SA13A CC: 519 A Monday 1330h

Mesosphere Dynamics and Energetics *(joint with A, P)*

Presiding: **T G Slanger,** Molecular Physics Laboratory, SRI International SRI International**; J M Russell,** Hampton University

SA13A-01 1330h

Nonmigrating Tides as Measured by the SABER Instrument on TIMED

Jeffrey M Forbes[1] (303-492-4359; forbes@colorado.edu); James Russell[2] (757-728-6893; james.russell@hamptonu.edu); Xiaoli Zhang[1] (303-492-2746; zhangx@rtt.colorado.edu); Christopher J Mertens[3] (757-864-5695; c.j.mertens@larc.nasa.gov); Scott Palo[1] (303-492-4289; palo@colorado.edu); Marty Mlynczak[3] (757-864-5695; m.g.mlynczak@larc.nasa.gov)

[1]University of Colorado, Department of Aerospace Engineering Sciences UCB 429, Boulder, CO 80309-0429, United States

[2]Hampton University, Center for Atmospheric Sciences 23 Tyler Street, Hampton, VA 23668, United States

[3]NASA Langley Research Center, 21 Langley Boulevard, Hampton, VA 23681, United States

Temperature measurements from 30 to 100 km from the SABER instrument on TIMED are used to investigate nonmigrating solar tides during March-August, 2002. The measurements include corrections for non-LTE effects. The most prominent nonmigrating tide oscillations include eastward-propagating diurnal tides near the equator and tropics, and semidiurnal tides with zonal wavenumbers s = 1 and s = 3 and diurnal tides with zonal wavenumbers s = 0, 2 and 3 at higher latitudes. Nonlinear tide-tide and tide-planetary wave interactions are explored as possible mechanisms to account for the existence of the high-latitude tides, while the low-latitude oscillations appear more likely to originate in latent heating associated with deep tropical convective systems.

SA13A-02 1345h

The TIMED Doppler Interferometer (TIDI) Neutral Wind Data From The O2 P Branch Broadband Filter

T. L. Killeen[1] (killeen@ucar.edu); Q. Wu[1] (qwu@ucar.edu); R. D. Gablehouse[1] (rdg@ucar.edu); R. J. Johnson[1] (rmjohnsn@ucar.edu); S. C. Solomon[1] (stans@ucar.edu); W. R. Skinner[2] (wskinner@umich.edu); D. A. Ortland[3] (ortland@nwra.com); R. J. Niciejewski[2] (niciejew@umich.edu); D. A. Gell[2] (gellda@umich.edu)

[1]High Altitude Observatory National Ccenter for Atmospheric Research, P.O.Box 3000, Boulder, Co 80307-3000, United States

[2]Space Physics Reserach Labortory Department of Atomspheric Oceanic and Space Sciences The University of Michigan, 2455 Hayward St., Ann Arbor, Mi 48109-2143, United States

[3]Northwest Reserach Associates, P.O. Box 3027, Bellevue, Wa 98009-3027, United States

A new operational mode for the instrument has been designed to incorporate a broadband filter, which allows most of the O2 (0-0) P branch to pass through. The broadband filter data increases the signal level by an order of magnitude, which greatly increases the accuracy of the neutral wind allowing more detailed analysis of the migrating and non-migrating tide in the MLT region. Already the new wind data have shown strong non-migrating tide component. Comparisons with ground-based radar measurements show a much better consistency. We will report these new data and tidal analysis results.

SA13A-03 1400h

Significant Intraseasonal Oscillations in the Mesosphere

Jason Philip Russell (506 447 3093; jruss@unb.ca)

University of New Brunswick, Physics Dept. Box 4400, Fredericton, NB E3B 5A3, Canada

With the vast set of airglow nighttime data collected by the WINDII instrument on board the Upper Atmospheric Research Satellite, large time series of the order of half a solar cycle can be generated. Time series of atomic oxygen mixing ratios derived from two measured nightglow emissions have been used to obtain significant intraseasonal (50-122 day Period) oscillations that are comparable in strenfgth to annual and semiannual oscillations. The most significant of these being a 61-day oscillation found at mid-latitudes. The amplitudes and phases of these oscillations will be shown to vary with latitude.

SA13A-04 1415h

Zonal-Mean Quasi Bi-Monthly Oscillations (BMO) in the Mesosphere

Frank T Huang[1] ((301) 474-8675; fthuang@comcast.net)

Hans G Mayr[2] ((301) 286-7505; Hans.G.Mayr@nasa.gov)

Carl A. Reber[2] ((301) 614 5201; Carl.A.Reber@nasa.gov)

[1]Terranet Inc, 4900 Lisboro Rd., Mitchellville, MD 20720, United States

[2]NASA GSFC, Greenbelt Rd., Greenbelt, MD 20771, United States

In the zonal mean (m = 0), oscillations are observed with the UARS spacecraft that have periods of months. Based on measurements from the High Resolution Doppler Imager (HRDI) instrument, Quasi Bi-Monthly Oscillations (BMO) appear in the meridional winds at equatorial latitudes and at 95 km altitude, as reported by Huang and Reber (JGR, 2003). Such oscillations are also observed in temperatures at altitudes of about 55 km, which are measured with the Microwave Limb Sounder (MLS) and the Cryogenic Limb Array Etalon Spectrometer (CLAES) on UARS. Considering that it takes 36 days to cover all solar local times, a two-dimensional Fourier least squares analysis is carried out to delineate in the temperature variations (a) the tides (diurnal and semidiurnal) and (b) the zonal-mean component. The inferred zonal-mean temperature variations have periods between 2 and 3 months, and they are larger away from the equator. The amplitudes of this BMO are about 4 K, and the oscillations are in opposite phase in the two hemispheres. We shall investigate the BMO with the temperature and wind measurements from the TIMED spacecraft, which are available at common altitudes throughout the mesosphere and thus can provide a more definitive picture of this phenomenon. Oscillations of the kind discussed have been identified in a modeling study (Mayr et al., JATP, 2003). It is shown there that the meridional momentum source from parameterized small-scale gravity waves generates variations in the meridional winds with periods between one and three months that have the character of a non-linear auto-oscillator – the apparent counterpart to the Quasi-Biennial Oscillation (QBO) in the zonal circulation. The meridional wind oscillations are largely confined to equatorial latitudes, and they generate through dynamical heating and cooling temperature oscillations in the two hemispheres on either side of the equator.

SA13A-05 1430h

Variations in the Mesospheric OH Vibrational Distributions

Tom G. Slanger[1] (650-859-2764; tom.slanger@sri.com); Philip C. Cosby[1] (650-859-5128; philip.cosby@sri.com); David L. Huestis[1] (650-859-3464; david.huestis@sri.com); Richard A. Copeland[1] (650-859-6534; richard.copeland@sri.com); Brian D. Sharpee[1] (650-859-2975; brian.sharpee@sri.com); James M. Russell[2] (757-728-6893; james.russell@hamptonu.edu); Marty G. Mlynczak[3] (757-864-5695; m.g.mlynczak@larc.nasa.gov); Maya Garcia-Comas[4] (maya@iaa.es); Manuel Lopez-Puertas[4] (34-958-121311; puertas@iaa.es)

[1]Molecular Physics Laboratory SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025, United States

[2]Hampton University, 533 E. Queen St., Hampton, VA 23668, United States

[3]NASA Langley Research Center, 21 Langley Blvd. MS 420, Hampton, VA 23681, United States

[4]Instituto de Astrofisica de Andalucia, Apdo. 3004, Granada 18080, Spain

Intensity-calibrated sky spectra from the Keck II telescope on Mauna Kea, measured throughout the visible and the infrared to 1.09 microns, show that there is substantial variation in the vibrational distribution of OH(v=3-9) during the night. From five nights of observation in March 2000, utilizing low-J lines of the 3-0 and 9-5 bands near 1 micron, the v=3 population typically fell by a factor of 2-4 over a 9-hour period, while the N(v=3)/N(v=9) population ratio simultaneously decreased, by a factor of about two. Although the intensity changed in a different manner during four observing nights in October 2000, two in July 2000, and one in July 2001, the v=3 population and the N(v=3)/N(v=9) ratio still co-vary. The total range of the ratio in our observations is 4-15. The vibrational distribution presented by McDade and Llewellyn [JGR, 92, 7643, 1987], based on various measurements, results in a value of 6.6±0.7 for the ratio. Observations from the infrared SABER instrument on the TIMED satellite in March 2002 indicate that the highest OH intensities are seen at the lowest altitudes, and that the highest [low-v]/[high-v] intensity ratios are associated with the highest OH intensities. The presumption is that decreasing [low-v]/[high-v] ratios are indicative of increasing altitude and decreasing density in the glowing layer. We believe that the N(v=3)/N(v=9) ratio as viewed from the ground defines the emission altitude and/or species density in the OH nightglow region. This study was supported by a grant from the NSF Aeronomy program.

SA13A-06 1445h

Determination of Atmospheric Parameters in the Upper Mesosphere and Lower Thermosphere Using Rocket-Borne Ionization Gauge Measurements

J H Clemmons[1] (310 336 2428; james.clemmons@aero.org)

J H Hecht[1]

I D Boyd[2]

Q Sun[2]

C Cai[2]

[1]The Aerospace Corporation, P. O. Box 92957 Mail Station M2/260, El Segundo, CA 90009, United States

[2]University of Michigan, Department of Aerospace Engineering, Ann Arbor, MI 48109, United States

The goal of rocket-borne ionization gauge measurements in the upper mesosphere and lower thermosphere (UM/LT) is to determine the flow parameters (density, temperature, and wind vector) of the ambient gas. These basic measurements can then be used to understand the dynamics of the region. However, interpretation of the raw measurements is complicated by a variety of factors that are difficult to assess from first principles. Included in these effects are the non-ideal aspects of transitional gasdynamic flow, vehicle outgassing and sensor temporal response. Two complementary techniques have been used to understand these factors so that their influence in the measurements can be appropriately treated. First, the instrumentation includes multiple, directional sensors so that several angles of attack can be monitored concurrently. Second, the direct simulation Monte Carlo (DSMC) method is used to simulate the gas flow in the transitional regime. These techniques are applied to the TOMEX sounding rocket flight to make accurate determinations of the atmospheric flow parameters in the UM/LT. The results are compared to concurrent measurements made by lidar. Time permitting, the technique as applied to other rocket flights is discussed. The understanding gained is also applied to the instrumentation designed for the upcoming TRIO sounding rocket experiment.

SA14A CC: 519 A Monday 1530h

Mesosphere-Thermosphere-Ionosphere Coupling Processes and Issues for the Earth and Planets *(joint with P, SM)*

Presiding: **M P Hickey,** Embry-Riddle Aeronautical University**; P J Espy,** British Antarctic Survey

SA14A-01 1530h INVITED

Physical Processes in Acoustic Wave Heating of the Thermosphere

Gerald Schubert[1,3] (1-310-825-4577; schubert@ucla.edu)

Michael P. Hickey[2]