

EOF is actually related to a widely known physically prominent effect on the convection patterns. In brief the variability associated with the interplanetary magnetic field (IMF) By component emerges as the primary mode, and the IMF Bz effect emerges as the secondary mode. The tertiary mode seems to reflect the variability in the cusp region, which may also be associated with the IMF By effect.

SA32A-0690 1330h POSTER

The morphology of the dayside ionospheric trough and the nightside stagnation region: a coupled study

Richard L Balthazor¹ (+44 114 222 3711; r.balthazor@sheffield.ac.uk); Michael H Denton² (mick.denton@aber.ac.uk); Eleri Pryse² (sep@aber.ac.uk); Len Kersley² (lek@aber.ac.uk); Ian K Walker²; Robert J Moffett¹ (r.moffett@sheffield.ac.uk)

¹Space and Atmosphere Research Group, Hicks Building, University of Sheffield, Sheffield S3 7RH, United Kingdom

²Radio and Space Physics Group, Department of Physics University of Wales, Aberystwyth SY23 3BZ, United Kingdom

The Aberystwyth tomographic imaging experiment and the Sheffield Coupled Thermosphere-Ionosphere-Plasmasphere model (SCTIP) have been used to investigate the dayside ionospheric trough at high latitude under different geomagnetic conditions. Previous work has suggested that the latitude of the trough minimum and the structure of the poleward wall is dependent on the electron precipitation, whereas the formation of the trough itself is dependent on the convection of flux tubes. We further discuss the roles of flux tube convection and the nightside stagnation region in the formation of both the dayside and nightside troughs, and the role of partially depleted flux tubes in the observed equatorward structuring of the trough region.

SA41A MC: 135 Thursday 0830h
Van Allen Lecture - Magnetospheric Imaging: Promise to Reality (joint with SH, SM)

Presiding: J T Gosling, Los Alamos National Laboratory

SA41A-01 0835h INVITED

Magnetospheric Imaging: Promise to Reality

James Burch (jburch@swri.edu)
Southwest Research Institute, P.O. Drawer 28510, San Antonio, TX 78228, United States

There is no abstract available for this presentation.

SA41B MC: Hall D Thursday 0920h

The Mesosphere/Lower Thermosphere Region: Instabilities, Structure, Dynamics, Composition, and Emissions I (joint with NG, A, AE)

Presiding: H Liu, National Center for Atmospheric Research; S M Azeem, University of Colorado

SA41B-0710 0920h POSTER

OH and O₃ in the MLT: Comparing MAHRSI and ORA measurements With the SOCRATES 2D-model

Simon Chabrilat¹ (Simon.Chabrilat@oma.be)

Gaston Kockarts¹ (Gaston.Kockarts@oma.be)

Guy Brasseur² (brasseur@dkrz.de)

Didier Fussen¹ (Didier.Fussen@oma.be)

Dominique Fonteyn¹ (Dominique.Fonteyn@oma.be)

¹Belgium Institute for Space Aeronomy, 3, avenue Circulaire, Brussels B-1000, Belgium

²Max Planck Institute for Meteorology, Bundesstrasse, 55, Hamburg D-20146, Germany

New space-based measurements of two key chemical species in the MLT, OH and O₃, were recently published. The OH radical was measured for the first time in the stratosphere and the mesosphere by the MAHRSI instrument. Conway *et al.* [2000] showed the difficulty to explain these observations with a one-dimensional model.

Ozone measurements were extracted from the ORA instrument, which uses solar occultation in the UV-visible wavelength range. More than 2500 vertical profiles of O₃ at sunrise and sunset were obtained, up to 110 km altitude. This is the first ozone data set to extend above the mesopause, capturing the ozone secondary maximum in its totality.

We compare these measurements with the results of the SOCRATES two-dimensional interactive model. The latest version of this model includes, among other improvements, an accurate calculation of the absorption of the Lyman- α solar line by O₂, molecular diffusion, and a parameterization of the gravity wave drag to accurately match the observed temperature distribution in the MLT - especially the temporal and spatial structure of the mesopause.

We show that the observations of mesospheric OH and O₃ in the MLT are reproduced in a very satisfactory manner using this new multi-dimensional model.

SA41B-0711 0920h POSTER

THE MESOSPHERIC QBO IN AN INTERACTIVE ZONALLY AVERAGED PHOTOCHEMICAL TRANSPORT MODEL

John P McCormack¹ (202-767-3380; mccormack@uap2.nrl.navy.mil)

David E Siskind¹

Stephen D Eckermann¹

¹E.O. Hulburt Center for Space Research, Naval Research Laboratory 4555 Overlook Avenue SW, Washington, DC 20375, United States

Satellite and ground-based measurements of zonal winds in the tropical upper stratosphere and mesosphere show that the semi-annual oscillation (SAO) in zonal wind is modulated by the phase of the quasi-biennial oscillation (QBO) in lower stratospheric winds. Above 85 km, effects of the diurnal tide hinder satellite-based observations of this feature. Furthermore, most observational records of the mesospheric QBO (MQBO) cover only 2-3 cycles, which may be too short to fully describe the interannual variability. For these reasons, model simulations of the MQBO are useful for quantifying its long-term impact on tracer transport throughout the middle atmosphere. The SAO in mesospheric winds is simulated in a zonally averaged two-dimensional model in which dynamics, radiation, and photochemistry are fully coupled. When an interactive (i.e. not imposed) stratospheric QBO is introduced in a twenty-year simulation, a mesospheric QBO is reproduced in the 60-80 km region that is qualitatively similar to observations, although there are significant quantitative discrepancies. For example, the amplitude of the modeled MQBO (~ 10 meters per second) is a factor of two smaller than what is observed. In addition, the altitude of the peak MQBO signal in the model is approximately 10 km lower than observed in ground based radar data. Possible reasons for these discrepancies, and the impact of the modeled MQBO on the transport of constituents throughout the middle atmosphere, will be discussed.

SA41B-0712 0920h POSTER

Quasi-decadal Oscillations Generated by the QBO

Hans G Mayr¹ (301 286-7505; hmayr@pop900.gsfc.nasa.gov)

John J Mengel² (301 286-4516; jmengel@pop900.gsfc.nasa.gov)

Douglas P Drob³ (202 404-1292; drob@uap2.nrl.navy.mil)

Hayden S Porter⁴ (864 294-3223; Hayden.Porter@furman.edu)

¹Goddard Space Flight Center, Laboratory for Atmospheres, Greenbelt, MD 20771, United States

²Science Systems Applications Inc., 5900 Princess Garden Parkway, Lanham, MD 20706, United States

³Naval Research Laboratory, Upper Atmospheric Physics Branch, Washington, DC 20375, United States

⁴Furman University, Computer Science Department, Greenville, SC 29613, United States

Quasi-decadal oscillations (QDO) have been observed in the stratosphere and have been linked to the equatorial Quasi-Biennial Oscillation (QBO) and to the 11-year solar activity cycle. With the use of a 2D version of our Numerical Spectral Model (NSM) that incorporates Hines' Doppler Spread Parameterization (DSP) for gravity waves (GW), we demonstrate that beat periods between 9 and 11 years can be generated by the QBO as it interacts through GW filtering with the Annual Oscillation (AO) and Semi-annual Oscillation (SAO). Results are discussed from computations covering up to 50 years, and our analyses leads to the following conclusions. The QDO as a stand-alone signature is largely confined to the upper mesosphere. Its largest signature appears in the form of amplitude modulations of the QBO, AO and SAO, and these extend into the lower stratosphere. The downward control that characterizes the QBO apparently comes into play, and the longer time constants for diffusion and radiative loss at lower altitudes facilitate the QDO response. Although excited by the QBO, which is confined to low latitudes, the QDO is shown to extend to high latitudes. The effect is particularly large for the QBO with period around 33.5 month (near the upper limit of observations), which interacts with the SAO to produce a hemispherically symmetric QDO. Our analysis indicates that the QDO is transferred to high latitudes by the meridional circulation, which prominently exhibits this periodicity particularly in the amplitude modulation of the AO. The propensity for beat periods around 10 years may help to increase significantly the efficiency for generating solar cycle signatures in the atmosphere, and we discuss numerical experiments related to that.

SA41B-0713 0920h POSTER

Observations of the Two-Day Wave Using Mesospheric Radars, Satellite Instruments, and Gridded Analyses During the Boreal Summer of 1994

Dennis M Riggan¹ (303-415-9701 x208; riggin@colorado-research.com)

Ruth S Lieberman¹ (303-415-9701 x212; ruth@colorado-research.com)

¹Colorado Research Associates, 3380 Mitchell Lane, Boulder, CO 80301, United States

Mesospheric (MF and meteor scatter) radars extending over latitudes from 5°S to 55°N are used to study the spatial structure and temporal evolution of the two-day wave in the horizontal winds from June through October of 1994. Correlative data from satellite instruments aboard UARS (HRDI and MLS) are used to diagnose latitude-longitude patterns in the winds and temperatures and diagnose possible baroclinic conditions. The UKMO gridded analyses provides further information on the global structure of the wave. The event had a sudden onset in mid-June at high northern latitudes. At lower latitudes the wave was observed at progressively later times with an onset in mid-July near the equator. The wave event was characterized by two distinct responses, first at a period of ~2.1 days and then subsequently at ~1.8 days. We hypothesize that the 2.1-day response corresponds to the zonal wavenumber-3, Rossby-gravity mode that is usually identified as the two day wave, while the 1.8-day response is a zonal wavenumber-4 mode that has previously reported, although it is not a normal mode. In addition, a response with a period of ~2.5 days was observed in the HRDI winds. This response may correspond to the gravest antisymmetric zonal wavenumber-2, Rossby-gravity mode. Spectral decompositions of the HRDI winds suggest that this mode becomes important above ~95 km.

SA41B-0714 0920h POSTER

Simulated 2-day Planetary-Wave Signatures in the Ionospheric Dynamo Region.

Gilbert S Lichstein¹ (lichstei@odo.colorado.edu)

Jeffrey M Forbes¹ (forbes@zeke.colorado.edu)

Christian K Meyer² (meyer@colorado-research.com)

¹University of Colorado, Campus Box 429, Boulder, CO 80309, United States

²Colorado Research Associates, A Division of Northwest Research Associates, 3380 Mitchell Lane, Boulder, CO 80301, United States

A quasi-two-day (QTD) oscillation is known to exist in ionospheric peak densities, peak heights and ground magnetic perturbations due to E-region currents. Several mechanisms have been proposed to explain these observations, including (1) QTD modulation (in the stratosphere and mesosphere) of upward-propagating semi-diurnal tides that generate E-fields via the wind