



**UMass Lowell**

**Center for Atmospheric Research**

*umlcar.uml.edu*

---

**Bodo W. Reinisch, Director**

**Paul Song, Co-Director**

**Triennial Review 2002-2005**

**3 March 2006**



# *Objectives of UMLCAR*

- Interdisciplinary Space Science
- Advanced Space Measuring Technology
- Leadership in Plasma Radar Science
- National and International Partnerships
- Exciting Research Opportunity for Graduate and Undergraduate Students



# *UMLCAR Statistics*

- First university research center, established in 1975
- Seven faculty; six graduate students; six undergraduate students; eighteen research staff
- Operating budget \$2 to \$3 million per year
- Number of current grants (> \$100K): 11
- 1000 m<sup>2</sup> of laboratory and office space on the Third Floor South, Wannalancit Mills
- Center homepage at <http://umlcar.uml.edu>

# The Lowell Sun

February 25, 2006

## UML's 30-year mission to space

Lab team learning the mysteries  
beyond Earth's atmosphere

---

By MATT MURPHY  
Sun Staff

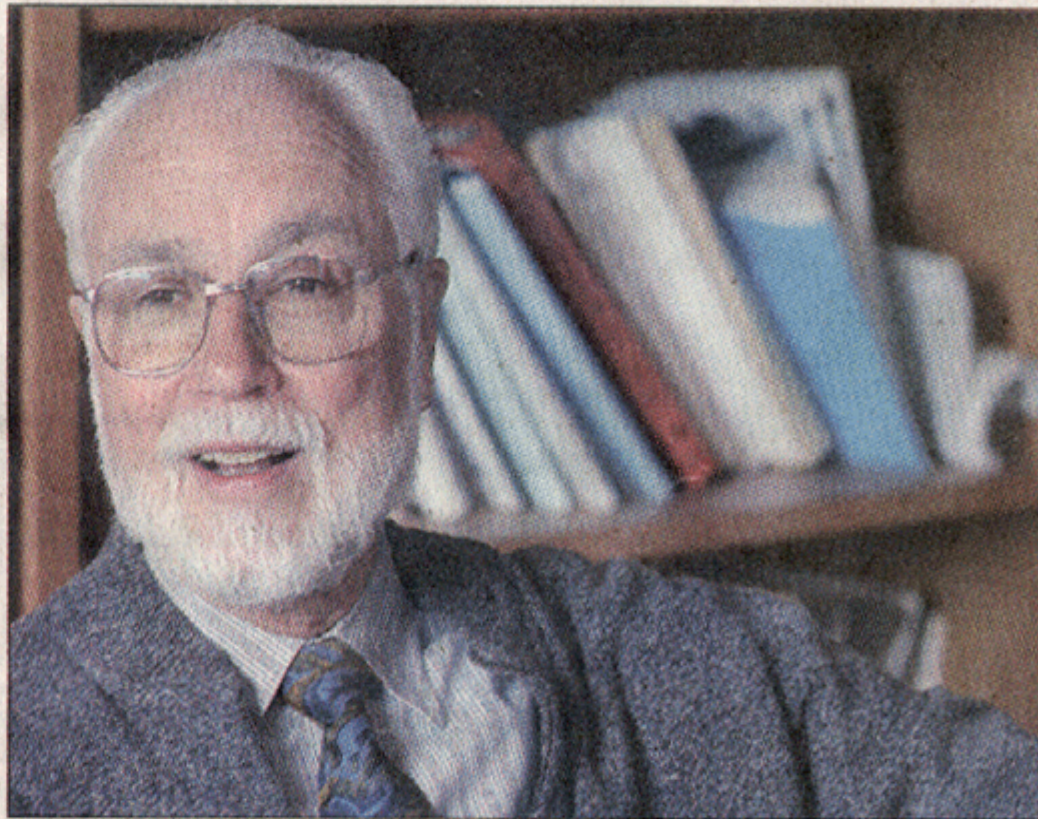
---

LOWELL — In late December, the stream of data transmitted from a space satellite to a Wannalancit Mills laboratory stopped.

For the first time in nearly 5½ years, UMass Lowell researchers had lost contact with NASA's IMAGE satellite, which carried two pieces of radar equipment conceived and built in Lowell.

Launched in the summer of 2000, the satellite was designed to help scientists understand the composition of the magnetosphere, a belt in space controlled by the Earth's magnetic field that protects the atmosphere from particle radiation emitted

Please see **SPACE/6**



Professor Bodo Reinisch and his team at UMass Lowell's Center for Atmospheric Research have earned worldwide renown for their discoveries over the decades.

SUN/BOB WH



# ***UMLCAR Staff***

## **Faculty**

- Bodo Reinisch, Environmental, Earth and Atmospheric Sciences
- Paul Song, Environmental, Earth and Atmospheric Sciences
- Gary Sales, Electrical and Computer Engineering (emeritus)
- George Cheney, Electrical and Computer Engineering
- Yan Liu, Electrical and Computer Engineering
- Georges Grinstein, Computer Sciences
- Vytenis Vasyliunas (visiting)

## **Graduate Students**

- Patrick Nsumei
- Pavel Ozhogin
- Sebahattin Eker
- Liqiang Ma
- Ivaylo Mechev
- Patricia Briea



# ***UMLCAR Staff (cont.)***

## **Undergraduate Students:**

- Andrew Carkin
- Sarinya Duke
- Jordan Grinstein
- Daniil Khmyrov
- Jonathan McElroy
- Keith Sorota

## **Research/Support:**

- Dr. Klaus Bibl
- Dr. Madhu Dhar
- Claude Dozois
- Dr. Ivan Galkin
- Jason Grochmal
- Ryan Hamel
- Prof. Xueqin Huang
- Walter Jones
- Grigori Khmyrov
- Alexander Kozlov
- Igor Lissyssian
- Steve Mendonca
- Steve Myers (NRL, Consultant)
- Dr. Vadym Paznukhov
- Kevin Roche
- Lynne Schaufenbil
- Stephen Stelmash (Leica-Geosys, Consult.)
- Dr. Jiannan Tu
- Dr. Vytenis Vasyliunas (Visiting Prof.)
- Mengjuan Zhao
- David Kitrosser



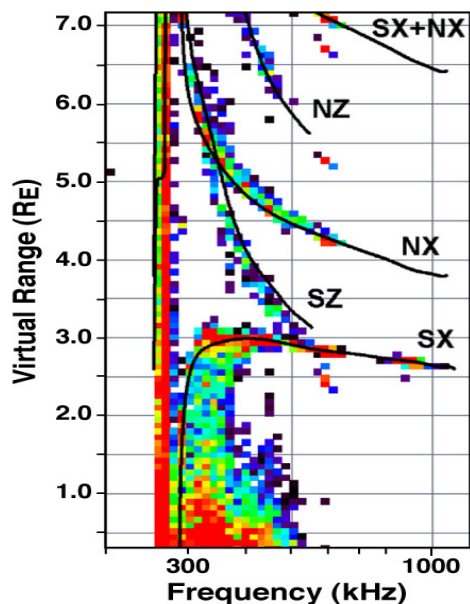
## *Major UMLCAR Research Projects*

1. UML Radio Plasma Imager on NASA's IMAGE satellite (launched 2000)
2. Stanford-UML payload development for AFRL's DSX satellite (launch in 2008/9)
3. UML Digisonde ionospheric radar network
4. Solar wind, magnetosphere-ionosphere coupling
5. International Reference Ionosphere
6. Antennas in plasma –general theory
7. Intelligent systems, data prospecting

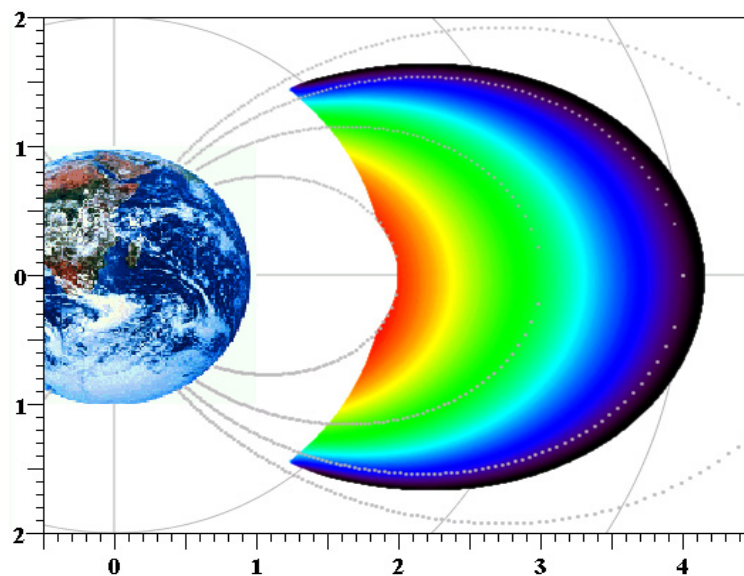
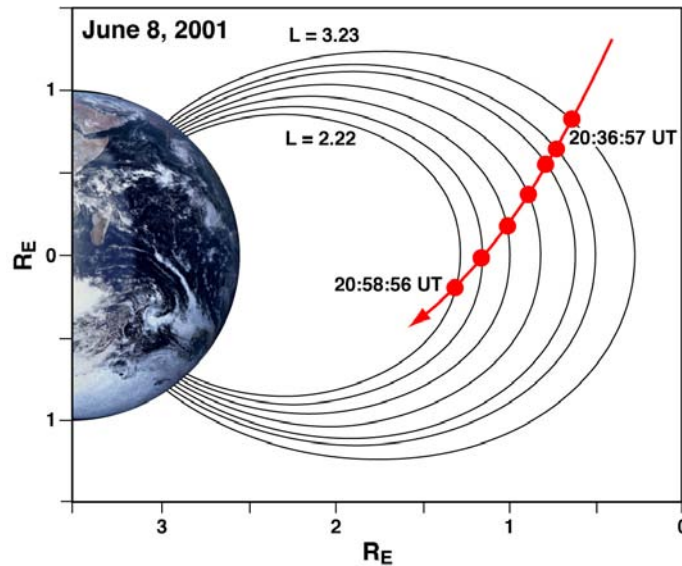
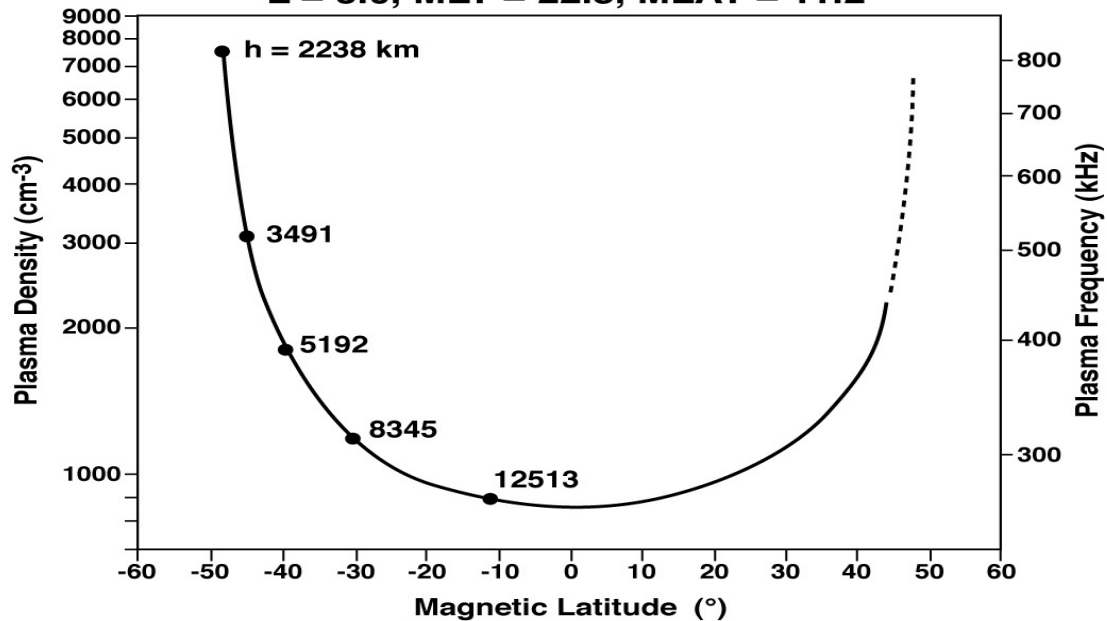


# IMAGE/RPI Field-Aligned Ne Profiles

17:50 October 24, 2000



L = 3.0, MLT = 22.8, MLAT = 11.2

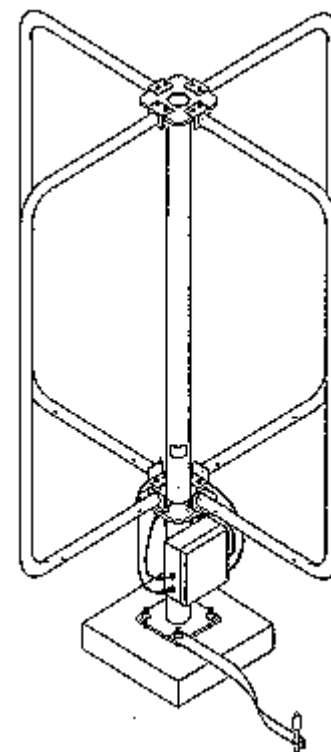




# *Digisonde Ionospheric Radar*



**2000**





# *Digisonde Historical Development*



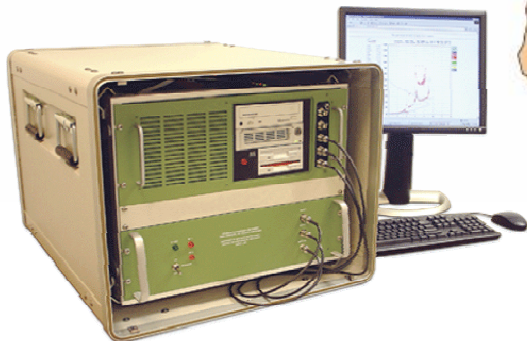
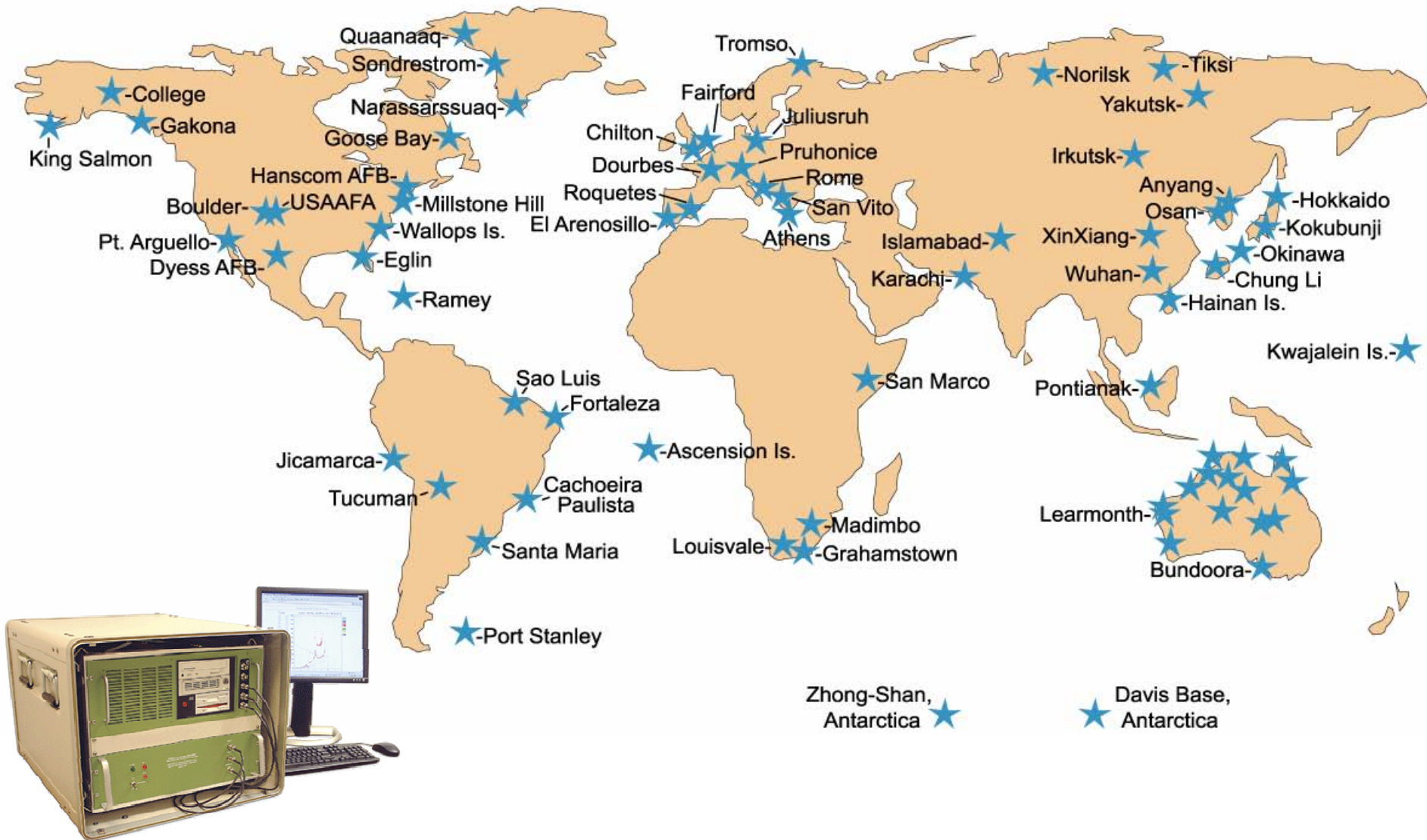
**1970**



**1980**

# Digisonde Stations Map

Digisonde is the de facto standard for ionospheric sounders





# *“Publish or Perish”*

(see <http://ulcar.uml.edu/publications.htm>)

## Publications in Refereed Journals:

**2002 = 23**

**2003 = 16**

**2004 = 32**

**2005 = 29**

## Conference Presentations:

**2002 = 55**

**2003 = 33**

**2004 = 31**

**2005 = 51**



# International / National Collaborations -2006

- Mendillo, Michael (**BU**), Paul Withers, David Hinson (**Stanford**), Henry Henry Rishbeth (**U. Northampton, UK**), and Bodo **Reinisch**, Effects of solar flares upon the ionosphere on Mars, *SCIENCE*, 2006.
- **Tu, Jiannan, P. Song, B. W. Reinisch, X. Huang**, J. L. Green (**NASA**), H. H. U. Frey (**U.. Berkeley**), and P. H. Reiff (**Rice U.**), Electron density images of the middle and high latitude magnetosphere in response to the solar wind, *J. Geophys. Res.*, 2006.
- Denton, R.E. (**Dartmouth College**), K. Takahashi, I. A. **Galkin, P. A. Nsumei, X. Huang, B. W. Reinisch**, R. R. Anderson (**U. Iowa**), M. K. Sleeper, and W. J. Hughes, The distribution of density along magnetospheric field lines, *J. Geophys. Res.*, 2006.
- **Reinisch, B. W.**, Space-borne observations for short-term earthquake predictions. A two-day workshop in **Istanbul, Turkey**, *IEEE A&P Magazine*, 2006.



## International / National Collaborations -2005

- Belehaki, A., (NOA, Greece) B. Reinisch, and N. Jakowski (DRL Germany), Plasmaspheric electron content derived from GPS TEC and Digisonde ionograms, *Adv. Spac. Res.*, 2005
- Reinisch, B. W., X. Huang, P. Song, J. L. Green (NASA GSFC), S. F. Fung, V. M. Vasyliunas (Max Planck Inst., Germany) D. L. Gallagher, and B. R. Sandel (U. Arizona), Plasmaspheric mass loss and refilling as a result of a magnetic storm, *J. Geophys. Res.*, 2005
- Lee, Chien-Chih (Ching-Yun University, Taiwan) Shin-Yi Su, and B. W. Reinisch, Concurrent study of bottomside spread F and bubble using digisonde and ROCSAT-1 in the equatorial ionosphere during solar maximum, *Annales Geophysicae*, 2005
- Song, P., V. M. Vasyliunas (MPI, Germany), , and L. Ma, A Three-Three-Fluid Model of Solar Wind-Magnetosphere-Ionosphere-Thermosphere Coupling, Multi-scale Coupling of Sun-Earth Processes, Processes, ed. A. T. Y. Lui, Y. Kamide, and G. Consolini, Elsevier B. Elsevier B. V., 2005



## International / National Collaborations -2005

- Abdu, M. A., I. S. Batista, (**INPE, Brazil**) B. W. **Reinisch**, A. J. Carrasco, Equatorial F-layer heights, evening prereversal electric field, and night E layer density in the American sector: IRI validation with observations, *Adv. Space Res.* 2005
- **Song**, P., V. M. Vasyliunas (**MPI, Germany**), and L. **Ma**, Solar-Wind-Magnetosphere-Ionosphere Coupling: Neutral Atmosphere Effects on Signal Propagation, *J. Geophys. Res.* 2005.
- **Reinisch**, B. W., **X. Huang**, A. Belehaki (**NOA, Greece**) O, J. Shi (**Acad. Sinica, Beijing**), M. L. Zhang, and R. Ilma (**Jicamarca, Peru**), Modeling the IRI topside profile using scale heights from ground-based ionosonde measurements, *Adv. Space Res.*, 2004.
- **Reinisch**, B. W., M. Abdu (**Brazil**), I. Batista, G. S. **Sales**, G. **Khmyrov**, T. A. Bullett (**AFRL**), J. Chau (**Peru**), and V. Rios (**Argentina**), Multistation digisonde observations of equatorial spread F in South America, *Annales Geophysicae*, 2004.
- Anderson, D. (**U. Colorado**), B. **Reinisch**, C. Valladares (**BC**), J. Chau (**Peru**), and O. Veliz, Forecasting the occurrence of ionospheric scintillation activity in the equatorial ionosphere on a day-to-day bases, *J. Atmos. Solar-Terr. Phys.*, 2004
- **Galkin**, I., B. W. **Reinisch**, G. **Grinstein**, G. **Khmyrov**, A. **Kozlov**, **X. Huang**, and S. and S. Fung (**NASA**), Automated Exploration of the Radio Plasma Inager Data, *J. Data, J. Geophys. Res.*, 2004.



# *2006 Conference Presentations*

- January:      URSI, Boulder, CO -- 5
- February:     DSX PDR, Stanford, CA -- 4
- April:         EGU, Vienna, Austria – 6  
                  European COST296, Germany --1
- May:           AGU, Baltimore, MD – 8  
                  ISO, Colorado Springs, CO – 1  
                  IMAGE Science WS, Greenbelt, MD -- 3
- July:           COSPAR, Beijing, China – 6  
                  WPGM, Beijing , China– 3
- October:       IRI Workshop, Buenos Aires, Argentina –2  
                  DSX Science W.S., Hanscom, MA – 2
- December:     AGU, San Francisco, CA – 6 (estimate)