

財團法人國家實驗研究院國家太空中心

全球定位科學應用研究委託案(3/3)

101年度「全球定位科學應用研究中心」

期末報告

工作項目(1.2): 國際學者交流報告 (II)

執行期間： 2012/2/18~2013/2/17

計畫主持人：黃清勇

參與人員：黃成勇、蔡和芳、曾子榜、吳怡娟、翁佩芬、

吳靜美、謝涵蓁

中 華 民 國 1 0 2 年 2 月

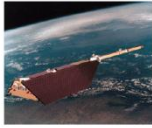
姓名	聯絡資料	單位及職稱	研究專長
Bill Schreiner	America Email: schrein@ucar.edu	UCAR	Precise orbit determination, GPS radio occultation, CHAMP/GRACE RO data processing and analysis.
Tomoko Matsuo	USA Email : tomoko.matsuo@noaa.gov	University of Colorado at Boulder / NOAA-Space Weather Prediction Center, USA Scientist II	Data assimilation of ionospheric/thermospheric parameters, thermosphere-ionosphere coupling
Jens Wickert	Germany Email: wickert@gfz-potsdam.de	Group leading scientist, Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences Section 1.1, GPS/Galileo Earth Observation	GPS radio occultation, CHAMP/GRACE RO data processing and system development, GPS Project management, GPS RO data analysis.
Ho Shupeng	USA Email: spho@ucar.edu	National Center for Atmospheric Research, Atmospheric Chemistry Division University Corporation for Atmospheric Research, COSMIC Program	Member of the American Meteorological Society Member of the American Geophysical Union Member of the International Society for Optical Engineering

「學者交流訪問計畫」

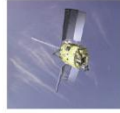
短期訪問進行情形報告

訪問學者	Bill Schreiner		
主辦單位	全球定位科學研究中心(GPS-ARC)	邀訪者	黃清勇 教授
時間	2012年8月21日至2012年8月24日		
<p>主旨：擔任 2012 掩星暑期營授課講師及演講，介紹 GPS RO Excess Phase Processing 。Lecture in GPSARC RO summer camp and discuss about the application of precise orbit determination of FORMOSAT-3/COSMIC and FORMOSAT-7/COSMIC</p> <p>行程及活動經過： Lecture for students. The given topic is “GPS RO Excess Phase Processing.”</p> <p>檢討：</p> <p>The uncertainty of computing excess phase is mainly caused by the determined FORMOSAT-3/COSMIC orbit and clock. Additionally, the orbit accuracy is highly related to the satellite attitude control. The zero-differenced data process produces less noise than single- and double-differenced data process. Since the above uncertainties, the COSMIC-derived bending angle noise is higher than the METOP-derived one. The use of 5-sec GPS clock will slight improve the noise in the zero- and single-differenced data processing.</p> <p>建議：</p> <p>The above factors will affect the retrieval of atmosphere profile. Therefore, in the FORMOSAT-7/COSMIC-2 mission, the improvements of orbit accuracy, clock stability and attitude control over FORMOSAT-3/COSMIC are expected. If FORMOSAT-7/COSMIC-2 equips with the ultra-stable oscillator, it will be helpful for the zero-differenced data process. With the GNSS development, we need to modify software for FORMOSAT-7/COSMIC-2 and improve the quality control.</p> <p>相關活動：</p> <p>Discussion about error sources of precise orbit determination and satellite attitude control.</p>			

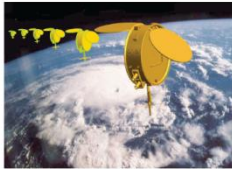
Some Aspects of Inversion of GPS RO Signals



Bill Schreiner
S. Sokolovskiy, Janet Zeng, D. Hunt, B. Kuo



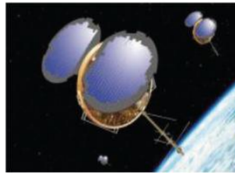
UCAR COSMIC Program Office
www.cosmic.ucar.edu



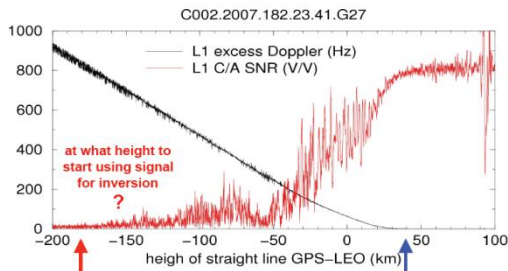
Aug 23, 2012



Seminar at NCU/Taiwan



Upper stratosphere and lower troposphere are regions of maximum uncertainty for GPS RO inversions



In the lower troposphere:
the signal reduces below noise level in terms of the amplitude

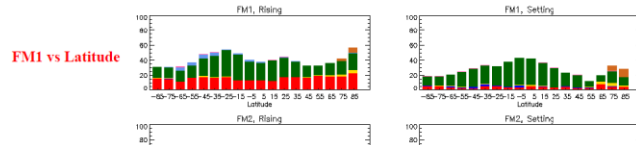
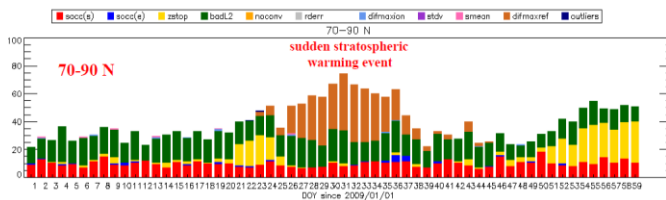
In the upper stratosphere:
the signal reduces below noise level in terms of the phase (Doppler)

Aug 23, 2012

Seminar at NCU/Taiwan

Neutral Atmospheric Profile QC

- COSMIC data from Jan-Feb 2009
 - Green failures due to poor quality of L2 signal
 - Tan failures due to large departures from climatology
 - Red failures due to problem with rising occultation tracking



Biographical Sketch: Tomoko Matsuo

(a) Professional Preparation:

Hokkaido University, Sapporo, Japan, *Geophysics, B.Sc.* 1995
Nagoya University, Nagoya, Japan, *Physics, M.Sc.* 1998
State University of New York, Stony Brook, *Atmospheric Sciences, Ph.D.* 2003

(b) Appointments:

2007-Present *Research Scientist II*, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder
2003–2007 *Visiting Scientist*, Institute for Mathematics Applied to Geosciences, National Center for Atmospheric Research
1999–2003 *Graduate Research Assistant*, HAO/NCAR
1998–1999 *Visiting Research Scientist*, Space Environment Center/NOAA
1997–1998 *Research/Teaching Assistant*, SUNY, Stony Brook

(c) Publications Related to This Proposal:

Matsuo, T., I. T. Lee, and J. L. Anderson, Thermospheric mass density specification using an ensemble Kalman filter, *Journal of Geophysical Research*, under review.
Matsuo, T., Upper atmosphere data assimilation using an ensemble Kalman filter, AGU monograph on modeling the IT system, under review.
Sun, Y. Y., T. Matsuo, E. A. Araujo-Pradere, J. Y. Liu, Ground-based GPS observation of SED-associated irregularities over CONUS, *Journal of Geophysical Research*, under review.
Lee, I. T., T. Matsuo, A. D. Richmond, J. Y. Liu, W. Wang, C. H. Lin, J. L. Anderson, M. Q. Chen, Assimilation of FORMOSAT-3/COSMIC electron density profiles into thermosphere/ionosphere coupling model by using ensemble Kalman filter, *Journal of Geophysical Research*, under review.
Matsuo, T., M. Fedrizzi, T. J. Fuller-Rowell, and M. Codrescu, Data assimilation of thermospheric mass density, *Space Weather*, 10, S05002, doi:10.1029/2012SW000773, 2012
Matsuo, T., E. A. Araujo-Pradere, Role of thermosphere-ionosphere coupling in a global ionosphere specification, *Radio Science*, 46, RS0D23, doi:10.1029/2010RS004576, 2011.
Matsuo, T., D. W. Nychka, and D. Paul, Nonstationary covariance modeling for incomplete data: Monte Carlo EM approach, *Computational Statistics and Data Analysis*, 55, 2059-2073, 2011.
Matsuo, T., and J. M. Forbes, Principal modes of thermospheric density variability: Empirical orthogonal function analysis of CHAMP 2001-2008 data, *Journal of Geophysical Research*, 115, 10.1029/2009JA015109, 2010.
Matsuo, T., and A. D. Richmond, Effects of high-latitude ionospheric electric field variability on global thermospheric Joule heating and mechanical energy transfer rate, *Journal of Geophysical Research*, 113, 10.1029/2007JA012993, 2008.
Matsuo, T., A. D. Richmond, and G. Lu, Optimal Interpolation analysis of high-latitude ionospheric electrodynamics using empirical orthogonal functions: Estimation of dominant modes of variability and temporal scales of large-scale electric fields, *Journal of Geophysical Research*, 110, 10.1029/2004JA010531, 2005
Matsuo, T., A. D. Richmond, and D. W. Nychka, Modes of high-latitude electric field variability derived from DE-2 measurements: Empirical Orthogonal Function (EOF) analysis, *Geophysical Research Letters*, 29, 10.1029/2001GL014077, 2002.

(d) Synergistic Activities:

Session convener:

IUGG (session: data assimilation and ensemble forecasting for weather and climate), Melbourne, Australia, 2011;
IUGG (session: data assimilation and space weather session), Perugia, Italy, 2007;
IAGA (session: data assimilation techniques for the ionosphere-thermosphere magnetosphere system), Toulouse, France, 2005

Panelist:

CEDAR workshop data assimilation panel discussion, Santa Fe, NM, 2006;
International Space Science Institute (ISSI) science team for 3d ionospheric modeling Bern, Switzerland, 2005-2006

Proposal Reviews:

NASA Geospace Science proposal peer-review panels and mail-in external reviewers
NASA Heliophysics Guest Investigators Program peer-review panels;
NSF Aeronomy Program mail-in external reviewers;
NSF Antarctic Aeronomy and Astrophysics Program peer-review panels;
NSF Coupling, Energetics, and Dynamics of Atmospheric Regions Program peer-review panels;

Paper Reviews:

Journal of Geophysical Research; Monthly Weather Review;
Geophysical Research Letter; Tellus; Mathematical Geosciences;
Annals of the Institute of Statistical Mathematics; Space Weather

(e) Collaborators and other Affiliations:

Collaborators and Co-Editors:

Akmaev, R. (NOAA); Amm, O. (Finnish Meteorological Institute); Anderson, B. J. (APL/JHU); Anderson, J. L. (NCAR); Araujo-Pradere, E. A. (CU-Boulder/NOAA); Aruliah, A. (UCL); Bahcivan, H. (SRI); Buchert, S. C. (Swedish Institute of Space Physics); Codrescu, M. (NOAA); Cosgrove, R. B. (SRI); Crowley, G. (ASTRA); Fedrizzi, M. (CU-Boulder/NOAA); Forbes, J. M. (CU-Boulder); Fuller-Rowell, T. J. (CU-Boulder/NOAA); Fujii, R. (Nagoya Univ.); Gjerloev, J. W. (Univ. of Bergen); Heinselman, C. J. (SRI); Ieda, A. (Nagoya Univ.); Knipp, D. L. (CU-Boulder); Lee, I. T. (NCU); Lin, C. H. (); Liu, J. Y. (NCU); Lu, G. (NCAR); McCready, M. A. (SRI); Maruyama, N. (CU-Boulder/NOAA); Marsh, D. (NCAR); Nychka, D. W. (NCAR); Paul, D. (UC-Davis); Raeder, J. (UNH); Richmond, A. D. (NCAR); Smith, A. K. (NCAR); Stolle, C. (TUD); Sun, Y. Y. (NCU); Vanhamaki, H. (Finnish Meteorological Institute); Wang, W. (NCAR); Yoshikawa, A. (Kyushu Univ.)

Graduate Advisors:

A. D. Richmond (NCAR); M. A. Geller (SUNY-Stony Brook)

Postdoctoral Sponsors:

D. W. Nychka (NCAR); J. L. Anderson (NCAR)

「學者交流訪問計畫」

短期訪問進行情形報告

訪問學者	Tomoko Matsuo		
主辦單位	全球定位科學研究中心(GPS-ARC)	邀訪者	黃清勇 教授
時 間	2012 年 8 月 21 日 至 2012 年 8 月 25 日		
主旨： 此行主要在 GPS 掩星暑期營期間，為新進學員講授資料同化概論以及其在電離層反演資料方面的應用，另外公開演講進階之高層大氣 EnKF 資料同化，並進行相關討論與交流。			
行程及活動經過： 8/22 資料同化概論及應用講座 8/23 高層大氣 EnKF 資料同化演講與討論			
檢討： 電離層資料同化已從過去的電離圖資料同化進展到掩星電離層電子密度剖線資料同化，但不論國內外都面臨大量計算資源的窘境。Matsuo 博士在 NOAA 使用大型叢集電腦平行運算，雖然資料同化相關程式可能取得，但仍需相當的軟硬體支援，因此未來福衛七號之電離層天氣現報或預報的作業即時性還有待克服。			
建議： 建議國家太空中心持續支持電離層相關研究經費。			
相關活動： 第一場講座介紹資料同化是先驗系統狀態與直接或間接觀測量的組合，進而由貝氏理論推導後驗機率函數（即條件機率函數，表示在現有觀測量的條件下，先驗值發生的可能性有多少）方程式，並說明共變異數所扮演的角色，最後以福衛三號電離層路徑 TEC（觀測量）為例，展示資料同化前後的差異。 第二場公開演講從人造衛星在太空中的分布談起，說明熱氣層的物質密度會影響衛星軌道的預測。因為我們想要追蹤衛星及太空垃圾，以預知衛星被太空垃圾撞擊的機率為何。但又從何得知熱氣層的物質密度為何呢？熱氣層的觀測量非常稀疏，因此我們需要高層大氣的資料同化。以 EnKF 為基礎，推導出來的條件機率函數，針對德國 CHAMP 衛星所進行的觀測模擬實驗（OSSE），顯示中性大氣密度的誤差，在衛星軌道附近獲得改善。應用福衛三號電離層電子密度剖線於高層大氣的 OSSE 實驗也有初步成效，因此可望應用於未來的福衛七號掩			

UNDERSTANDING DATA ASSIMILATION

APPLICATIONS TO IONOSPHERIC RADIO OCCULTATION

Tomoko MATSUO (aka – 松尾朋子)
University of Colorado, Boulder
Space Weather Prediction Center, NOAA

Data Assimilation

Combining Information

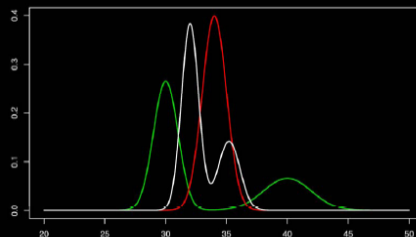
prior knowledge of the state of system x
empirical or physical models
complete in space and time

Bayes Theorem

prior $p(x)$

observation likelihood $p(y|x)$
probability distribution of y when x have a given value

posterior
 $p(x|y) \propto p(y|x)p(x)$





Dr. Jens Wickert

Helmholtz-Zentrum Potsdam

Deutsches GeoForschungsZentrum GFZ

Sektion 1.1, GPS/GALILEO-Erdbeobachtung

Telegrafenberg, A17 20.03

14473 Potsdam

Tel.: +49 331 288-1758

Fax: +49 331 288-1111

E-Mail: jens.wickert@gfz-potsdam.de

Wissenschaftliche Interessen:

- GPS-Radiookkultation der elektrisch neutralen und ionisierten Atmosphäre
- Bodengestützte GPS-Atmosphärensondierung (Atmosphäre/Ionosphäre), GPS-Reflektometrie/Scatterometrie, GPS-Empfängertechnik
- Entwicklung von Auswertesoftware für boden- und satellitengestützte GNSS-Messungen und deren Anwendung unter Echtzeitaspekten
- Geodäsie/Satellitengeodäsie, Geophysik, Atmosphären-/Ionosphärenforschung, GNSS-Seismologie, Erdsystemforschung, interdisziplinäre Forschungsprojekte
- Planung, Realisierung und Betrieb von Satellitenmissionen mit GNSS-Komponenten
- Einwerbung von Drittmitteln für Forschungsprojekte auf nationaler und internationaler Basis bei unterschiedlichsten Projektförderern und Leitung der damit verbundenen Forschungsprojekte
- Publizieren und Popularisieren von wissenschaftlichen Ergebnissen
- Wissenschaftliches Programmieren mit FORTRAN und IDL

- Arbeiten mit LATEX, MS Office, COREL, HTML
- Digitale Fotografie und Bildbearbeitung (mit Adobe Software, z.B., Photoshop, Illustrator, und Premiere)
- Populärwissenschaftliche Vorträge (z.B. URANIA) Satellitenmissionen, Antarktisüberwinterung
- Autor und Fotograf für populärwissenschaftliche Zeitschriften (u.a. MARE, Themen Antarktis, Kaiserpinguine)
- Sprachen: Englisch, Russisch (sehr gut/fliessend), Lettisch, Französisch (Grundlagen)

「學者交流訪問計畫」

短期訪問進行情形報告

訪問學者	Dr. Jens Wickert		
主辦單位	全球定位科學與應用研究中心 (GPSARC)	邀訪者	黃清勇 教授
時間	2012年8月22日至2012年8月25日		

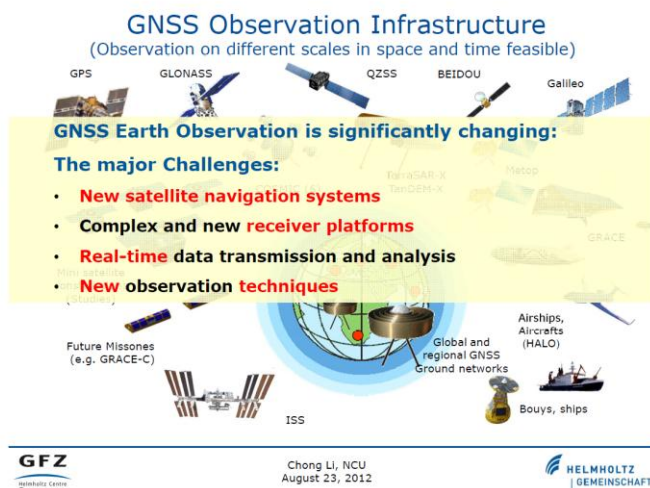
主旨：擔任 2012 掩星暑期營授課講師及演講，GPSARC 與 GFZ 兩單位學術合作及交流。

行程及活動經過：

1. 於 101.08.22 抵達台灣準備授課資料與演講資料
2. 於 101.08.23 於中央大學 S1-713 授課，授課題目”**GPS Reflectometry: Short Introduction and Activities at GFZ**”。下午於 S1-702D 演講，題目為 GNSS Reflectometry: Introduction, Recent Results from GFZ and future Prospects。
3. 於 101.08.24 下午 03:00 與中央大學 GPSARC 人員討論未來合作與 GPS 反射應用技術交流。
4. 離開台灣。

檢討：

這次的交流，Jens 帶給我們許多 GPS 反射訊號的應用和研究的新觀念與新的應用。提供我們未來發展新的衛星任務許多寶貴的經驗，GFZ 的經驗有許多可借鏡之處。



建議：

未來與 GFZ 可多加強合作或學者交流

相關活動：

Curriculum Vitae: Shu-Peng Ben Ho

National Center for Atmospheric Research, Atmospheric Chemistry Division

University Corporation for Atmospheric Research, COSMIC Program

2450 Mitchell Lane, Boulder, CO 80301, USA

Phone: +1-(303) 497-2922, Fax: +1(303) 497-2920,

E-mail: spho@ucar.edu

Education:

Ph. D. Atmospheric science, May 1998, University of Wisconsin-Madison,

M.S., Atmospheric science, May 1995, University of Wisconsin-Madison

M.S., Meteorology, May 1992, Rutgers-the State University of New Jersey

B.A., Computer Science, May 1987, Feng Chia University, Taichung, Taiwan

Professional Experiences:

2008/03- UCAR/COSMIC, NCAR/ACD, Project scientist II

2005-2008: UCAR/COSMIC

2002-2005: NCAR/ACD, Project scientist I

2001-2002: NCAR/ACD, Associate Scientist III

1998-2001: Analytical Service & Materials, Inc., in affiliation of NASA Langley Research Center,
Hampton, VA, Research Scientist

1993-1998: Department of Atmospheric and Oceanic, University of Wisconsin-Madison, Research
Assistant

1990-1992: Department of Meteorology, Rutgers-the State University of New Jersey,
Research Assistant

Professional Activities

Member of the American Meteorological Society

Member of the American Geophysical Union

Member of the International Society for Optical Engineering

Awards and Recognitions:

Member of international working groups, the World Climate Research Programme (WCRP) Global
Energy and Water Cycle Experiment (GEWEX).

Member of international working groups, the World Climate Research Programme (WCRP) Global
Stratospheric Processes and their Role in Climate (SPARC)

January, 2012: Invited visiting to the GPS Scientific Application Research Center in National
Central University, Taiwan from 5 to 15 January, 2012.

February, 2012: Selected in "Who is who in American" for 2013 issue.

June, 2011: Selected in "Who is who in American" for 2012 issue.

May, 2011: invited to join the WCRP SPARC group.

March, 2011: invited to attend the World Climate Research Programme (WCRP) Global Energy and Water Cycle Experiment (GEWEX) Radiation Panel (GRP) workshop and the ESA Data User Element (DUE) programme's global Vapour project in Frascati, Italy.

November, 2010: invited to be a Contributing Author for the Fifth Assessment Report 2 of the Intergovernmental Panel on Climate Change (IPCC WGI AR5).

June 2010: Invited visiting to the GPS Scientific Application Research Center in National Central University, Taiwan from June 5 to July 2, 2010.

March 2009: Invited to workshop on the "Assessment of Small Satellite Missions to "Meet the Needs of the Earth Sciences", University of Colorado Laboratory for Atmospheric and Space Physics (LASP).

July 2009: Selected in "Who is who in American" for 2010 issue.

June 2008: Selected in "Who is who in American" for 2009 issue.

April 2007: Special Contribution to UCAR COSMIC Mission Award.

April 2007: Selected by "Who is who in the World" for 2008 issue.

May 2006: Selected in "Who is who in American" for 2007 issue.

Internal:

December 2006: UCAR Outstanding Accomplishment Award for Scientific and Technical Advancement (for the MOPITT project).

September 2006: Key Contributor to UCAR COSMIC Program Award.

October 2008: COSMIC Special Recognition Award for coordinating COSMIC Student Program.

Externally Funded Collaborations:

1. Principal Investigator: Validation and Calibration of MSU/AMSU Measurements and Radiosonde Observations Using GPS RO Data for Improving Stratospheric and Tropospheric Temperature Trends, NOAA, NA07OAR4310224, POP: 08/01/07-07/31/10 (300K/ for three years, finished).
2. Principal Investigator: Satellite and Ground-Based Validation of TES Tropospheric CO Products, NASA, NNX07AB52G, POP: 01/15/07-01/14/10 (600K for three years).
3. Co-Principal Investigator: A Climate Virtual Observatory (CVO): Online Data Fusion & Analysis for Climate Variability & Change, POP: 04/01/08-03/31/09 (350K for two years finished).
4. Co-Principal Investigator: UCAR-NOAA Collaborative Planning for an Operational Radio Occultation (RO) Mission, NOAA NESDIS, 2009-2011 (on going).
5. Co-Principal Investigator: Climate Trends and model Evaluation by Radio Occultation Trendeval: Analysis, Detection and Attribution of Atmospheric Climate Trend and Climate Model Evaluation based on Data Records from Radio Occultation, Research Project Proposal to the Austrian Science Fund, 2009-2011, POP: 07/01/10-06/30/12 (on going).
6. Principal Investigator: Construction of Consistent Microwave Sensor Temperature Records and Tropopause Height Climatology Using MSU/AMSU Measurements, GPS RO Data and Radiosonde Observations, NOAA, POP: 07/01/2009-06/30/2012 (600K for three years, on

going).

7. Co-Principal Investigator: Operational processing of COSMIC Radio Occultation Data, 2011-2015 (on going).
8. Consultant: NASA FBAR project, 2010-2013 (on going).
9. Co-Principal Investigator: Applications and Construction of Climate Data Records for Global Climate Change Studies, China-973 project, China, 2010-2014 (on going).
10. Principal Investigator: RO-Calibrated AMSU Brightness Temperature CDR, NOAA (dole source contract, 50K/year, on going).

Professional Service:

- 2006 – present: NOAA climate contact for COSMIC
- 2006 – present: NASA TES/Aura Science Team, Member
- 2008 – present: NASA sounding science team, Member
- 2006 – present : Multi-center RO trend analysis team, Member
- 2007 – present : NOAA climate data record science team, Member
- 2010 – present : NOAA climate data record science team, lead of GPS RO data
- 2005 – present : Professional Journal Reviews:
Atmospheric Chemistry and Physics
Atmospheric Environment
Environmental Chemistry
Geophysical Research Letters
Journal of Geophysical Research-Atmospheres
IEEE Transactions on Geoscience and Remote Sensing
- 2008 – present : Proposal review for NASA
- 2006 – present : Internal review for NCAR ACD and UCAR COSMIC proposals
- Organizer of the Workshop on the Applications of GPS Radio Occultation to Climate, NCAR Foothills Laboratory, Building #1 Atrium Conference Room 3450 Mitchell Lane, Boulder, CO 80301 March 17-18, 2008.
- Supervisor of COSMIC student program, 2008
- Organizer and Co-chair of the COSMIC-NOAA meeting in AMS, 2008.
- Program Committee of COSMIC 2009 International Workshop
- Coordinator and moderator of the UCAR/COSMIC Seminar Series, 2009-
- Chair of NCAR Asian Listening Meeting breakout section, 2008
- Chair of COSMIC scientific applications section in the COSMIC/NCAR/UCAR retreat, 2009.
- Chair and panel member for the Science Opportunities for COSMIC-II, COSMIC/NCAR/UCAR retreat, 2010, Lake Shore Lodge and Conference Center, Estes Park, CO.
- Committee of NCAR Asian circle Meeting, 2009-present.
- Organizer and Co-chair of COSMIC-NOAA climate meeting in AMS, 2008.

- Organizer and Co-chair of COSMIC-NOAA climate meeting in AMS, 2009.
- Organizer and Co-chair of COSMIC-NOAA climate meeting in AMS, 2010.
- Chair of student poster competition of COSMIC international workshop, Boulder, CO, USA, October, 2009.
- Panel member of NCAR Asian circle Meeting, 2010
- Director of the Student Program for 2011 COSMIC student trip and workshop, Taipei, Taiwan.
- Organizer and Co-chair UCAR/COSMIC workshop the RO inversion and climate workshop in Estes Park, CO, USA from 28th March to 3rd April 2012, together with the CGMS International Radio Occultation Working Group (IROWG).
- Lead of the WCRP (World Climate Research Program) GEWEX Radiation Panel (GRP) water vapor profile climate data record assessment.
- Chair for the climate section in the 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO, April, 2011, Taipei, Taiwan.
- Co-Chair of student poster competition of the 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO 2011, April, 2011, Taipei, Taiwan.
- Co-Chair for the COSMIC workshop of the GPS RO Data Processing for Climate Applications, Estes Park, CO, USA from 28th March to 3rd April 2012.
- RO inversion and climate workshop, September, Boulder CO., 2011. □ Member of the WCRP (World Climate Research Program) SPARC global temperature profile climate record assessment.
- Chair of Workshop Organizing Committee for the sixth COSMIC users workshop, 2012.
- Chair for the climate section in the 2nd IROWG Workshop 28 March 3, April 2012, CO, U.S.A.
- Moderator of the section of Inventory and requirements on data records and reference data working group for the GEWEX water vapor assessment workshop, September, 25-28, 2012, Germany.

Supervisory Experiences:

2007-2008: supervisor of Dr. Wenying He, COSMIC/UCAR visiting scientist from Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China.

2008-present: supervisor of Xinjia Zhou, COSMIC/UCAR visiting scientist from Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China.

2008-present: supervisor of Dr. Patrick F. Callaghan, COSMIC/UCAR post-graduate scientist.

2009-2010: supervisor of Professor Jie Xiang, ACD/NCAR, COSMIC/UCAR visiting scientist from Department of Atmospheric science, Nanjing University, Nanjing, China.

2009-2010: supervisor of Dr. Junmei Zhang, COSMIC/UCAR visiting scientist from Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China.

2009-2011: supervisor of Teresa VanHove, COSMIC/UCAR associate scientist.

2010-present: co-supervisor of Jerry Raj, Ph. D. student from the National Central University, Taiwan.

2010-present: supervisor of Wen-Hsin Teng, student visitor from the National Central University, Taiwan.

2011-present: supervisor of Dr. Liang Peng, COSMIC/UCAR visiting scientist from Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China.

2010-present: co-supervisor of Dr. Barbara Scherllin-Pirscher, a NCAR ASP postdoctoral scientist, who is originally from University of Graz, Austria.

2010-present: co-supervisor of Dr. Zhen Zang, NCAR COSMIC project scientist.

2011-present: co-supervisor of Mr. Riccardo Biondi, Ph. D. visitor from DMI.

2012-present: co-supervisor of Ms. Xu Xu, Associate Professor visitor from China

Hosting Scientific Visitor:

2010, July: Dr. Andrea Stenier, research scientist from WegC, Graz

2012, July: Dr. Uli Foelsche, Associate Professor from WegC, Graz

Publications:

Thesis

1. **Shu-peng Ho**, An Expert System for Validation and Screening of Air Quality data. Master Thesis. Rutgers-the State University of New Jersey. 1992.
2. **Shu-peng Ho**. Atmospheric Profiles from Simultaneous Observations of Upwelling and Downwelling Spectral Radiance. Ph. D. Thesis, University of Wisconsin - Madison, March 1998.

Referred Journal Articles:

1. **Ho, S.-P.**, Construction of a Consistent Microwave Sensor Temperature Record in the Lower Stratosphere Using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, *J. Geophys. Research*, 2012 (submitted).
2. **Ho, S. P.**, The Sixth FORMOSAT-3/COSMIC Data Users' Workshop: Current Developments on the Applications of COSMIC from the Troposphere to Ionosphere and the Potential Impacts of COSMIC-2 Data, BAMS, 2012 (ready to submit).
3. Mears C., J. Wang, **S.-P. Ho**, L. Zhang, and X. Zhou, Total Column Water Vapor, [In "States of the Climate in 2010"]. *Bul. Amer. Meteor. Sci.*, 2013, (ready to submit).
4. Wen-Hsin Teng, Ching-Yung Huang, **S.-P. Ho**, Ying-Hwa Kuo, and Xin-Jia Zhou, Characteristics of Global Precipitable Water in ENSO Events Revealed by COSMIC Measurements, *J. Geophys. Research*, 2012 (accepted).
5. Biondi, R., **S.-P. Ho**, W. Randel, T. Neubert and S. Syndergaard, 2012: Tropical cyclone cloud top detection using GPS bending angle, *J. Geophys. Research* (submitted).
6. Scherllin-Pirscher B., C. Deser, **S.-P. Ho**, C. Chou, W. Randel, and Y.-W. Kuo, (2012), The vertical and spatial structure of ENSO in the upper troposphere and lower stratosphere from

GPS radio occultation measurements, *GRL*, VOL. 39, L20801, 6 PP., 2012,
doi:10.1029/2012GL053071.

7. **Ho, S.-P.**, Doug Hunt, Andrea K. Steiner, Anthony J. Mannucci, Gottfried Kirchengast, Hans Gleisner, Stefan Heise, Axel von Engel, Christian Marquardt, Sergey Sokolovskiy, William Schreiner, Barbara Scherllin-Pirscher, Chi Ao, Jens Wickert, Stig Syndergaard, Kent B. Lauritsen, Stephen Leroy, Emil R. Kursinski, Ying-Hwa Kuo, Ulrich Foelsche, Torsten Schmidt, and Michael Gorbunov (2012): Reproducibility of GPS Radio Occultation Data for Climate Monitoring: Profile-to-Profile Inter-comparison of CHAMP Climate Records 2002 to 2008 from Six Data Centers, *J. Geophys. Research*. VOL. 117, D18111, doi:10.1029/2012JD017665, 2012.
8. Steiner, A. K., D. Hunt, **S.-P. Ho**, G. Kirchengast, A. J. Mannucci, B. Scherllin-Pirscher, H. Gleisner, A. von Engel, T. Schmidt, C. Ao, S. S. Leroy, E. R. Kursinski, U. Foelsche, M. Gorbunov, Y.-H. Kuo, K. B. Lauritsen, C. Marquardt, C. Rocken, W. Schreiner, S. Sokolovskiy, S. Syndergaard, and J. Wickert, Quantification of Structural Uncertainty in Climate Data Records from GPS Radio Occultation, *ACP (accepted)*.
9. Mears, C., J. Wang, **S.-P. Ho**, L. Zhang, and X. Zhou, 2012: [Global Climate] Hydrological cycle, Total column water vapor [in "State of the Climate in 2011"]. *Bull. Amer. Meteor. Soc.*, 93(7), S25–S26, doi:10.1175.
10. Zeng, Zhen, **S.-P. Ho**, S. Sokolovskiy (2012), The Structure and Evolution of Madden-Julian Oscillation from FORMOSAT-3/COSMIC Radio Occultation Data, *J. Geophys. Research* (accepted).
11. Biondi, R., W. Randel, **S.-P. Ho**, T. Neubert, and S. Syndergaard, 2011: Thermal structure of intense convective clouds derived from GPS radio occultations, in press *ACP*, 2011.
12. Mears, C., J. Wang, **S.-P. Ho**, L. Zhang, and X. Zhou, 2011: [Global Climate] Hydrologic cycle, Total column water vapor [in "State of the Climate in 2010"]. *Bull. Amer. Meteor. Soc.*, 92(6), S41–S42, doi:10.1175/1520-0477-92.6.S1.
13. **Ho, S.-P.**, IPCC AR5 report (invited).
14. Illingworth, S. M., Remedios, J. J., Boesch, H., **Ho, S.-P.**, Edwards, D. P., Palmer, P. I., and Gonzi, S.: A comparison of OEM CO retrievals from the IASI and MOPITT instruments, *Atmos. Meas. Tech.*, 4, 775-793, doi:10.5194/amt-4-775- 2011, 2011.
15. **Ho, S.-P.**, Y.-H. Kuo, X.-J. Zhou, P. Callaghan (2011), The Use of the COSMIC/FORMOSAT-3 Global Positioning System Radio Occultation Data as Global Reference Observations in Orbit and Their Applications in Meteorology, *Horizons in Earth Science Research*, Vol. 5, B. Veress and J. Szigehy, Eds. NOVA Publishers, in press (invited).
16. **Ho, S.-P.**, Zhou X., Kuo Y.-H., Hunt D., Wang J.-H., (2010b), Global Evaluation of Radiosonde Water Vapor Systematic Biases using GPS Radio Occultation from COSMIC and ECMWF Analysis. *Remote Sensing*. 2010; 2(5):1320-1330.
17. **Ho, S.-P.**, Ying-Hwa Kuo, William Schreiner, Xinjia Zhou (2010a), Using S/traceable Global Positioning System Radio Occultation Measurements for Climate Monitoring [In "States of the Climate in 2009"]. *Bul. Amer. Meteor. Sci.*, 91 (7), S36-S37. (invited).

18. Mears C., J. Wang, **S.-P. Ho**, L. Zhang, and X. Zhou (2010), Total Column Water Vapor, [In "States of the Climate in 2009]. *Bul. Amer. Meteor. Sci.*, **91** (7), S29-S31 (invited).
19. **Ho, S.-P.**, M. Goldberg, Y.-H. Kuo, C.-Z Zou, W. Schreiner (2009c), Calibration of Temperature in the Lower Stratosphere from Microwave Measurements using COSMIC Radio Occultation Data: Preliminary Results, *Terr. Atmos. Oceanic Sci.*, Vol. 20, doi: 10.3319/TAO.2007.12.06.01(F3C), 2009.
20. **Ho, S.-P.**, W. He, and Y.-H. Kuo (2009b), Construction of consistent temperature records in the lower stratosphere using Global Positioning System radio occultation data and microwave sounding measurements, in *New Horizons in Occultation Research*, edited by A. K. Steiner et al., pp. 207–217, Springer, Berlin, doi:10.1007/978-3-642-00321-9_17.
21. **Ho, S.-P.**, G. Kirchengast, S. Leroy, J. Wickert, A. J. Mannucci, A. K. Steiner, D. Hunt, W. Schreiner, S. Sokolovskiy, C. O. Ao, M. Borsche, A. von Engel, U. Foelsche, S. Heise, B. Iijima, Y.-H. Kuo, R. Kursinski, B. Pirscher, M. Ringer, C. Rocken, and T. Schmidt (2009a), Estimating the Uncertainty of using GPS Radio Occultation Data for Climate Monitoring: Inter-comparison of CHAMP Refractivity Climate Records 2002-2006 from Different Data Centers, *J. Geophys. Res.*, doi:10.1029/2009JD011969.
22. **Ho, S.-P.**, D. P. Edwards, J. C. Gille, M. Luo, G. B. Osterman, S. S. Kulawik, and H. Worden, 2009: A global comparison of carbon monoxide profiles and column amounts from Tropospheric Emission Spectrometer (TES) and Measurements of Pollution in the Troposphere (MOPITT), *J. Geophys. Res.*, 114, D21307, doi:10.1029/2009JD012242.
23. He, W., **S.-P. Ho**, H. Chen, X. Zhou, D. Hunt, and Y. Kuo, 2009: Assessment of radiosonde temperature measurements in the upper troposphere and lower stratosphere using COSMIC radio occultation data, *Geophys. Res. Lett.*, **36**, L17807, doi:10.1029/2009GL038712.
24. Deeter M. N., D. P. Edwards, J. C. Gille, L. K. Emmons, G. Francis, **S.-P. Ho**, D. Mao, D. Masters, H. Worden, V. Yudin, and James R. Drummond, 2009: The MOPITT version 4 CO product: Algorithm enhancements, validation, and long-term stability, *J. Geophys. Res.*, 115, D07306, doi:10.1029/2009JD013005.
25. Anthes, R. A., P. Bernhardt, Y. Chen, L. Cucurull, K. Dymond, D. Ector, S. Healy, **S.-P. Ho**, D. Hunt, Y.-H. Kuo, H. Liu, K. Manning, C. McCormick, T. Meehan, W. Randel, C. R. Rocken, W. Schreiner, S. Sokolovskiy, S. Syndergaard, D. Thompson, K. Trenberth, T.-K. Wee, Z. Zeng, The COSMIC/FORMOSAT-3 Mission: Early Results, *Bul. Amer. Meteor. Sci.* **89**, No.3, 313-333, DOI: 10.1175/BAMS-89-3-313, 2008.
26. **Ho, S.-P.**, Y. H. Kuo, and S. Sokolovskiy, Improvement of the Temperature and Moisture Retrievals in the Lower Troposphere using AIRS and GPS Radio Occultation Measurements, *Journal of Atmospheric and Oceanic Technique*, doi: 10.1175/JTECH2071.1, 1726-1739, 2007.
27. **Ho, S.-P.**, Y. H. Kuo, Zhen Zeng, and Thomas Peterson, A Comparison of Lower Stratosphere Temperature from Microwave Measurements with CHAMP GPS RO Data, *Geophys. Research Letters*, 34, L15701, doi:10.1029/2007GL030202, 2007.
28. **Ho, S.-P.**, D. P. Edwards, J. C. Gille, J. Chen, D. Ziskin, M. N. Deeter, and G. L. Francis,

- Estimates of the Global 4.7 μm Surface Emissivity from MOPITT Measurements and their Impacts on the Retrieval of Tropospheric Carbon Monoxide Profiles, *J. Geophys. Research*, Vol. 110, No. D21, D21308.10.1029/2005JD005946, 2005.
29. Lamarque, J.-F., Khattatov, B. , Yudin, V. , Edwards, D. P. , Gille, J. C. , Emmons, L. K. , Deeter, M. N. , Warner, J. , Ziskin, D. C. , Francis, G. L. , **Ho, S.-P.** , Mao, D., Chen, J. , Drummond, J. R, Application of a bias estimator for the improved assimilation of Measurements of Pollution in the Troposphere (MOPITT) carbon monoxide retrievals, *J. Geophys. Res.*, Vol. 109, No. D16, D16304 10.1029/2003JD004466, 2004.
 30. Edwards P. D., et al., Observations of carbon monoxide and aerosols from the Terra satellite: Northern Hemisphere variability, *J. Geophys. Res.*, VOL. 109, D24202, doi:10.1029/2004JD004727, 2004.
 31. Ziskin, D., **S.-P. Ho**, Jason Zou, Debbie Mao, Empirical Corrections to Instrument Artifacts in the MOPITT Data Stream, NCAR/TN-466+STR, 2004.
 32. Deeter M. N., L. K. Emmons, G. L. Francis, D. P. Edwards, J. C. Gille, J. X. Warner, D. Ziskin, **S.-P. Ho**, V. Yudin, J.-L. Attie, D. Packman, J. Chen, and D. Mao, Observational Carbon Monoxide Retrieval Algorithm and Selected Results for the MOPITT Instrument. *J. Geophys. Res.*, 108(D14), 4399, doi:10.1029/2002JD003186, 2003.
 33. Emmons L. K., M. Deeter, J.-L. Attie, D. P. Edwards, J. C. Gille , **S.-P. Ho**, B. Khattatov, J. –F. Lamarque, J. Warner, V. Yudin, D. Ziskin, J. S. Chen, D. Mao, J. Drummond, P. Novelli, G. Sachse, M. Coffey, S. Kawakami, Y. Kondo, N. Takegawa, Validation of MOPITT CO retrievals with aircraft in situ profiles, *J. Geophys. Research*, 109(D3), D03309, 10.1029/2003JD004101, 2003.
 34. **Ho, S.-P.**, B. Lin, P. Minnis, and T.-F. Fan, Estimates of cloud vertical structure and water amount over tropical oceans using VIRS and TMI data, *J. Geophys. Res.*, 108(D14), 4419, doi:10.1029/2002JD003298, 2003.
 35. Deeter, M. N., L. K. Emmons, G. L. Francis, D. P. Edwards, J. C. Gille, J. X. Warner, D. Ziskin, **S.-P. Ho**, V. Yudin, J.-L. Attie, D. Packman, J. Chen, and D. Mao, J. R. Drummond, P. Novelli, Evaluation of operational radiances for the Measurements of Pollution in the Troposphere (MOPITT) instrument CO thermalband channels, *J. Geophys. Res.*, 109(D3), D03308, 10.1029/2003JD003970.
 36. Lamarque J.-F., D. P. Edwards, L. K. Emmons, and J. C. Gille, O. Wilhelmi, C. Gerbig, D. Prevedel, M. N. Deeter, J. Warner, D. C. Ziskin, B. Khattatov, G. L. Francis, V. Yudin, **S.-P. Ho**, D. Mao, and J. Chen, Identification of CO plumes from MOPITT data: Application to the August 2000 Idaho-Montana forest fires, *Geophysical Research Letters*, 30(13), 1688, doi:10.1029/2003GL017503, 2003.
 37. **Ho, S.-P.**, Smith, W. L., and Huang, H. L. The Retrieval of Atmospheric Temperature and Water Vapor Profile using Combined Satellite and Ground Based Infrared Spectral Radiance Measurements. *Applied Optics*, 41, 4057-4069, 2002.

Papers in preparation

38. **Ho, S.-P.**, Y.-H., Kuo, Construction of a Consistent Microwave Sensor Temperature Record in the middle Troposphere (Channel 7) using Global Positioning System Radio Occultation Data, Radiosonde, and Microwave Sounding Measurements, ch7., *J. Geophys. Research*.
39. **Ho, S.-P.**, Y.-H., Kuo, W. C. Schreiner, D. Hunt, C. R. Rocken, 2009: Estimates of the Long-term Stability of GPS RO Derived Variables: inter-comparison of COSMIC and CHAMP results, *J. Geophys. Research*, to be submitted.
40. **Ho et al.**, Sampling error estimation from the GPS RO missions, MMC, ACP.
41. Qiang Fu and **S.-P. Ho**, Using GPS RO data for the CMIP5 assessments.
42. **Ho, S.-P.**, Enhancement of the AIRS Troposphere and Stratosphere Temperature Climate Data Records using Global Positioning System Radio Occultation Data (7 years), ACP (or JGR) paper.
43. **Ho, S.-P.**, the ionosphere effect on the natural atmospheric temperature profiles, JGR.
44. **Ho, S.-P.**, Y.-H., Kuo, An Assessment of the Seasonal and Diurnal Variation of the Radiosonde Systematic Temperature Biases in the Lower Stratosphere using GPS RO Data.
45. **Ho, S.-P.**, Inter-comparing the RSS, UAH, and STAR TLS, PANS.
46. Kumar, V., S. K. Dhaka, R. K. Choudhary, **S.-P. Ho**, and K. K. Reddy, Climatology of coldest temperature in troposphere and stratosphere: A study using COSMIC/ FORMOSAT-3 satellite observations, JGR.

Other Referred Articles:

1. William L. Smith, H. L. Huang, M. S. Whipple and S.-P. Ho, UW-CIMSS Physical Retrieval System Science Document for AIRS/AMSU/MHS, AIRS science team document, Jet propulsion Laboratory, NASA, Pasadena, Calif., 1996.
2. Ho, S.-P., Smith, William L.; Huang, Hung-Lung Retrieval of atmospheric temperature and water-vapor profiles by use of combined satellite and groundbased infrared spectral-radiance measurements, NASA Center: Langley Research Center, 2002, NTRS: 2005-09-29, Document ID: 20020069237.
3. Ho, S.-P., B. Lin, P. Minnis, T. F. Fan, Estimation of Cloud Properties over Oceans Using VIRS and TMI Measurements on the TRMM Satellite, NASA Technical Report 2000.
4. Lin, B. P. Minnis, B. Wielicki, Y. X. Hu, S.-P. Ho, Overcast clouds determined by TRMM measurements, NASA Technical Report, NASA Center: Langley Research Center, NTRS: 2004-11-03, Document ID: 20000090515, 2000.

Other Publications and Proceedings

1. **Ho, S.-P.**, J. C. Gille, D. P. Edwards, M. N. Deeter, J. Warner, G. L. Francis, D. Ziskin, Retrieval of surface skin temperature from MOPITT measurements: validation and impacts to the retrievals of tropospheric carbon monoxide profiles Geoscience and Remote Sensing Symposium, 2002. IGARSS apos;02. 2002 IEEE International Volume 6, Issue, 2002 Page(s): 3177 - 3179 vol.6,
10.1109/IGARSS.2002.1027122.

2. **Ho, S.-P.**, David P. Edwards, John C. Gille, Jarnei Chen, and Daniel Ziskin National Ctr. for Atmospheric Research (USA) Improvement of the global surface emissivity from MOPITT measurements and its impacts on the retrievals of tropospheric carbon monoxide profiles, Proc. SPIE, Vol. 5652, 124 (2004); DOI:10.1117/12.579046.
3. Lin B., Patrick Minnis, **Shu-peng Ho**, Jianping Huang, and Alice Fan, Ice Water Path and Overlapping Frequency of Tropical Overcast Clouds, IUGG 2003 Japan. (proceeding)
4. John C. Gille, David P. Edwards, Juying Warner, Merritt N. Deeter, Gene L. Francis, **Shu-peng Ho** and Daniel Ziskin, SPIE's third International Asia-Pacific Symposium on Remote Sensing of the Atmosphere, Environment, and Space, 23-27 October 2002, Hangzhou, China. (proceeding)
5. Louisa Emmons, John C. Gille, David P. Edwards, Merritt N. Deeter, Juying Warner, Gene L. Francis, **Shu-peng Ho**, Validation of MOPITT Retrieval of Carbon Monoxide, IGARSS 02 annual meeting, Toronto, Canada, 24-28 June 2002.
6. Merritt N. Deeter, John C. Gille, David P. Edwards, Jean-Luc Attie, Juying Warner, Gene L. Francis, **Shu-peng Ho** and Daniel Ziskin, Quantitative Radiance Validation for the MOPITT Instrument, IGARSS 02 annual meeting, Toronto, Canada, 24-28 June 2002
7. Bing Lin, Patrick Minnis, Bruce Wielicki, Yongxiang Hu, and **Shu-peng Ho**. Overcast clouds determined by TRMM measurements. IRS, 24-29 July, 2000 Saint Petersburg, Russia. (proceeding)
8. Young, David F., Minnis, Patrick, Lin, Bing, Ayers, J. Kirk, **Shu-Peng Ho**, Albrecht, Bruce A. - Rifkin, Hollis - Fairall, Chris W. - Garreaud, René. Cloud and Radiation Properties Derived from Satellite Data During the Fall 1999 CIMAR-5 and EPIC Cruises. CLIVAR Pan-American PI Meeting. (proceeding)
9. W. F. Feltz, W. L. Smith, **S.-P. Ho**, T. J. Schmit, X. L. Ma, H. B. Howell : Combined Surface and Satellite Infrared Measurements of Atmospheric Temperature and Water Vapor Profiles. Proceedings of the 10th Symposium on Meteorological Observations and Instrument, Phoenix, AZ, January 11-16, 1998. (proceeding)
10. William L. Smith, S. A. Ackerman, D. H. DeSlover, W. F. Feltz, **S.-P. Ho**, R. O. Knuteson, H. E. Revercomb, and S. A. Clough. ARM Science Applications of AERI Measurements, Atmospheric Radiation Measurement (ARM) Science Team Meeting, San Antonio, TX March 3-7, 1997. (proceeding)
11. Valery A. Yudin, John C. Gille, David P. Edwards, Merritt N. Deeter, Shu-peng Ho, and Louisa K. Emmons, Data assimilation of carbon monoxide in the troposphere, Proc. SPIE, Vol. 6299, 62990K (2006); doi:10.1117/12.680968, Remote Sensing of Aerosol and Chemical Gases, Model Simulation/Assimilation, and Applications to Air Quality, SPIE, Sunday 13 August 2006, San Diego, CA, USA.
12. Ho S.-P., Xinjia Zhou, Ying-Hwa Kuo, Doug Hunt, Cheng-Zhi Zou, Construction of a Consistent Microwave Sensor Temperature Record in the Lower Stratosphere Using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, joint 2010 CWB Weather Analysis and Forecasting and COAA 5th International Ocean-Atmosphere

Conference, June 28-30, 2010, Center Weather Bureau, Taipei.

Invited Talk

1. **Ho, S.-P.**, GPS RO-MSU calibration and data record, 2008: NOAA-NIST Workshop on Calibration for Climate-Quality Time Series, Camp Springs, MD, Jan 14, 2008.
2. **Ho, S.-P.**, Validation and Calibration of Microwave Sounders' Lower Stratosphere Temperature Trend using GPS RO Data, COSMIC/FORMAST-3, 4, Dec. Taipei, Taiwan, 2006.
3. **Ho, S.-P.**, Climatological Validation of Microwave Lower Stratosphere Temperature using GPS RO Data, invited seminar given in National Central University, May 8, 2006, Taiwan.
4. **Ho, S.-P.**, Validation and Calibration of MSU/AMSU Measurements using GPS RO Data for Improving Stratospheric Temperature Trend Analysis, invited seminar given in National Technical institute, May 10, Taiwan, 2006.
5. **Ho, S.-P.**, Comparability and reproducibility of RO data, Workshop on the Applications of GPS Radio Occultation to Climate, NCAR Foothills Laboratory, Building #1 Atrium Conference Room 3450 Mitchell Lane, Boulder, CO 80301 March 17-18, 2008.
6. **Ho, S.-P.**, Validation of Microwave Sounders' Lower Stratosphere Temperature Trend using GPS RO Data, NOAA-COSMIC climate meeting, 14th Symposium on Meteorological Observation and Instrumentation, San Antonio, TX 14-18 January 2007.
7. **Ho, S.-P.**, Construction of Consistent Temperature Records using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, NOAACOSMIC climate meeting in AMS, New Orleans, LA., 20-24 January 2008.
8. **Ho, S.-P.**, Applications of COSMIC RO to Climate Studies, NRC-CES meeting, Boulder, CO, Sep.22-23, 2008.
9. **Ho, S.-P.** "Enhancement of the AIRS Troposphere and Stratosphere Temperature Climate Data Records using Global Positioning System Radio Occultation Data", tele-conference presentation to JPL, Feb. 17 2010
10. **Ho, S.-P.**, Construction of a Consistent Microwave Sensor Temperature Record in the Lower Stratosphere Using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, 2010 Workshop on Climate Data Records from Satellite Microwave Radiometry, March 22-24, 2010 at the NOAA Science 12 Center, in Silver Spring, MD.
11. **Ho, S.-P.**, Using SI-traceable Global Positioning System Radio Occultation Measurements for Climate Monitoring, 2010 CMOS-CGU Congress, Ottawa, Canada.
12. **Ho S.-P.**, Xinjia Zhou, Ying-Hwa Kuo, Construction of a Consistent Microwave Sensor Temperature Record in the Lower Stratosphere Using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, June 17, 2010, Center Weather Bureau, Taipei (invited).

National and international Conference Presentations

1. **Ho, S.-P.**, Y. H. Kuo and S. Sokolovskiy, Improvement of the Temperature and Moisture Retrievals in the Troposphere using AIRS and GPS Radio Occultation Measurements, Satellite

Remote Sensing Symposium for celebration of CIMSS 25th Anniversary, Madison Wisconsin, 11-13 July, 2005.

2. **Ho, S.-P.**, Y. H. Kuo and S. Sokolovskiy, Improvement of the temperature and moisture retrievals in the tropospheric using AIRS, AMSU and GPS RO measurements, Second GPSRO Users' Workshop 22-24 August 2005 – National Conference Center - Lansdowne, Virginia.
3. Merritt Deeter, John Gille, David Edwards, **Shu-peng Ho**, Valery Yudin, Louisa Emmons and Dan Ziskin, Planned Improvements to the MOPITT CO Product, AGU Fall Meeting, 5-9 December 2005, San Francisco, CA, USA.
4. **Ho, S.-P.**, John C. Gille, David P. Edwards, and Daniel Ziskin, Improvement of Global MOPITT 4.7 μm Surface Emissivity by using MODIS Measurements and its Impacts on the Retrieval of Tropospheric Carbon Monoxide Profiles, MODIS science team meeting, 13-15, July, Baltimore, DC, 2004.
5. Emmons, L. K, M. Deeter, D. Edwards, D., J. Gille, D. Ziskin, G. Francis, V. Yudin, **S.-P. Ho**, P. Novelli, J. R. Drummond, AGU Spring Meeting Montreal, Canada, 17-21, May, 2004.
6. **Ho, S.-P.**, John C. Gille, David P. Edwards, Juying Warner, Merritt N. Deeter, Gene L. Francis and Daniel Ziskin, Calibrating MOPITT Radiances Using Sea Surface Temperature and Determining Land Surface Temperature and Emissivities Satellite Calibration workshop, D. C. Washington, 20-21, November, 2003.
8. **Ho, S.-P.**, John C. Gille, David P. Edwards, Juying Warner, Merritt N. Deeter, Gene L. Francis and Daniel Ziskin, Improvement of the Retrieval of Surface Parameters from MOPITT Measurements and their Impact to the Retrievals of Tropospheric Carbon Monoxide Profiles, AGU Fall Meeting, San Francisco, 8-12 December, 2003.
9. Louisa Emmons, John C. Gille, David P. Edwards, Merritt N. Deeter, Juying Warner, Gene L. Francis, **Shu-peng Ho**, The Distribution of Tropospheric Carbon Monoxide Observed by MOPITT, IGAC Conference, Sep 18-25, 2002.
10. Gille, J. C., J. Drummond, D. Edwards, J.-L. Attie, D. Merritt, L. Emmons, G. Francis, B. Khattatov, J.-F. Lamarque, G. Mand, J. Warner, **S. P. Ho**. The MOPITT experiment on Terra: early results and prospects. SPIE 46th annual meeting, San Diego, California, USA, 29 July - 3 August 2001.
11. Warner J., J. C. Gille, J. R. Drummond, D. P. Edwards, M. N. Deeter, G. L. Francis, D. C. Ziskin, M. W. Smith, D. Grant, L. R. Mayer, C. Cavanaugh, J. S. Chen and **S.-P. Ho**. MOPITT cloud detection and its validation. SPIE 46th annual meeting, San Diego, California, USA, 29 July - 3 August 2001.
12. Ho, S.-P., John C. Gille, David P. Edwards, Jean-Luc Attie, Merritt N. Deeter, Juying Warner, Gene L. Francis and Daniel Ziskin, The Role of the *A Priori* Information in the Retrieval of CO Profiles from Terra-MOPITT Measurements, 11th Conference on Satellite Meteorology and Oceanography, Madison, Wisconsin, 15-18 October 2001.
13. **Ho, S.-P.**, Lin, Bing, Minnis, Patrick. Estimation of Cloud Properties over Oceans Using VIRS and TMI Measurements on the TRMM Satellite. Fifth Symposium on Integrated Observing

Systems, 81st AMS Annual Meeting, Albuquerque, New Mexico, 14-19 Jan 2001.

14. **Ho, S.-P.**, Lin, Bing, Minnis, Patrick. Estimation of the Seasonal Variation of the Liquid Water Path and the Frequency of Cloud Overlapping by using TMI and VIRS data over Ocean - more Validation and Results. CERES 2000 Fall meeting, Huntsville, AL 20-22 Sep, 2000
15. **Ho, S.-P.**, Lin, Bing, Minnis, Patrick. Estimation of the Seasonal Variation of the Liquid Water Path and the Frequency of Cloud Overlapping by using TMI and VIRS data over Ocean. CERES 2000 spring meeting, Hampton VA. 2-4 May, 2000
16. **Ho, S.-P.**, Estimation of Tropical Nonprecipitating Cloud Overlapping by using Microwave, Visible and Infrared Measurements in Oceanic Environment. American Geophysical Union 2000 Spring Meeting, Washington, DC. 30 May - 3 June 2000.
17. **Ho, S.-P.**, Seasonal Variation of the Cloud Overlapping by using Microwave, Visible and Infrared Measurements over Ocean. Gordon Research Conference on Solar Radiation and Climate, Connecticut College, New London, Connecticut. 24 – 29 June. 2000.
18. **Ho, S.-P.**, Smith, W. L., and Huang, H. L. A Study of Vertical Resolution of Simultaneous observations of upwelling and downwelling spectral radiance. Optical Remote Sensing and Fourier Transform Spectroscopy, Santa Barbara CA. 21-25 June, 1999.
19. **Ho, S.-P.**, Smith, W. L., and Huang, H. L. Combined Satellite- and Surface-Based Infrared Atmospheric Profile Retrieval. Optical Remote Sensing and Fourier Transform Spectroscopy, Santa Barbara CA. 21-25 June, 1999.
20. **Ho, S.-P.**, Smith, W. L., and Huang, H. L. Atmospheric profiles from simultaneous observations of upwelling and downwelling spectral radiance. Symposium on Integrated Observing Systems, 3rd, Dallas, TX, 10-15 January 1999.
21. **Ho, S.-P.**, Smith, W. L., and Huang, H. L. The determination of smoothing parameter for sounding retrieval for GOES radiance measurements. Symposium on Integrated Observing Systems, 3rd, Dallas, TX, 10-15 January 1999.
22. Doelling, D. R., **S.-P. Ho**, W. L. Smith Jr., P. Minnis, Initial Cloud Properties Derived from GMS over the Tropical Western Pacific 9th Annual Atmospheric Radiation Measurement (ARM) Science Team Meeting, San Antonio, TX, 22-26 March, 1999.
23. Louis Nguyen, Patrick Minnis, J. Kirk Ayers, William L. Smith, Jr., and **Shu-peng Ho**. Intercalibration of Geostationary and Polar Satellite Imager Data Using AVHRR, VIRS, and ATSR-2 Data, AMS Conference on Atmospheric Radiation, 10 th, Madison, WI, 28 June - 2 July, 1999.
24. W. F. Feltz, W. L. Smith, R. O. Knuteson, H. E. Revercomb, H. Woolf, H. B. Howell, and **S.-P. Ho**. AERI Temperature and Water Vapor Retrievals: SGP CART Seasonal Statistical Analysis, Monthly Climatic Means for Model Integration, and Future GOES/AERI Retrievals, ARM report San Antonio, TX March 3-7, 1997.
25. **Ho, S.-P.**, Smith, W. L., and Huang, H. L. Sounding Retrieval from Upwelling and Downwelling Infrared Interferometer Radiance Measurements. Optical Remote Sensing of the Atmosphere, Santa Fe, New Mexico, 10-14 February, 1997.(proceeding)
26. **Ho, S.-P.**, Combined Surface and Satellite Infrared Measurements of Atmospheric

Temperature and Water Vapor Profiles. NCAR MOPITT Team, Boulder, Colorado, 26, October 2000.

27. **Ho, S.-P.**, Estimation of the Seasonal Variation of the Liquid Water Path and the Frequency of Cloud Overlapping by using TMI and VIRS data over Ocean – more Validation and Results. NCAR MOPITT Team, Boulder, Colorado, 26, October 2000.
28. **Ho, S.-P.**, Atmospheric profiles from simultaneous observations of upwelling and downwelling spectral radiance. NASA Goddard Institute for Space Studies, Columbia University, New York City, NY. 12. July 1999.
29. **Ho, S.-P.**, Sounding Retrieval from Upwelling and Downwelling Infrared Interferometer Radiance Measurements. NCAR MOPITT Team, Boulder, Colorado, 5 December 1997.
30. **Ho, S.-P.**, Atmospheric profiles from simultaneous observations of upwelling and downwelling spectral radiance. NASA Langley Research Center, Hampton, VA. 28 Sep 1997.
31. **Ho, S.-P.** William Smith, Allen Huang, Wayne Feltz, John Gille, David Edwards and MOPITT team, The Retrieval of Atmospheric Temperature and Water Vapor Profile using Combined Satellite and Ground Based Infrared Spectral Radiance Measurements, NCAR COSMIC seminar, Boulder CO, 22, July, 2003.
32. **Ho, S.-P.** and D. Ziskin, MOPITT Packet Position Problem and the Possible Correction Algorithm, MOPITT science team meeting, Boulder CO, 3, Feb 2001.
33. Ziskin, D., **S.-P. Ho** and D. Mao, Recovery of the First Two Stares for MOPITT Radiances MOPITT science team meeting, Toronto, Canada. 25, June 2002.
34. Valery A. Yudin, John C. Gille, David P. Edwards, Merritt N. Deeter, **Shu-peng Ho**, and Louisa K. Emmons, Data assimilation of carbon monoxide in the troposphere, Proceedings of SPIE 6299, 62990K, 2006.
35. **Ho, S.-P.**, Ying-Hwa Kuo and Zhen Zeng, Validation of Microwave Lower Stratosphere Temperature using CHAMP GPS RO Data, Formosat-3/COSMIC data user Workshop, Oct 17, Boulder. CO, 2006.
36. **Ho, S.-P.**, D. P. Edwards, Improvements of the Retrievals of Carbon Monoxide in the Planetary Boundary Layer using Combined Infrared and Solar Measurements : A Simulation Study, NCAR AIR Quality work shop, Boulder, CO., 2006.
37. **Ho, S.-P.**, D. P. Edwards, A Simulation Study to investigate the possible Retrievals of Carbon Monoxide in the Planetary Boundary Layer using Combined Infrared and Near Infrared Measurements, 3 - 17 August 2006, San Diego, California USA.
38. **Shu-peng Ho**, Y.-H. Kuo and Z. Zhen, Validation of Lower Stratosphere Temperature from AMSU/MSU Measurements using GPS RO data, COSMIC meeting in AMS, San Antonio, TX 14—18 January 2007.
39. **Shu-peng Ho**, Y.-H. Kuo and Z. Zhen, Validation of Microwave Sounders' Lower Stratosphere Temperature Trend using GPS RO Data, 14th Symposium on Meteorological Observation and Instrumentation, San Antonio, TX 14—18 January 2007.
40. **Shu-peng Ho**, D. Edwards, J. C. Gille, Validation of TES CO profiles using MOPITT CO Products, ACD NCAR report, Jan. 9, 2007.

41. **Shu-peng Ho.**, D. Edwards, Validation of TES CO profiles using MOPTT CO Products, AURA validation meeting, Boulder CO., Oct. 2006.
42. **Ho, S.-P.**, Applications of COSMIC Radio Occultation Data to Climate Monitoring: Early Results, NOAA, Camp Springs, MD, July 13, 2007.
43. **Ho, S.-P.**, Applications of COSMIC Radio Occultation Data to Climate Monitoring: Early Results, the 3rd international workshop on Occultation for Probing Atmosphere and climate, Graz, Austria, Sep. 17-21, 2007.
44. **Ho, S.-P.**, Inter-comparisons of Refractivity and Dry Temperature Derived from different Data Center, COSMIC-workshop, Boulder, CO., Oct. 22-24, 2007.
45. **Ho, S.-P.**, Applications of COSMIC Radio Occultation Data to Climate Monitoring: Early Results, AMS, New Orleans, LA., 20-24 January 2008.
46. **Ho, S.-P.**, Construction of Consistent Temperature Records using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, COSMIC meeting in AMS, New Orleans, LA., 20-24 January 2008.
47. Rocken C., S. Sokolovskiy, B. Schreiner, D. Hunt, **S. P. Ho**, B. Kuo, U. Foelsche, Climate Monitoring with Radio Occultation Data: systematic error sources, Workshop on the Applications of GPS Radio Occultation to Climate, NCAR Foothills Laboratory, Building #1 Atrium Conference Room 3450 Mitchell Lane, Boulder, CO 80301 March 17-18, 2008.
48. Sokolovskiy S., C.Rocken, W.Schreiner, D.Hunt, **S.-P.Ho**, Y.-H.Kuo, S. Syndergaard, U.Foelsche, Climate Monitoring with Radio Occultation Data: Effects and magnitudes of some specific errors of GPS RO data and assumptions used in their processing, NCAR Foothills Laboratory, Building #1 Atrium Conference Room 3450 Mitchell Lane, Boulder, CO 80301 March 17-18, 2008.
49. Deeter, M., **Shu-peng Ho** et al. MOPITT Version 4 Products for CO: Content, Format, and Validation.
50. **Ho, S.-P.**, Ying-Hwa Kuo, Wenying He, Doug Hunt, Chris Rocken, William Schreiner, and Sergey Sokolovskiy, Global Comparisons of Water Vapor Profiles in the Lower Troposphere from COSMIC Radio Occultation, in situ Observations, and ECMWF Analysis, 4th Asian Space Conference, Taipei, Taiwan, 1-3, October, 2008.
51. **Ho, S.-P.**, Ying-Hwa Kuo, Doug Hunt, Chris Rocken, William Schreiner, and Sergey Sokolovskiy, and Jens Wickert, Anthony J. Mannucci, Quantitative Estimation of the Reproducibility of GPS RO Data for Climate Research, 4th Asian Space Conference, Taipei, Taiwan, 1-3, October, 2008.
52. Bill Schreiner, B. Kuo, C. Rocken, S. Sokolovskiy, D. Hunt, **S.-P. Ho**, X. Yue, T.-K. Wee, K. Hudnut, M. Slezziak-Sallee, T. VanHove. CDAAC Current Status and Future Plans. COSMIC workshop, Oct. 2009, Boulder, CO.
53. **S.-P. Ho** ,Tele-conference presentation: JPL talk about the “Enhancement of the AIRS Troposphere and Stratosphere Temperature Climate Data Records using Global Positioning System Radio Occultation Data”
54. **S.-P. Ho**, Xinjia Zhou, Ying-Hwa Kuo , Doug Hunt, Cheng-Zhi Zou. Construction of a

Consistent Microwave Sensor Temperature Record in the Lower Stratosphere Using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, 2010 Workshop on Climate Data Records from Satellite Microwave Radiometry, March 22-24 2010 at NOAA Science Center in Silver Spring, MD (invited).

55. **Ho, S.-P.**, Xinjia Zhou, Ying-Hwa Kuo, Doug Hunt, Cheng-Zhi Zou, Construction of a Consistent Microwave Sensor Temperature Record in the Lower Stratosphere Using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, joint 2010 CWB Weather Analysis and Forecasting and COAA 5th International Ocean-Atmosphere Conference, June 28-30, 2010, Center Weather Bureau, Taipei, Taiwan.
56. **Ho, S.-P.**, Xinjia Zhou, Ying-Hwa Kuo, Construction of a Consistent Microwave Sensor Temperature Record in the Lower Stratosphere Using Global Positioning System Radio Occultation Data and Microwave Sounding Measurements, June 17, 2010, Center Weather Bureau, Taipei (invited).
57. **Ho, S.-P.**, Using SI-traceable Global Positioning System Radio Occultation Measurements for Climate Monitoring, National Central University, Department of Atmospheric Science, and GPS ARC, June 22, Jhongli, Taiwan (invited).
58. **Ho, S.-P.**, Xinjia Zhou, Ying-Hwa Kuo, Climate Calibration Observatory in Orbit: Calibration and Validation of Measurements of AMSU and AIRS using Global Positioning System Radio Occultation Observations, September, 6-10, OPAC-4, Graz, Austria.
59. A. K. Steiner, **S.-P. Ho**, D. Hunt , G. Kirchengast, A. J. Mannucci, B. Scherllin-Pirscher, H. Gleisner , A. von Engeln , T. Schmidt C. Ao , S. S. Leroy , U. Foelsche , Y-H. Kuo , E. R. Kursinski, K. B. Lauritsen , S. Syndergaard , C. Marquardt , C. Rocken , W. Schreiner , S. Sokolovskiy , J. Wickert W., Uncertainty of the CHAMP Climate Record from Different Data Centers, September, 6-10, OPAC-4, Graz, Austria.
60. **Ho, S.-P.**, Xinjia Zhou, Ying-Hwa Kuo, Assessment of Systematic Biases of Radiosonde Temperature and Moisture Measurements using Global Positioning System Radio Occultation from COSMIC, September, 6-10, OPAC-4, Graz, Austria.
61. **Ho, S.-P.**, Construction of Consistent Microwave Sensor Temperature Records and Tropopause Height Climatology using MSU/AMSU Measurements, GPS RO Data, and Radiosonde Observations, Climate Data Records Program Review meeting, August 4-5, 2010 in Asheville, NC.
62. **Ho, S.-P.**, Construction of Consistent Microwave Sensor Temperature Records and Tropopause Height Climatology using MSU/AMSU Measurements, GPS RO Data, and Radiosonde Observations, ARC/SDS Program Review meeting, September, 14-16, 2010 in Asheville, NC.
63. R. Biondi, **S.-P. Ho**, S. Syndergaard, T. Neubert, Tropical Cyclone Detection using GPS Radio Occultation Data, IUGG XXV General Assembly Earth on the Edge: Science for a Sustainable Planet, Melbourne, Australia 27 June - 8 July 2011.
64. Ricardo Biondi, **S.-P. Ho**, Convective Systems Analysis using GPS Radio Occultation, 3rd International Colloquium - Scientific and Fundamental Aspects of the Galileo Programme 31

August - 2 September 2011, Copenhagen, Denmark.

65. **Ho, S.-P.**, Assessment of Systematic Biases of Radiosonde Moisture Measurements using Global Positioning System Radio Occultation from COSMIC, GEWEX/ESA DUE GlobVapour workshop on long term water vapour data sets and their quality assessment, 8 – 10 March 2011 - ESA/ESRIN, Frascati, Italy (invited).
66. **Ho, S.-P.**, Xinjia Zhou, Ying-Hwa Kuo, Assessment of Systematic Biases of Radiosonde Moisture Measurements using Global Positioning System Radio Occultation from COSMIC, [91st American Meteorological Society Annual Meeting](#), Seattle, WA, USA.
67. Callaghan, P. F., **S.-P. Ho**, T. Yunck, B. D. Wilson, and G. Manion, 2011: Evaluation of AIRS V5 Temperature Profiles Using Matched Retrievals From COSMIC and ECMWF Analyses. Presentation, [91st American Meteorological Society Annual Meeting](#), Seattle, WA, USA.
68. **Ho, S.-P.**, Xinjia Zhou, Ying-Hwa Kuo, Climate Calibration Observatory in Orbit: Using COSMIC RO Data to Calibrate and Validate the AIRS and AMSU Troposphere and Stratosphere Temperature Climate Data Records, [91st American Meteorological Society Annual Meeting](#), Seattle, WA, USA.
69. Steiner, A. K., **S.-P. Ho**, D. Hunt, G. Kirchengast, A. J. Mannucci, B. Scherllin-Pirscher, H. Gleisner, A. von Engel, T. Schmidt C. Ao, S. S. Leroy, U. Foelsche, Y.-H. Kuo, E. R. Kursinski, K. B. Lauritsen, S. Syndergaard, C. Marquardt, C. Rocken, W. Schreiner, S. Sokolovskiy, J. Wickert W. and Coauthors, 2011: Uncertainty of the CHAMP Climate Record from Different Data Centers. The 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO, April 12-14, 2011, Taipei, Taiwan.
70. **Ho, S.-P.**, Y.-H. Kuo, X.-J. Zhou, and P. Callaghan, 2011: Long Term Assessment of Radiosonde Temperature Systematic Biases using COSMIC, CHAMP, and GRACE from 2001 to 2010. The 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO, April 12-14, 2011, Taipei, Taiwan.
71. Zeng, Zhen, **S.-P. Ho**, S. Sokolovskiy, The Structure and Evolution of Madden-Julian Oscillation from FORMOSAT-3/COSMIC Radio Occultation Data. The 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO, April 12-14, 2011, Taipei, Taiwan.
72. Barbara Scherllin-Pirscher, **S.-P. Ho**, Chia Chou, Ying-Hwa Kuo, Reconstruction of the 3-dimensional structure of ENSO using radio occultation data, The 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO, April 12-14, 2011, Taipei, Taiwan.
73. Wen-Xin Deng, **S.-P. Ho**, Ching-Yuang Huang, Global and Regional Distribution of Water Vapor from COSMIC, , the 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO, April 12-14, 2011, Taipei, Taiwan.
74. Jerry, Ching-Yuang Huang, **S.-P. Ho**, Jens Wickert, and Torsten Schmidt, Characteristics of Tropopause Height in Indian Monsoon Region Revealed by COSMIC GPS RO Data, the 5th FORMOSAT-3/COSMIC Data Users Workshop & ICGPSRO, April 12-14, 2011, Taipei, Taiwan.

References

Dr. William L. Smith, Professor
Center for Atmospheric Sciences
Hampton University
Hampton Virginia, 23668
Ph. (757)728-6743 (office)
Email: bill.smith@hamptonu.edu

Dr. John C. Gille
Senior Scientist
Earth and Sun System Laboratory
National Center of Atmospheric Research
3085 Center Green Drive
Boulder CO, 80301
Ph. (303)497-8062
Email: gille@eos.ucar.edu

Dr. Ying-Hwa Kuo
Senior Scientist
Earth and Sun System Laboratory
National Center of Atmospheric Research
Director of UCAR COSMIC program
P.O. Box 3000
Boulder CO. 80307-3000
Ph: (303)4978910
Email: kuo@ucar.edu

「學者交流訪問計畫」

短期訪問進行情形報告

訪問學者	Shu-Peng Ben Ho		
主辦單位	全球定位科學研究中心(GPS-ARC)	邀訪者	黃清勇 教授
時 間	2013 年 1 月 27 日 至 2013 年 2 月 1 日		
<p>主旨：來台進行短期訪問研究及演講</p> <p>行程及活動經過：</p> <p>1/27：抵達台灣</p> <p>1/28：在中央大學 GPSARC 進行討論研究合作</p> <p>1/29：在中央大學大氣系進行討論研究及專題演講</p> <p>1/30：在中央大學大氣系進行討論研究合作</p> <p>1/31：在中央研究院進行討論研究及專題演講</p> <p>2/01：在中央大學 GPSARC 進行討論合作論文撰寫重點</p> <p>檢討：無</p> <p>建議：這次何博士訪問中大，除與 GPSARC 及大氣系同仁交流，亦安排至中研院全變中心專題演講。何博士專長為 GPS 掩星觀測資料分析及應用，對使用掩星之溫濕度於詮釋氣候變異及暖化趨勢有深入的研究。在台灣，關於全球及區域氣候變異分析及模擬，也有一些同仁在各單位進行研究，但大多未直接使用 GPS 掩星觀測資料。就未來福衛七號資料，應提昇各單位來廣泛應用，增進我國重要的氣候變異模擬能力。</p> <p>相關活動：</p> <p>在大氣系及中央研究院專題演講:</p> <p>Current Developments on the Applications of COSMIC from the Troposphere to Stratosphere and the Potential Impacts of COSMIC-2 Data</p> <p>Shu-peng Ho</p> <p>COSMIC, University Corporation for Atmospheric Research, P.O. Box 3000, Boulder, CO 80307-3000</p> <p>摘要</p> <p>Since the launch of the COSMIC constellation in 2006, FORMOSAT-3/COSMIC has provided more than 3.2 million Global Positioning System (GPS) radio occultation (RO) soundings (~1500</p>			

soundings per day) to support research and operational numerical weather prediction (NWP). COSMIC data processed by the COSMIC Data Analysis and Archive Center (CDAAC) have been widely used by meteorology, climate, and ionospheric communities. As of June 2012, more than 1,900 researchers from 63 countries have become registered users of the data. The success of COSMIC has also prompted U.S. agencies to move forward with a follow-on RO mission (called FORMOSAT-7/COSMIC-2, hereafter COSMIC-2) with Taiwan that will launch six satellites into low-inclination orbits in early 2016, and another six satellites into high-inclination orbits in early 2018. Being developed by JPL, the GNSS RO payload, named TriG (Tri-GNSS), is designed to track RO signals from the GPS, GLONASS, and Galileo systems. It is expected to track up to 12,000 high-quality profiles per day after the two constellations are fully deployed. The COSMIC-2 soundings are expected to have better signal-to-noise ratios than those of COSMIC, which would provide an unprecedented capability to explore new applications for weather, climate, and ionospheric communities. The objective of this talk is i) to highlight accomplishments and discuss the remaining challenges in the areas of RO data applications; and ii) to summarize potential new applications that can be explored using COSMIC-2 data.

國立中央大學 大氣科學系暨大氣物理研究所

DEPARTMENT OF ATMOSPHERIC SCIENCES AND GRADUATE INSTITUTE OF ATMOSPHERIC PHYSICS,
NATIONAL CENTRAL UNIVERSITY

演講公告 *Announcement*

主講 Speaker : Dr. Shu-Peng Ben Ho
COSMIC, University Corporation for
Atmospheric Research, USA.

講題 Title : Current Developments on the Applications of
COSMIC from the Troposphere to Stratosphere
and the Potential Impacts of COSMIC-2 Data

時間 Date&Time : January 29, 2013 (Tuesday)
15:30~17:00 (Including 30mins Discussion)

地點 Location : 科學二館 S1-713
S1-713, Science Building 2



歡迎參加！

摘要 Abstract:

Since the launch of the COSMIC constellation in 2006, FORMOSAT-3/COSMIC has provided more than 3.2 million Global Positioning System (GPS) radio occultation (RO) soundings (~1500 soundings per day) to support research and operational numerical weather prediction (NWP). COSMIC data processed by the COSMIC Data Analysis and Archive Center (CDAAC) have been widely used by meteorology, climate, and ionospheric communities. As of June 2012, more than 1,900 researchers from 63 countries have become registered users of the data. The success of COSMIC has also prompted U.S. agencies to move forward with a follow-on RO mission (called FORMOSAT-7/COSMIC-2, hereafter COSMIC-2) with Taiwan that will launch six satellites into low-inclination orbits in early 2016, and another six satellites into high-inclination orbits in early 2018. Being developed by JPL, the GNSS RO payload, named TriG (Tri-GNSS), is designed to track RO signals from the GPS, GLONASS, and Galileo systems. It is expected to track up to 12,000 high-quality profiles per day after the two constellations are fully deployed. The COSMIC-2 soundings are expected to have better signal-to-noise ratios than those of COSMIC, which would provide an unprecedented capability to explore new applications for weather, climate, and ionospheric communities. The objective of this talk is i) to highlight accomplishments and discuss the remaining challenges in the areas of RO data applications; and ii) to summarize potential new applications that can be explored using COSMIC-2 data.

Current Developments on the Applications of COSMIC from the Troposphere to Stratosphere and the Potential Impacts of COSMIC-2 Data

Shu-peng Ho
University Corporation for Atmospheric Research/COSMIC, USA

The graph shows atmospheric parameters plotted against altitude (km) from 0 to 600. The parameters include electron density (el/cm³) on a logarithmic scale (10⁷ to 10¹²), temperature (C) from -80 to 20, and water vapor pressure (mb) from 0 to 30. The electron density curve shows a sharp increase in the ionosphere. The temperature curve shows a decrease in the stratosphere and a slight increase in the troposphere. The water vapor pressure curve shows a decrease in the stratosphere and a slight increase in the troposphere.

Theme : Bridge to the future; and Bridge to other communities

The purpose of this workshop is to provide a forum for scientific discussions between the RO community and the weather, climate, and space weather communities, which is crucial to capitalizing the scientific opportunities provided by past, current, and future RO missions. A dialogue between RO data providers and data users is also important to ensure optimal use of RO data for research and operational applications.

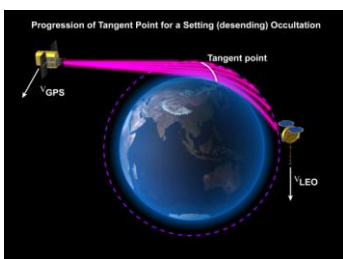
Background

1. Since the launch of COSMIC in 2006, we have organized five COSMIC Data Users Workshop, to discuss accomplishments in:

- RO operation and algorithm development
 - Meteorology application
 - Climate
 - Ionosphere
- through accessing COSMIC data from CDAAC.

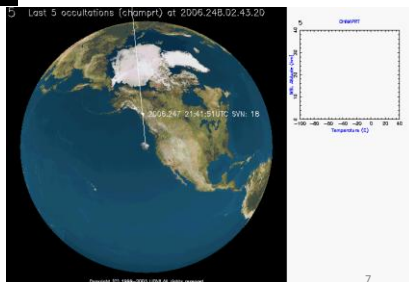
What have we accomplished ? What are outstanding issues remaining?
Who are using these data/who are not ? Help users to better use the RO data.

4



Limb sounding of atmosphere as LEO rises or sets with respect to GPS satellites

Global observations of:
Pressure, Temperature, Humidity
Refractivity
Ionospheric Electron Density



7