway MeV Electron Beams, Early/fast Conductivity Changes and Energetic Electron Precipitation, Electrical and Computer Engineering Department Graduate Seminar, October 12, 2000.
- 48) **Inan, U. S.**, Lightning Interactions with Trapped Radiation, presented at the Global Environmental Modeling (GEM) Conference, Snowmass, Colorado, June 16-22, 2001.
- 49) **Inan, U. S.**, Radio techniques, Invited tutorial presented at the High-frequency Active Auroral Research Program (HAARP) Summer School, August 13-22, 2001.
- 50) **Inan, U. S.**, Generation Mechanism of ELF/VLF Chorus and Its Relationship with Solar Wind Dynamic Pressure, presented at *Polar Science Workshop*, Maryland, October 1999.
- 51) **Inan, U. S.**, VLF Imaging of Ionospheric Disturbances Associated with Lightning Discharges and Enhanced Auroral Precipitation, presented at *European Science Foundation Space Weather Workshop*, France, 2-4 December 1999.
- 52) **Inan, U. S.**, M. P. Johnson, and T. F. Bell, Lightning Discharges, Early/Fast VLF Events and Sprites, *URSI/USNC National Radio Science Meeting*, Boulder, Colorado, January 2000.
- 53) **Inan, U. S.**, Ionospheric Effects of Lightning Discharges: Sprites, Elves, Runaway MeV Electron Beams, and Early/Fast Conductivity Changes, presented at *the Tenth International Symposium on Equatorial Aeronomy*, Turkey, May 2000.

- 54) **Inan, U. S.** and D. Backer, Gamma Ray Flare from 'Magnetar' Perturbs Earth's Ionosphere, Research Highlight Presentation *in the Plenary Session of National Radio Science Meeting of USNC/URSI*, Boulder, Colorado, January 1999.
- 55) **Inan, U. S.**, Telescopic Imaging of Sprites, presented at *URSI/USNC National Radio Science Meeting*, Boulder, Colorado, January 1999.
- 56) **Inan, U. S.**, Lightning-Ionosphere Interactions and Other Transient Ionospheric Disturbances, invited colloquium talk given at *the High Altitude Observatory of the National Center for Atmospheric Research*, February 10, 1999.
- 57) **Inan, U. S.**, Ionization of the Upper Atmosphere by Gamma Rays from a Distant Magnetar, presented at *RF Ionospheric Interactions Workshop*, Santa Fe, New Mexico, April 1999.
- 58) **Inan, U. S.**, Transient Disturbances of the Lower Ionosphere, invited tutorial presented at *the Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) Workshop*, Boulder, Colorado, June 1999.
- 59) **Inan, U. S.**, Lightning Induced Disturbances of the Middle Atmosphere, presented at the *XXII General Assembly of the International Union of Geodesy and Geophysics (IUGG)* held in Birmingham, UK, July 1999.
- 60) **Inan, U. S.**, Triggered VLF Emissions, presented at *the XXVIth General Assembly of the International Union of Radio Science (URSI)*, Toronto, Canada, August 1999.

#### **Other Presentations at Meetings and Symposia**

- 1) Cohen, M. B., and **U. S. Inan**, Geometric modulation: A new, more effective method of storable ELF/VLF wave generation with continuous HF heating of the lower ionosphere, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 2) Lehtinen, N. G., and **U. S. Inan**, Generation of ELF/VLF waves by an ionospheric heater at the geomagnetic equator, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 3) Golden, D. L., M. Spasojevic, and **U. S. Inan**, Chorus and hiss characteristics as observed at L=2.4 and their relation to the plasmasphere, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 4) Kulkarni, P., **U. S. Inan**, and T. F. Bell, Thermal corrections to the refractive index surface for whistler-mode waves, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 5) Pidduyachiy, D., **U. S. Inan**, T. F. Bell, M. Parrot, and N. G. Lehtinen, DEMETER observations of a column of intense up-going ELF/VLF radiation excited by the HAARP HF heater, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 6) Marshall, R. A., and **U. S. Inan**, Early VLF perturbations driven by lightning-EMP generated density perturbations in the ionosphere: model results, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.

- 7) Carlson, B. E., and **U. S. Inan**, Kerr effect remote sensing of thunderstorm electric fields using sky polarization, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 8) Bijoor, S., **U. S. Inan**, M. B. Cohen, D. Scherrer, P. Scherrer, Capacity building in radio science through the global network of AWESOME ELF/VLF space monitors, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 9) Newsome, R. T., and **U. S. Inan**, Photometric array imaging of elves, presented at the *XXIXth General Assembly of the International Union of Radio Science (URSI)*, Chicago, USA, August 7-16, 2008.
- 10) **Inan, U. S.**, D. Piddyachiy, T. F. Bell, and M. Parrot, DEMETER observations of ELF/VLF signals from HAARP and VLF transmitters, presented at *General Assembly of the European Geosciences Union (EGU)*, Vienna, Austria, April 13-18, 2008.
- 11) Graf, K., and **U. S. Inan**, Subionospheric VLF observations of VLF transmitter-induced precipitation of inner radiation belt electrons, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.
- 12) Gibby, A. R., **U. S. Inan**, and T. F. Bell, Empirical models of saturation in VLF triggered emissions, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.
- 13) Cohen, M. B., **U. S. Inan**, and M. Golkowski, Variation of HF beam parameters in ELF/VLF generation via modulated heating of the auroral electrojet, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.
- 14) Golkowski, M., **U. S. Inan**, and M. B. Cohen, Determination of magnetospheric propagation paths of ELF/VLF whistler-mode signals excited by the HAARP HF heater, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.
- 15) Newsome, R. T., and **U. S. Inan**, PIPER sprite observations during 2007 summer observation campaign, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.
- 16) Lehtinen, N. G., and **U. S. Inan**, Possible persistent ionization caused by giant blue jets, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.
- 17) Marshall, R. A., and **U. S. Inan**, Dissociative attachment as a possible cause of Early VLF perturbations, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.
- 18) Carlson, B. E., N. G. Lehtinen, and U. S. Inan, Energetic electrons accompanying terrestrial gamma-ray flashes, presented at the *USNC-URSI National Radio Science Meeting*, Boulder, Colorado, January 3-6, 2008.

- 19) Cohen, M. B., **U. S. Inan**, M. Golkowski, and N. Lehtinen, Geometric modulation: A new method of ELF/VLF generation with continuous HF heating of the auroral electrojet, presented at the *Fall Meeting of the American Geophysical Union (AGU)*, San Francisco, California, December 10-14, 2007.
- 20) Lehtinen, N. G., and **U. S. Inan**, Emission of ELF/VLF waves by a modulated electrojet upwards into the ionosphere and into the Earth-ionosphere waveguide, presented at the *Fall Meeting of the American Geophysical Union (AGU)*, San Francisco, California, and December 10-14, 2007.
- 21) Bell, T. F., **U. S. Inan**, P. Kulkarni, M. Parrot, The effects of plasma density irregularities on the pitch angle scattering of energetic radiation belt electrons due to VLF signals from ground-based transmitters, presented at the *Fall Meeting of the American Geophysical Union (AGU)*, San Francisco, California, December 10-14, 2007.
- 22) Kulkarni, P., **U. S. Inan**, T. F. Bell, and J. Bortnik, Dependence of whistler-mode wave induced electron precipitation on k-vector direction, presented at the *Fall Meeting of the American Geophysical Union (AGU)*, San Francisco, California, and December 10-14, 2007.
- 23) Golkowski, M., **U. S. Inan**, M. B. Cohen, D. Pidyyachiy, Magnetospheric wave-particle interactions excited by the HAARP HF heater, presented at the *Fall Meeting of the American Geophysical Union (AGU)*, San Francisco, California, December 10-14, 2007.
- 24) Pidyyachiy, D., **U. S. Inan**, T. F. Bell, M. Parrot, Observations of ELF signals over HAARP HF ionospheric heater and its conjugate region aboard DEMETER satellite, presented at the *Fall Meeting of the American Geophysical Union (AGU)*, San Francisco, California, December 10-14, 2007.
- 25) **Inan, U. S.**, VLF beacon transmitter at South Pole, presented at the *Kick-off Meeting of International Polar Year/Heliosphere Impact on Geospace*, Helsinki, Finland, February 5-9, 2007.
- 26) **Inan U. S.**, D. Pidyyachiy, W. Peter, M. Parrot, J-A. Sauvaud, Lightning-induced electron Precipitation: DEMETER and ground-based observations, presented at the *General Assembly of the European Geosciences Union*, Vienna, Austria, 15-20 April, 2007.
- 27) **Inan, U.S.**, F. Foust and T. Chevalier, FDFD modeling of trans-ionospheric propagation of VLF signals over long subionospheric paths, *IEEE Antennas & Propagation Society International Symposium*, Honolulu, Hawaii, June 10-15, 2007.
- 28) **Inan, U.S.**, B. R. T. Cotts, and N. Lehtinen, Long recovery early VLF events as possible evidence for persistent ionization by gigantic blue Jets, *XXIV General Assembly of the International Union of Geomagnetism & Geodesy (IUGG)*, Perugia, Italy, July 2-13, 2007.
- 29) **Inan, U.S.**, W. Peter., D. Pidyyachiy., M. Parrot., J-A. Sauvaud, Ground- and Satellite-based measurements of lightning-induced electron precipitation, *XXIV General Assembly of the International Union of Geomagnetism & Geodesy (IUGG)*, Perugia, Italy, July 2-13, 2007.
- 30) **Inan, U. S.**, M. Cohen, P. H. Scherrer, D. Scherrer, Remote sensing of the lower ionosphere with AWESOME VLF receivers, *XXIV General Assembly of the International Union of Geomagnetism & Geodesy (IUGG)*, Perugia, Italy, July 2-13, 2007.

- 31) Cohen, M. B., **U. S. Inan**, R. K. Said, D. M. Smith, Broadband and Narrowband multi-site VLF studies of global terrestrial gamma-ray flashes, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract AE31A-1038, 2006.
- 32) Piddyachiy D., **U. S. Inan**, M. Parrot, J. A. Sauvaud, Lightning-induced Electron Precipitation (LEP) Events Observed on DEMETER Satellite, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract SM43B-1489, 2006.
- 33) **Inan, U. S.**, D. Piddyachiy, M. Parrot, J.-A. Sauvaud, W. Peter, and R. Marshall, Ground- and satellite based observations of electron precipitation induced by lightning discharges and VLF transmitters, *2nd VERSIM Workshop*, Sodankyla Geophysical Observatory, Finland, 26 – 30 September, 2006.
- 34) N. G. Lehtinen and **U. S. Inan**, Non-Maxwellian model of ionospheric heating by radiation, *American Geophysical Union Meeting*, SA53B-1379, San Francisco, CA, December 11-15, 2006.
- 35) B. Carlson, N. Lehtinen and **U. Inan**, Constraints on terrestrial gamma-ray flash production derived from satellite observations, *American Geophysical Union Meeting*, AE31A-1039, San Francisco, CA, December 11-15, 2006.
- 36) Marshall, R. A. and **U. S. Inan**, Observations of burst-like VLF sferic activity in association with sprites, *American Geophysical Union Meeting*, AE51A-0263, San Francisco, CA, December 11-15, 2006.
- 37) Golkowski, M., **U. S. Inan**, and W. Peter, Subionospheric VLF Observations of Transmitter-Induced Precipitation of Inner Radiation Belt Electrons, *American Geophysical Union Meeting*, San Francisco, CA, December 11-15, 2006.
- 38) Carlson, B. E., N. G. Lehtinen, and **U. S. Inan**, Constraints on terrestrial gamma-ray source mechanisms, *American Geophysical Union Meeting*, San Francisco, , CA, December 11-15, 2006.
- 39) Piddyachiy D., and **U. S. Inan**, M. Parrot, Observations of ELF/VLF signals generated by full power HAARP array aboard DEMETER satellite, *RF Ionospheric Interactions Workshop*, Santa Fe, NM, 22 - 25 April, 2007.
- 40) Lehtinen, N. G., and **U. S. Inan**, Comparison of non-Maxwellian and Maxwellian models of ionospheric heating by HF radiation, *RF Ionospheric Interactions Workshop*, Santa Fe, NM, 22 - 25 April, 2007.
- 41) Marshall, R. A., R. T. Newsome, and **U. S. Inan**, First results from the PIPER imaging photometer instrument at HAARP, *RF Ionospheric Interactions Workshop*, Santa Fe, NM, 22-25, April 2007.
- 42) Gibby, A. R., **U. S. Inan**, and T. F. Bell, Modeling saturation effects in VLF triggered emissions, *Geospace Environment Modeling Workshop*, Midway, UT, June 18-22, 2007.
- 43) Selser, E. M., and **U. S. Inan**, On the association of inner Radiation Belt Electron Precipitation with Lightning, *North American Radioscience Meeting*, Ottawa, July 22-26, 2007.
- 44) Marshall, R. A. and **U. S. Inan**, The association of Very-Low-Frequency sferic bursts with sprites and intra-cloud lightning activity, *URSI National Radio Science Meeting*, Ottawa, Canada, July 23-26, 2007.
- 45) Marshall, R. A., **U. S. Inan**, and W. A. Lyons, Observations of burst-like VLF activity in association with sprites and correlations with intracloud lightning activity, *XXIV General Assembly of the International Union of Geophysics and Geodesy*, Perugia, Italy, July 2-13, 2007.

- 46) Cohen, M. B., **U. S. Inan**, and M. Golkowski, Terrestrial gamma-ray flashes and Very Low Frequency data, *XXIV General Assembly of the International Union of Geophysics and Geodesy, Perugia, Italy*, July 2-13, 2007.
- 47) Gibby, A. R., **U. S. Inan**, and T. F. Bell, Saturation of coherent VLF cyclotron-resonant wave growth, *North American Radio Science Meeting (URSI)*, Ottawa, Ontario, Canada, 2007.
- 48) Golkowski, M., and **U. S. Inan**, M. B. Cohen, ELF/VLF magnetospheric wave injection results from the upgraded ionospheric heater, *North American Radio Science Meeting (URSI)*, Ottawa, Ontario, Canada, 2007.
- 49) Cohen, M. B., **U. S. Inan**, and M. Golkowski, Temporal and spatial characteristics of HAARP-radiated ELF/VLF waves across Alaska and the Pacific Rim, *North American Radio Science Meeting (URSI)*, Ottawa, Ontario, Canada, 2007.
- 50) Chevalier, T.W., **U. S. Inan**, T. F. Bell, M. W. Chevalier, Fluid model of the collisionless plasma sheath surrounding an electric dipole antenna, *North American Radio Science Meeting (URSI)*, Ottawa, Ontario, Canada, 2007.
- 51) Cotts, B. R. T., **U. S. Inan**, and N. G. Lehtinen, Long recovery early/fast events as possible evidence of persistent ionization by gigantic blue jets. *North American Radio Science Meeting (URSI)*, Ottawa, Ontario, Canada, 2007.
- 52) Golkowski, M., and **U. S. Inan**, Multi-station observations of whistler-mode chorus, *International Union of Geodesy and Geophysics (IUGG) General Assembly*, July 2-13, 2007.
- 53) **Inan, U. S.**, B. R. T. Cotts, and N. G. Lehtinen, Long recovery early VLF events as possible evidence for persistent ionization by gigantic blue jets *International Union of Geodesy and Geophysics (IUGG)* July 2-13, 2007.
- 54) Said, R. K., and **U. S. Inan**, Lightning geo-location via combined use of time of arrival, arrival azimuth, and VLF propagation measurements of radio atmospherics, *ICAE Conference*, Beijing, China Aug 13-17, 2007.
- 55) Cotts, B. R. T., and **U. S. Inan**, Observation of daytime perturbations of VLF transmitter signals, *ICAE Conference*, Beijing, China, August 12-17, 2007.
- 56) **Inan, U. S.**, VLF beacon transmitter at South Pole, presented at *the Kick-off Meeting of International Polar Year/Heliosphere Impact on Geospace*, Helsinki, Finland, February 5-9, 2007.
- 57) **Inan U. S.**, D. Pidtyachiy, W. Peter, M. Parrot, J-A. Sauvaud, Lightning-induced electron Precipitation: DEMETER and ground-based observations, presented at the *General Assembly of the European Geosciences Union*, Vienna, Austria, 15-20 April, 2007.
- 58) **Inan, U.S.**, F. Foust and T. Chevalier, FDFD modeling of trans-ionospheric propagation of VLF signals over long subionospheric paths, *IEEE Antennas & Propagation Society International Symposium*, Honolulu, Hawaii, June 10-15, 2007.
- 59) **Inan, U.S.**, B. R. T. Cotts, and N. Lehtinen, Long recovery early VLF events as possible evidence for persistent ionization by gigantic blue Jets, *XXIV General Assembly of the International Union of Geomagnetism & Geodesy (IUGG)*, Perugia, Italy, July 2-13, 2007.
- 60) **Inan, U.S.**, W. Peter., D. Pidtyachiy., M. Parrot., J-A. Sauvaud, Ground- and Satellite-based measurements of lightning-induced electron precipitation, *XXIV General Assembly of the International Union of Geomagnetism & Geodesy (IUGG)*, Perugia, Italy, July 2-13, 2007.

- 61) **Inan, U. S.**, M. Cohen, P. H. Scherrer, D. Scherrer, Remote sensing of the lower ionosphere with AWESOME VLF receivers, *XXIV General Assembly of the International Union of Geomagnetism & Geodesy (IUGG)*, Perugia, Italy, July 2-13, 2007.
- 62) **Inan, U. S.**, M. Parrot, J.-A. Sauvaud, D. Piddiyachiy, M. Platino, T. F. Bell, Active Wave Injection Experiments with DEMETER, presented at the International Symposium DEMETER, Toulouse, France, Jun 14-16, 2006.
- 63) **Inan, U. S.**, J.-A. Sauvaud, M. Parrot, R. Marshall, D. Piddiyachiy, DEMETER Observations of Lightning-induced Electron Precipitation, presented at the International Symposium DEMETER, Toulouse, France, Jun 14-16, 2006.
- 64) **Inan, U. S.**, A Simple Plasma Wave Receiver for ASIM, presented at the First Atmospheric Space Interactions Monitor (ASIM) Science Workshop, ESTEC, Noordwijk, Netherlands, June 26-27, 2006.
- 65) **Inan, U. S.**, Global Thunderstorm Activity and its Effects on the Lower Ionosphere and the Radiation Belts, presented at the Open Science Conference during the 29th Meeting of the Scientific Committee on Antarctic Research (SCAR), Hobart, Australia, July 9-14, 2006.
- 66) **Inan, U. S.**, A VLF Beacon Transmitter at South Pole, presented at the Open Science Conference during the 29th Meeting of the Scientific Committee on Antarctic Research (SCAR), Hobart, Australia, July 9-14, 2006.
- 67) Spasojevic, M., and **U. S. Inan**, Ground based VLF observations near L=2.5 during the Halloween 2003 storm, *American Geophysical Union Meeting*, San Francisco, CA, Dec. 5-9, 2005.
- 68) Platino M., **U. S. Inan**, T. F. Bell, A Physical Interpretation of Moving Sources of ELF/VLF Chorus, *American Geophysical Union Meeting*, San Francisco, CA, December, 5-9, 2005.
- 69) Marshall, R. A., **U. S. Inan**, Measurements of small-scale features in sprites: sizes, lifetimes and propagation, *URSI General Assembly*, New Delhi, India, October 23-29, 2005.
- 70) Cohen, M. B., U. S. Inan, and G. R. Fishman, Terrestrial gamma rayflashes observed aboard the Compton Gamma Ray Observatory/Burst and Transient Source Experiment and ELF/VLF radio atmospherics, *Eos Trans. AGU*, 86(52), Fall Meet. Suppl., Abstract AE33A-0944, 2005.
- 71) Platino, M., **U. S. Inan**, T. F. Bell, A Physical Interpretation of Moving Sources of ELF/VLF Chorus, *Global Aspects of Magnetosphere-Ionosphere Coupling Workshop*, Yosemite, February 7-10, 2006.
- 72) Moore, R. C., **U. S. Inan**, and T. F. Bell, Long-distance detection of ELF waves generated via modulated heating of the auroral electrojet, *URSI National Meeting*, Boulder, CO, January 4-7, 2006.
- 73) Chevalier, T.W., **Inan, U. S.**, Bell, T.F., Chevalier, M.W. "Numerical Simulation of Electric Dipole Antennas in the Inner Magnetosphere". *URSI National Meeting*, Boulder CO, January 4-7, 2006.
- 74) Cohen, M. B., **U. S. Inan**, and G. R. Fishman (2006) , Terrestrial gamma ray flashes observed aboard the Compton Gamma Ray Observatory/Burst and Transient Source Experiment and ELF/VLF radio atmospherics *URSI National Meeting*, Boulder, CO, January 4-7, 2006.
- 75) Platino, M., **U. S. Inan**, T. F. Bell, A Physical Interpretation of Moving Sources of ELF/VLF Chorus, *URSI National Radio Science Meeting*, Boulder, CO, January 4-7, 2006.

- 76) Peter, W. B., **U. S. Inan**, *On the occurrence of lightning-induced electron precipitation (LEP) events*, *American Geophysical Union Meeting*, San Francisco, CA, December, 5-9, 2005.
- 77) Peter, W. B., **U. S. Inan**, *Quantification of VLF Signatures of LEP Events*, *URSI National Radio Science Meeting*, Boulder, CO, January 4-7, 2006.
- 78) Peter, W. B., **U. S. Inan**, *Precipitation of Energetic Electrons Induced by Lightning-Generated Whistler Waves*, *Global Aspects of Magnetosphere-Ionosphere Coupling, Yosemite Workshop*, February 7-10, 2006.
- 79) Peter, W. B., **U. S. Inan**, *Electron Precipitation and VLF Remote Sensing of Ionospheric Disturbances*, *GEM 2006 Summer workshop*, Snowmass, Colorado, June 25-30, 2006.
- 80) **Inan, U. S.**, M. Golkowski, D. L. Carpenter, N. Reddell, R. Moore, and T. F. Bell, *Multi-hop Whistler-mode ELF/VLF Signals and Triggered Emissions Excited by the HAARP HF Heater*, *URSI National Radio Science Meeting*, Boulder, Colorado, Jan. 5-8, 2005.
- 81) **Inan, U. S.**, M. Platino, T. F. Bell, *Rapid Motions of the Source Regions of Discrete Chorus and Implications For Triggered VLF Emissions*, *General Assembly of the European Geophysical Union (EGU)*, Vienna, Austria, 24-29 April, 2005.
- 82) **Inan, U. S.**, N. Lehtinen, R. Moore, K. Hurley, S. Boggs, D. Smith, G. Fishman, *Massive Disturbance of the Daytime Lower Ionosphere by the Giant g-ray Flare from Magnetar SGR 1806-20*, *Scientific Assembly of the International Association of Geomagnetism and Aeronomy (IAGA)*, Toulouse, France, 18-29 July, 2005.
- 83) Platino, M, **U. S. Inan**, and T. F. Bell, *Rapidly moving sources of upper-band ELF/VLF chorus near the magnetic equator*, *8th Cluster Workshop and SOWG/SWT*, Univ. of New Hampshire at Durham, NH, USA. Sept 27-Oct 1, 2004.
- 84) Chevalier, M. C., and **U. S. Inan**, *Relativistic Electron Precipitation Measurements using the VLF Beacon Transmitter at South Pole Station*, *GEM Meeting*, Snowmass, Colorado, June 20-25, 2004.
- 85) Marshall, R. A. and **U. S. Inan**, *High time resolution telescopic imaging of fine structure in sprites*, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract AE51A-09, 2004.
- 86) Peter, W. B., and **U. S. Inan**, *The influence of geomagnetic storms on the D-Region at mid-latitudes*, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract SM23A-0493, 2004.
- 87) Cotts, B. R. T. and **U. S. Inan**, *Short range VLF sky wave observations of lightning-induced ionospheric effects*, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract SA31A-1116, 2004.
- 88) Platino, M., **U. S. Inan**, T. F. Bell, D. A. Gurnett, and J. S. Pickett, *Cluster observations whistler-mode propagation inside and outside the plasmasphere*, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract SM12A-1195, 2004.
- 89) Moore, R. C., **U. S. Inan**, and T. F. Bell, *ELF/VLF waves generated by an artificially-modulated auroral electrojet above the HAARP HF Transmitter*, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract SA21C-0377, 2004.
- 90) Golkowski, M., **U. S. Inan**, D. L. Carpenter, and T. F. Bell (2004), *ELF/VLF Wave-Injection experiments and magnetospheric probing with the HAARP HF ionospheric heater*, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract SM22A-03.

- 91) Chevalier, M. W. and **U. S. Inan**, Remote sensing of relativistic electron precipitation using a VLF beacon transmitter at South Pole, *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract SM41A-1112, 2004.
- 92) Peter, W. B., and **U. S. Inan**, Occurrence rates of VLF signatures of LEP events measured by the HAIL array, *URSI National Radio Science Meeting*, Boulder, CO, Jan. 5-8, 2005.
- 93) Golkowski, M., **U. S. Inan**, D. L. Carpenter, and T.F. Bell, Statistics of excitation of ducted whistler-mode waves via modulated heating with HAARP, *URSI National Radio Science Meeting*, Boulder, Colorado, Jan. 5-8, 2005.
- 94) Cotts, B.R.T., **U. S. Inan**, and V. Pasko, Short range VLF Sky Wave observations of lightning-induced ionospheric effects, *URSI National Radio Science Meeting*, Boulder, Colorado, Jan 5-8, 2005.
- 95) Moore, R. C., **U. S. Inan**, T. F. Bell, E. J. Kennedy, and P. A. Kossey, ELF/VLF waves generated by modulated heating of the auroral electrojet with the HAARP HF transmitter, *URSI National Radio Science Meeting*, Boulder, Colorado, Jan 5-8, 2005.
- 96) Moore, R. C. and **U. S. Inan**, Blind demodulation of continuous-phase MSK signals in the very low frequency (3-30 kHz) band, *URSI National Radio Science Meeting*, Boulder, Colorado, Jan 5-8, 2005.
- 97) Marshall, R. A., **U. S. Inan**, Measurements of small-scale features in sprites: sizes, lifetimes and propagation, *URSI General Assembly*, New Delhi, India, October 23-29, 2005.
- 98) Marshall, R. A., and **U.S. Inan**, High-speed measurements of small-scale features in sprites: sizes, lifetimes and propagation, *Ionospheric Effects Symposium*, Alexandria, VA, May 3-5, 2005.
- 99) Marshall, R.A., **U.S. Inan**, High-speed telescopic imaging of sprites, *URSI National Radio Science Meeting*, Boulder, Colorado, January 5-8, 2005.
- 100) Golkowski, M., **U. S. Inan**, D. L. Carpenter, T.F. Bell, Magnetospheric wave injection with HAARP: 1-hop and 2-hop echoes, *HAARP Sponsored Scientists Workshop*, Lake Arrowhead, California, March 4-9, 2005.
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