



Rainbow_at_keystone: Cedar workshop 2017 in beautiful Keystone, CO.

IMG_1546: These are the friendly CEDAR workshop organizers: Barbara Emery, Kendra Greb, Michelle McCambridge, and Astrid Maute.



barbara/DSCN1436

Donna Cummings, Kendra Greb and Michelle McCambridge



barbara/DSCN1441
Sunday evening
reception on the roof of
the conference center.



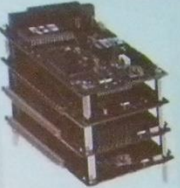
barbara/DSCN1452
CSSC member Jonathan
Makela is chairing the
Monday morning
session and welcomes
everybody.



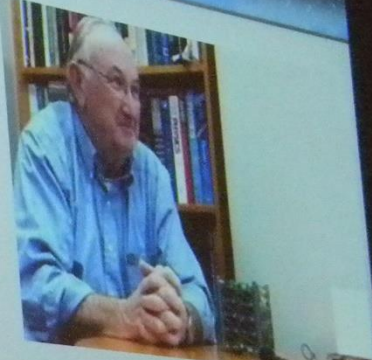
barbara/DSCN1464
Scott Palo gives a
science highlight about
cubesats.




The Vision circa 2000



PC104




Bob Twiggs



CubeSat
1kg/1L

The Problem:
How to launch these satellites?



Aerospace Engineering Science
UNIVERSITY OF COLORADO BOULDER

The slide features a starry space background at the top. It contains several images: a stack of PC104 computer boards, a photograph of Bob Twiggs, and a small satellite (CubeSat). The text is arranged around these images, with the title at the top, the problem statement at the bottom right, and the university logo at the bottom left.

barbara/DSCN1477
Recognizing Barbara Emery's several decades long support of the CEDAR workshop past CSSC chair Dave Hysell speaks with CSSC member Jonathan Makela, and past chairs Jeff Forbes and Jeff Thayer, and Kendra Greb in the back.



barbara/DSCN1483

Barbara Emery with her
certificate for life-long
free CEDAR workshop
registration.



IMG_1552: Barbara Emery was recognized for decades of organizing the CEDAR workshops. She got a CEDAR bracelet.



barbara/DSCN1496
Cedar prize lecturer
Delores Knipp (CU
Boulder) receives her
certificate from session
chair Jonathan Makela.



barbara/DSCN1525
Student panel
discussion during lunch
time with panelist
Seebany Dattu-Barua,
Michael Hirsch, Katrina
Bossert, John Sahr.





DSCN1506: Two workshops were dedicated to Art Richmond- Participants of the High Latitude Electrodynamics session.

barbara/DSCN1508
The 2017 Cedar
Distinguished lecturer
Art Richmond
(HAO/NCAR) with Gang
Lu who arranged the
session on High Latitude
Electrodynamics in his
honor.



barbara/DSCN1514
CSSC dinner on Monday:
Sitting at the table from
left to right: Lynn
Harvey, Ludger
Scherliess, Irfan Azeem
(NSF), John Meriwether
(NSF), Ruth Lieberman
(NSF), Scott England,
Jonathan Makela,
Seebany Datta-Barua. In
the background from
left to right: Rodger
Varney, Marco Milla,
Kendra Greb, Astrid
Maute, and Yue Deng is
walking in.



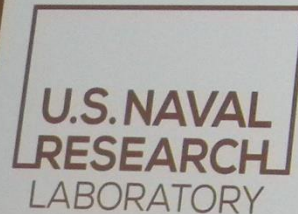
barbara/DSCN1538
Kendra Greb with a
young scientist.



barbara/DSCN1522
John Emmert and Doug
Drob report about the
new NRLMSIS 2.0.

NRLMSIS® 2.0: New Formulation, New Data

- 1) NRLMSISE-00 History and Formulation
 - 2) NRLMSIS 2.0 Data and Formulation
 - 3) NRLMSIS 2.0 Results
-



John Emmert, Doug Drob, David Siskind
Space Science Division, Naval Research Lab

Mike Picone
Voluntary Emeritus Program, Naval Research Lab

Acknowledgement: This work was supported by the Chief of Naval Research
and by NASA

Many, many thanks to the data providers!



IMG_1614:
Lara Waldrop and son
enjoy the poster session.



IMG_1631:

Delores Knipp, the 2017 CEDAR prize lecturer, and Katelynn Greer are having fun.



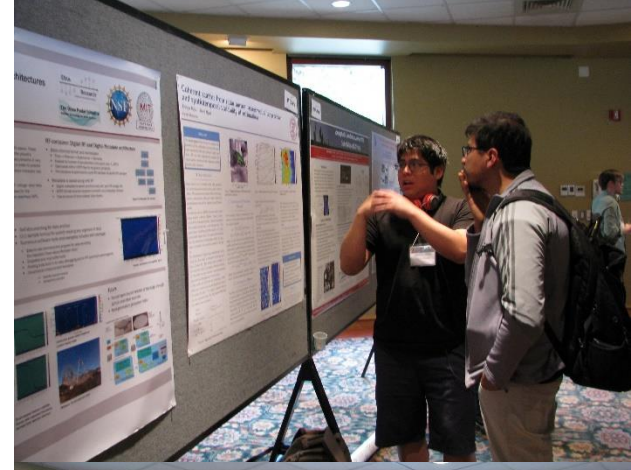
IMG_1621: Tomoko Matsuo, Farzad Kamalabadi, and Seebany Datta-Barua show that poster sessions are fun.



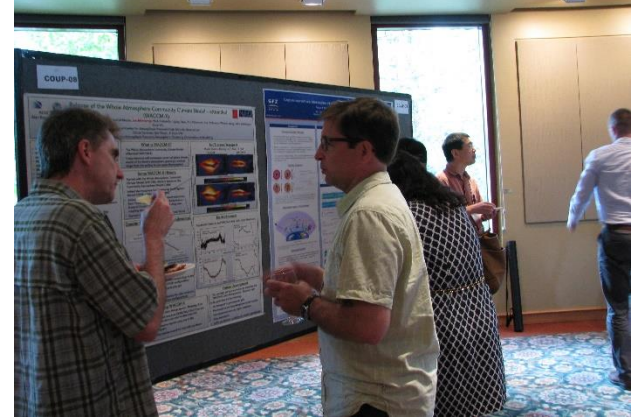
IMG_1615: Scott England, Colin Triplett, and Katelynn Greer during the poster session.



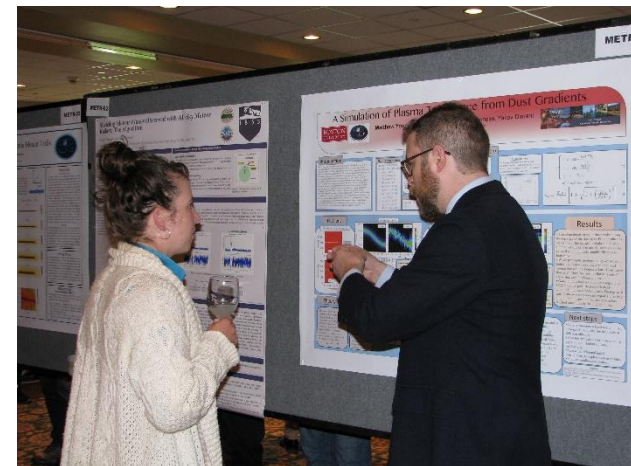
IMG_1579 Enrique Rojas Villalba explains his poster(ITIT-11).



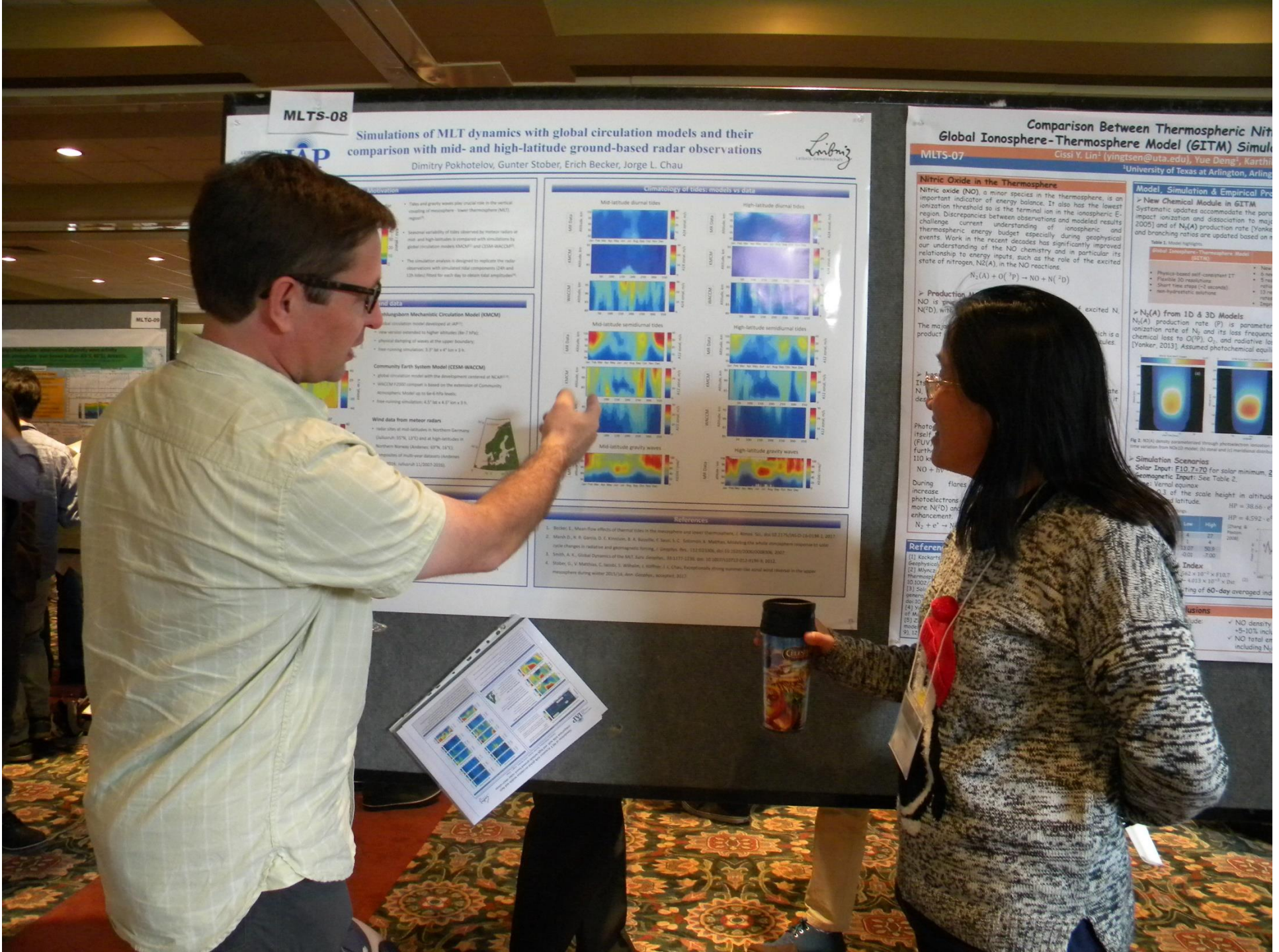
IMG_1578: Joe McInerney (COUP-08) and Dimitry Pokhotelov.



IMG_1589: Angeline Burrell and Matthew Young (METR-01).



barbara/DSCN1545
Dimitry Pokhotelov
discusses his poster
MLTS-08 with Xinzhao
Chu.



MLTS-08

Simulations of MLT dynamics with global circulation models and their comparison with mid- and high-latitude ground-based radar observations

Dimitry Pokhotelov, Gunter Stober, Erich Becker, Jorge L. Chau

Introduction

- Tides and gravity waves also crucial role in the vertical coupling of mesosphere (lower thermosphere MLT) region!
- Seasonal variability of tides observed by meteor radars at mid- and high latitudes is compared with simulations by global circulation models (MCM) and CISM-WACCM!
- The simulation analysis is designed to replicate the radar observations with simulated tidal components (2M and 4M tidal index) used for each day to obtain tidal amplitude!

Model Data

Mid-latitude diurnal tides

High-latitude diurnal tides

Mid-latitude semidiurnal tides

High-latitude semidiurnal tides

Mid-latitude gravity waves

High-latitude gravity waves

References

1. Stober, G., Mean-flow effects of transient tides in the mesosphere and lower thermosphere, *J. Atmos. Sci.*, doi:10.1175/JAS4104.1, 2007
2. Marsh, D., S. B. Gille, D. C. Kinnison, S. A. Bruneau, T. Sato, S. C. Solomon, S. Manabe, Modeling the winter circulation response to solar cycle changes in radiation and geomagnetic forcing, *J. Geophys. Res.*, 113, E02006, doi:10.1029/2006JE002696, 2007
3. Smith, A. K., Global Dynamics of the MLT, *J. Atmos. Sci.*, 69, 1771-1786, doi:10.1175/JAS4104.1, 2004
4. Stober, G., V. Matthias, C. Jacobi, S. Wilhelm, J. L. Chau, Transiently strong warmings in the wind and neutral in the upper mesosphere during winter 2013/14, *Ann. Geophys.*, accepted, 2017

Comparison Between Thermospheric Nitric Oxide in the Thermosphere

Global Ionosphere-Thermosphere Model (GITM) Simulation

MLTS-07

Cissi Y. Lin¹ (ylin@uta.edu), Yue Deng¹, Karthikeyan Sridharan¹

¹University of Texas at Arlington, Arlington, Texas

Nitric Oxide in the Thermosphere

Nitric oxide (NO), a minor species in the thermosphere, is an important indicator of energy balance. It also has the lowest ionization threshold so is the terminal ion in the ionospheric E-region. Discrepancies between observations and modeled results challenge current understanding of ionospheric and thermospheric energy budget, especially during geomagnetic events. Work in the recent decades has significantly improved our understanding of the NO chemistry and in particular its relationship to energy inputs, such as the role of the excited state of nitrogen, N₂(A), in the NO reactions.

$$N_2(A) + O(^1P) \rightarrow NO + N(^4D)$$

Model, Simulation & Empirical Parameters

- New Chemical Module in GITM
- Systematic updates accommodate the partial ionization and dissociation to mg (Yonker, 2005) and of N₂(A) production rate (Yonker and branching ratios are updated based on recent measurements)
- Model Comparison Thermosphere Model (CCTM)
- Physics-based self-consistent 3D model
- Flexible 3D resolution
- Short time step (~4 seconds)
- Non-hydrostatic equations
- New
- 6-m
- 5-mg
- 10-mg
- 13-mg
- 15-mg
- 20-mg
- 30-mg

Production of NO

NO is produced by the reaction of excited N₂(A) with O(^1P) and O(^3P). The major production mechanism is the reaction of N₂(A) with O(^1P).

Simulation Scenarios

Solar Input: F10.7=70 for solar minimum, 200 for solar maximum

Geomagnetic Input: See Table 2

Vernal equinox

During the simulation, the solar wind velocity is increased to 500 km/s at the scale height in altitude of 100 km at mid-latitude.

HP = 38.66 eV

HP = 4.592 eV

References

- [1] Eckert, T., Geophysical Research Letters, 2007
- [2] Manabe, S., Thermosphere Ionosphere Chemistry Model (TICM) v2.0.0
- [3] Salpeter, E. E., Astrophysical Journal, 1962
- [4] Yonker, C. A., Journal of Geophysical Research, 2005
- [5] Zetterstrom, M., Journal of Geophysical Research, 1997

Conclusions

- NO density
- +5-10% incl.
- NO total ion.
- including N₂

barbara/DSCN1544
Aramesh Seif and Aaron
Ridley at the poster
session.



barbara/DSCN1557
Lindsay Goodwin and
Rodger Varney at her
poster ITIT-24.



IMG_1641:

The IT poster judges work hard in the judging room (head judges Ethan Miller and Ed Mierkiewicz in the foreground).



barbara/DSCN1561
MLT judge Dave Siskind,
and head judges Ethan
Miller and Astrid Maute
in the poster judging
room.



104CANON/IMG_1669: Head judges Ethan Miller and Lynn Harvey announce the CEDAR poster prize winners.



- 104CANON/IMG_1689 Poster prize winners poster id
1. Agnit Mukhopadh (University of Michigan) CCMC Student Research Contest winner
 2. Ian Geraghty (University of Colorado, MLTG-07) MLT Undergrad honorable mention
 3. Aaron Bunch (California State University – Long Beach, POLA-05) IT Undergrad honorable mention
 4. Jacob Engle (Embry-Riddle Aeronautical University, SPRT-01) MLT Undergrad honorable mention
 5. Ningchao Wang (Illinois Institute of Technology, MDIT-09) IT honorable mention
 6. Jiashu Wu (University of Calgary, MITC-09) IT 2nd place
 7. Yangyang Shen (University of Calgary, MITC-09) IT 1st place
 8. Matthew Young (Boston University, METR-01) MLT honorable mention
 9. Matthew Grawe (University of Illinois at Urbana-Champaign, MLTG-08) MLT 1st place
 10. Kneeling: Lindsay Goodwin (University of Saskatchewan, ITIT-24) MLT 2nd place



barbara/DSCN1513
Ludger Scherliess
presenting at the
CEDAR-GEM Modeling
Challenge workshop.



Summary for Ionospheric Group
(April 3-7, 2017 Meeting in Florida)

Four Working Teams:

- Ionosphere Plasma Density
- Global & Regional TEC
- Scintillation
- Neutral Density and Orbit Determination at LEO

IMG_1607:Phil Erickson gives the “Solar Eclipse 2017” science highlight.



barbara/DSCN1438
Doug Drob and Astrid
Maute discuss science.



barbara/DSCN1440
?, Lindsay Goodwin and
Susan Nossal
Having a meeting
outside in front of the
conference center.



barbara/DSCN1510
The 2017 Cedar
Distinguished lecturer
Art Richmond
(HAO/NCAR) with
Maura Hagan.



104CANON/IMG_1648: Art Richmond (HAO/NCAR) gives the 2017 CEDAR Distinguished Lecture.



104CANON/IMG_1662: Art Richmond (HAO/NCAR) receives the 2017 CEDAR Distinguished Lecture prize from CSSC chair John Sahr and Maura Hagan.

