Geophysical Research Abstracts, Vol. 7, 08107, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08107

Mapping stratospheric turbulence using bi-chromatic scintillation measurements by GOMOS

V. Sofieva (1), E. Kyrölä (1), A.S. Gurvich (2), F. Dalaudier (3) and THE GOMOS TEAM (4)

(1) Finnish Meteorological Institute, Finland; (2) A. M. Oboukhov Institute of Atmospheric Physics, Russia; (3) Service d'Aeronomie du CNRS, France; (4) Service d'Aeronomie du CNRS, France; BIRA, Belgium; ACRI-ST, France; ESA, Netherlands and Italy; Astrium, France; (viktoria.sofieva@fmi.fi)

The scintillations in stellar flux observed through the Earth atmosphere are caused by diffraction of stellar light on air density irregularities. GOMOS (Global Ozone Monitoring by Occultation of Stars) is the first instrument which performs synchronous scintillation measurements at two wavelengths. In addition to UV-VIS and IR spectrometers, GOMOS is equipped with two fast photometers operating at blue (~499 nm) and red (~675nm) wavelengths with the sampling frequency of 1 kHz. The scintillations recorded by the fast photometers are used for the correction of spectrometer measurements and for the retrieval of high-resolution temperature profile. The scintillation measurements can also be used for studies of air density irregularities.

Additional information can be retrieved from the correlation analysis of the two photometer signals. Recently, the coherency analysis was applied to GOMOS bi-chromatic scintillations. It was shown that the presence of strong isotropic scintillation (caused mainly by turbulence as a result of IGW breakdown) leads to low coherency and correlation of photometer signals for oblique (off-orbital plane) occultations. The coherency analysis has allowed detecting layers where the locally isotropic turbulence is well developed.

The cross-correlation coefficient defined as the maximum of the cross-correlation function of photometer signals serves as an integral characteristic of coherency. Its low value can be used as a qualitative indicator for presence of layers with prevailing isotropic turbulence. Using this parameter opens a possibility for mapping the ratio of

anisotropic and isotropic irregularities of air density.

We will show the global distribution of turbulence retrieved from scintillation measurements in 2003. Observations show that the turbulent layers are located approximately at the same pressure level, corresponding to altitudes ˜30-40 km. Statistical analysis of the average occurrence of turbulence (which is assumed to be associated with IGW breaking) shows that the location of turbulent regions is in a good agreement with the previous observations and climatologies of IGW activity.