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ATMOSPHERIC TRACE GAS CORRELATIONS AS MEASURED BY CRISTA

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The CRISTA Instrument (CRyogenic Infrared Spectrometers and Telescopes for the Atmosphere) was flown on the Space-Shuttle missions STS 66 in November 1994 and STS 85 in August 1997. Global measurements of trace gases in the spectral range from 4 to 71 μm with high spatial resolution during free flying periods of 8 days in both flights were performed, and about 50000 height profiles were obtained in each flight. Correlations between the mixing ratios of several stratospheric constituents (e.g. N_2O, CH_4, HNO_3, O_3) for the first flight will be discussed and compared with model calculations.

ON THE VERTICAL WAVE-ENERGY PROPAGATION FROM TROPOSPHERE TO STRATOSPHERE IN DIFFERENT GEOGRAPHICAL REGIONS

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The vertical energy propagation connected with planetary waves controls up to a high extend the stratospheric circulation. The paper is concerned with the question of longitudinal and regional dependence of vertical wave-energy propagation.
For the 16 winter seasons of ECMWF reanalyses data covering 17 pressure levels the extended Eliassen-Palm-flux (EEPF) has been calculated for different characteristic timescales. The analyses show that the most dominant vertical synoptic wave-energy exchange with stratosphreric heights takes place over the North Atlantic region (NAR). In contrast to other geographical regions only in the NAR the synoptic wave-energy is able to penetrate up to stratospheric heights. Additional to the EEPF analyses this wave-energy window can be found in Principal Oscillation Patterns (POP) analyses, too. The so detected coherent wavepackets with oscillation periods between 5 and 10 days propagate only over the NAR up to the stratosphere. Besides this regional synoptic features it has been detected a more global travelling mode in the stratosphere with oscillation period of about 2 weeks. Both significant different POP structures may be interpreted in the framework of a linear theory.

MIDLATITUDINAL LOWER IONOSPHERE DISTURBANCES CAUSED BY NATURAL SOURSES

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There are presented experimental data on natural disturbances (powerful earthquakes, the solar terminator, strong thunderstorms, solar flares and magnetic storms) having effects on midlatitudinal ionospheric *D*-region parameters, characteristics of partially reflected (PR) signals and radio noise on f =2-4 MHz. There are investigated parameters of wave disturbances (type, periods, durations, and velocities) arising over these periods in the *D* region. Our investigations were carried out by the PR technique within a 1977-1997 period under different solar and geophysical conditions; the observation durations being minutes-days; ~30 to 200 samples covering each source of the disturbances.
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GLOBAL MODEL OF CIRCULATION OF THE MIDDLE AND UPPER ATMOSPHERE

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The numerical three-dimensional model of the atmosphere circulation at altitudes from 20 to 300 km is suggested. This model is developed on a basis of the empiric models of the structural parameters of the strato-thermosphere. As the analysis shows, it is just such models which in the present time reproduce more precisely the observed systems of circulation. However, at the middle atmosphere heights, in distinction to the thermosphere, we have only the zonal-averaged distribution of the temperature, pressure and density. Thus, we have to calculate the atmosphere parameters variations conditioned by the tide oscillations and quasisteady planetary waves. We achieve this including the solution of the heat balance equation into the numerical model. The necessary non-adiabatic sources of the heating are found from the energy equation, in doing so, the circulation was beforehand calculation from the empiric models of the atmosphere which were supplemented at the stratosphere heights by the sources of the tide oscillations excitement. The variations of the atmospheric parameters connected with the planetary waves propagating from the troposphere were taken into account by setting the geopotential disturbances at the lower boundary.

IONOSPHERIC PARAMETER VARIATIONS IN THE LOWER *D* REGION DURING MAGNETIC STORM

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Using the partial reflection technique, it is found that the electron collision frequency increases more than 50% in the lower part of the *D* region (z <70 km) due to precipitating energetic particles during magnetic storms (MS). Measurements made during 3 MS in a 1984-1985 period near Kharkiv show that the precipitation occurs in a cource of ~10 days after the MS. On these events, intensive partial reflections are observed from heights of 55< z <70 km, and the electron number density increases several times. Calculations of flux intensities of precipitating energetic particles and ion-production rates are presented.
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GLOBAL STRATOSPHERIC CIRCULATION ANALYSIS BY MEANS OF SPECTRAL DECOMPOSITION

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To give an objective characteristics of circulation patterns the spectral structure of stratospheric fields (temperature and geopotential) is analyzed in terms of the spherical harmonics with the aim to compare the long-term behaviour and connections to some extra-terrestric influence and circulations patterns. The daily meteo data from Free University Berlin cover more or less the period 1976–96 and are available for stratospheric levels 50, 30 and 10 hPa. The analysis of annual course of spherical harmonics is introduced as well as the comparison of the principal wave components changes with respect to the changes of different sets of solar, geomagnetic and global circulation indices. The interannual variability with special emphasis to the QBO and ENSO is also studied. Quite high correlation is found for some wave numbers.