ler to maximize the return from these kinds of observations, we developed new techniques for the production of synthetic es from *ab initio* codes. The key problem is the production of chromatic high spatial resolution images in a reasonable amount ne at a large number of wavelengths. To calculate a radiance we have to account for the production of radiation from chemical es, energetic particle precipitation, and/or solar scattering. For ally thick lines a simple line-of-sight integration is inadequate; on transport, which incurs the major computational burden, must cluded. From these "forward" calculations we have been able to l simple relationships between the observed intensity and key onmental parameters.

n example we will demonstrate the use FUV airglow features to the progress of a geomagnetic storm, show horizon images of quatorial nightglow, and synoptic images of the aurora and ow as viewed by GUVI from the TIMED orbit. We will also ss how the airglow can be used to determine key parameters as O/N_2 abundance, total electron content, and energy and flux recipitating electrons in the auroral oval and discuss error ates for the retrieval of these parameters.

2A-19 1330h POSTER

ote Sensing of F-Region Ion Drifts and Ion mperature at Søndre Strømfjord, Greenland Using ppler Measurements of the $O^+(^2P)$ State.

Carr, (Dept. of Physics, US Air Force Academy, CO 840-6425, 719-472-3510)
Niciejewski and T L Killeen (Space Physics Research boratory, University of Michigan, Ann Arbor, MI 109, 313-747-3425)

und-based observations of Doppler line profiles from e F-region $O^+(^2P)$ state, made with the Fabry-Perot terferometer (FPI) at Søndre Strømfjord, Greenland ve been analyzed to provide measurements of the ion nvection velocity and ion temperature. The FPI line-of-ght (LOS) ion drift and temperature measurements have en compared with simultaneous incoherent scatter dar (ISR) measurements; the results from the two chniques are in good agreement. The ground-based FPI 320Å) observations have future utility as a routine onitor of upper thermospheric atomic oxygen number nsities.

2A-20 1330h POSTER

rmospheric Gravity Wave Signatures on the Nocturnal tomic Oxygen 630 nm Airglow at Low Latitude Over outh America During Quiet and Disturbed Geomagnetic onditions

A Sobral, (PR/MCT - Instituto Nacional de Pesquisas spaciais, Caixa Postal 515, 12201-970 - São José dos ampos, SP, Brazil)
L Borba, M A Abdu, I S Batista, H Sawant, . Takahashi, C J Zamlutti, and Y Nakamura

report photometric observations of seasonally dependent equatorward traveling perturbations of the atomic ygen 630 nm airglow, over Cachoeira Paulista (CP, ogr. 22°41'S, 45°00'W, dip 28°S) which are apparently used by thermospheric gravity waves. About 40 occurnces of those moving disturbances were observed from 9 nights of observations within the period of 10 Aust 1977 to 4 July 1984. Their equatorward velocity, velength and period were observed to be 150-300 ms^{-1}, 0-250 km and 15 min-3 h, respectively. HF polariter records showed neither phase nor amplitude scinllations during the occurrence of those airglow rturbations which demonstrates that the perturbations e not associated to equatorial plasma depletions. e SN events appear during the postsunset period and main within the airglow NS scan from ten minutes to few hours. It is shown that they are not necessarily lated to geomagnetically active periods. A series of ysical and morphological features of those phenomena e presented. The present results are, to the authors owledge, the first report on the detection of effects gravity waves on the F-region atomic oxygen red ght airglow during undisturbed geomagnetic conditions.

SA41A CC: 106 Thurs 0830h
Mesospheric Winds, Waves, and Emissions

Presiding: **T F Tuan**, Univ of Cincinnati

SA41A-1 0830h

Doppler-Spread Parameterization of Gravity-Wave Momentum Deposition

C O Hines (Laboratory for Atmospheres, NASA/GSFC, Greenbelt, MD 20771; 416-977-8355; e-mail: hines@windic.yorku.ca)

The circulation of the middle atmosphere is known to be strongly influenced by the deposition of momentum by gravity waves as the waves themselves dissipate. Various parameterization schemes have been proposed in the past for use in large-scale circulation models. The scheme presented here is based on the author's Doppler-spread theory of gravity-wave saturation, in which nonlinear wave-wave interactions control the rate at which the wave spectrum is eroded as the waves propagate upward. The theory is extended here to include the effects of background winds (previously ignored) under approximations suitable for the purpose, and the momentum deposition is parameterized. So too are the corresponding heating rate, and below the turbopause, eddy diffusivity. The scheme has been applied (by others) in one particular large-scale model, with early results that are described in two following papers.

SA41A-2 0845h

In-Situ Generation of Planetary Waves Near the Mesopause During Solstices

K L Chan, J G Mengel (Both at Applied Research Corp., Landover, MD 20785)
H G Mayr, and C O Hines (Both at NASA/GSFC, Greenbelt, MD 20771)

Using a spectral model that naturally describes the planetary waves as motions with different low order zonal wave numbers, we study the waves' generation and propagation in the mesosphere. It is found that the large north-south temperature gradient associated with the mesospheric temperature anomaly during solstices provides a background for baroclinic instability to develop, especially near the summer pole. Planetary waves with a variety of periods are generated. The most prominent are the quasi-2-day waves associated with the zonal wave number 3, such as are in fact observed most strongly in the summer hemisphere. The quasi-5-day and 2.6 day waves are associated with the zonal wave numbers 1 and 2, respectively. A trace of waves with periods around 8 days is also indicated. The planetary waves also interact with and modulate the diurnal, semi-diurnal, and ter-diurnal tides.

SA41A-3 0900h

Correlation of Small Scale Density Fluctuations and Temperature Gradients in the Mesosphere

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The characteristics and interactions of wave motions on different scales play an important role in determining the global thermal and dynamical structure of the mesosphere and lower thermosphere. However, there is still the need for measurements which cover large scale wave structure and small scale processes simultaneously. We have obtained joint altitude profiles of temperatures, small scale fluctuations and turbulence parameters from 14 rocket soundings using neutral air number densities measured by an ionization gauge. The data were acquired between January 1990 and October 1991 during three international campaigns at high and middle latitudes and span the region from 70 to 110 km. The derivation of total number density and temperature profiles below 90 km involved supporting measurements from inflatable falling spheres. We have found in all flights high correlation between the Brunt-Vaisälä frequency squared and relative density fluctuations for large regions without notable turbulence. This observation is in agreement with the picture of adiabatic motions of air parcels which applies both to gravity waves and turbulence in a stably stratified atmosphere. Under conditions of low or negative convective stability, narrow turbulent layers with thicknesses of about 1 km have been often observed. Based on the spectra of the first mentioned "nonturbulent" fluctuations we interprete them as small saturated gravity waves. We will give a spectral estimate of the potential energy flux contained in these waves and compare our results with other studies of gravity wave spectra.

SA41A-4 0915h

Effect of 'Modal Interference' Among Gravity Wave Modes in a Windless, Realistic Atmosphere

G Munasinghe, A K Bhattacharyya and T F Tuan (Physics Department, University, Cincinnati, OH 45221-0011)

Two methods have been used for computing guided modes in the middle atmosphere: one uses the radiation boundary condition and the other uses what was tantamount to phase shift analysis. The results using these two methods disagree very strongly with each other. Tuan & Tadic (1982) showed that most of the partially guided modes obtained should cancel so that the two different methods should give the same result; that paper, however, did not provide for any explicit calculation to show this.

In the present paper, we show explicitly how, for long period gravity waves, the only middle atmospheric guided modes are the Lamb and the S_2 modes and how the enormously large number of modes computed from the first method manifest themselves in the reflection coefficient: they provide the background for the reflection coefficient without providing any guidance. We also consider the case when the period of the gravity wave is lowered and how the partially guided modes first become virtually guided and then fully guided as the period is lowered to the Brunt-period range.

SA41A-5 0930h

The Saturated-Cascade Model for Atmospheric Gravity Wave Spectra, and the Wavelength-Period (W-P) Relations

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The purpose of this paper is to present a model explaining all the atmospheric gravity wave spectra and, in addition, a wavelength-period constraint observed by many researchers and which will henceforth be designated the W-P Relations. The power spectral densities (PSD's) in terms of horizontal, k_x, and vertical, k_z, wave numbers, and frequency, ω, will be obtainable from this model for horizontal and vertical velocity components, temperature, and density fluctuations, etc. as a function primarily of buoyancy frequency, N, and turbulent dissipation rate ε. The W-P Relations will also be functions of these parameters; and, as a result, numerous experimental predictions will be available for the purpose of testing the model. Comparisons with available data will be shown to be in reasonable agreement with the model.

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SA41A-6 0945h

Damping of Atmospheric Gravity Waves Through Interaction with Molecular Vibration

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The damping of atmospheric gravity waves through interaction with molecular vibration has been treated using a technique equivalent to that of Hines (1977). The first vibrational state of molecular nitrogen is found to produce significant damping if the interaction with carbon dioxide is included. CO_2 has a vibrational level with nearly the same energy level as the lowest vibrational level of N_2 and the cross section for this approximately resonant vibration state exchange dominates the quenching of the N_2 vibration despite the low density of CO_2. The effect of this CO_2 quenching is to move the altitude of the maximum wave damping from the mesosphere, where the effect is small, up to the base of the thermosphere, where the damping is larger. This altitude effect is very sharp as the specific heat of the N_2 vibrational state has an exponential increase as the gas temperature increases to approach the vibrational temperature. In the future, the vibrational damping of gravity waves is expected to increase as the density of CO_2 increases.

Reference: Hines, C. O., Relaxational dissipation in atmospheric waves, Planet. Space Sci., 25, 1045-1074, 1977.