Geophysical Research Abstracts
Vol. 14, EGU2012-7874-1, 2012
EGU General Assembly 2012

Characterization of gravity waves at Venus cloud top from the Venus Monitoring Camera images

A. Piccialli (1), D. Titov (1), H. Svedhem (1), and W. J. Markiewicz (2)

(1) ESTEC-ESA, Netherlands (arianna.piccialli@esa.int), (2) Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany

Since 2006 the European mission Venus Express (VEx) is studying Venus atmosphere with a focus on atmospheric dynamics and circulation. Recently, several experiments on board Venus Express have detected waves in the Venus atmosphere both as oscillations in the temperature and wind fields and as patterns on the cloud layer. Waves could be playing an important role in the maintenance of the atmospheric circulation of Venus since they can transport energy and momentum. High resolution images of Venus Northern hemisphere obtained with the Venus Monitoring Camera (VMC/VEx) show distinct wave patterns at the cloud tops ($\sim$70 km altitude) interpreted as gravity waves. Venus Monitoring Camera (VMC) is a CCD-based camera specifically designed to take images of Venus in four narrow band filters in UV (365 nm), visible (513 nm), and near-IR (965 and 1000 nm). A systematic visual search of waves in VMC images was performed; more than 1700 orbits were analyzed and wave patterns were observed in about 200 images. With the aim to characterize the wave types and their possible origin, we retrieved wave properties such as location (latitude and longitude), local time, solar zenith angle, packet length and width, and orientation. A wavelet analysis was also applied to determine the wavelength and the region of dominance of each wave. Four types of waves were identified in VMC images: long, medium, short and irregular waves. The long type waves are characterized by long and narrow straight features extending more than a few hundreds kilometers and with a wavelength within the range of 7 to 48 km. Medium type waves have irregular wavefronts extending more than 100 km and with wavelengths in the range 8 – 21 km. Short wave packets have a width of several tens of kilometers and extends to few hundreds kilometers and are characterized by small wavelengths (3 – 16 km). Often short waves trains are observed at the edges of long features and seem connected to them. Irregular wave fields extend beyond the field of view of VMC and appear to be the result of wave breaking or wave interference. The waves are often identified in all channels and are mostly found at high latitudes (60–80ºN) in the Northern hemisphere and seem to be concentrated above Ishtar Terra, a continental size highland that includes the highest mountain belts of the planet, thus suggesting a possible orographic origin of the waves. However, at the moment it is not possible to rule out a bias in the observations due to the spacecraft orbit that prevents waves to be seen at lower latitudes, because of lower resolution, and on the night side of the planet.