Geophysical Research Abstracts
Vol. 21, EGU2019-1053, 2019
EGU General Assembly 2019

Characterising Atmospheric Gravity Waves on the lower and upper cloud bank using Venus Express VMC and VIRTIS images

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An atmospheric gravity wave is an oscillatory disturbance on an atmospheric layer in which buoyancy acts as the restoring force. It can only exist in a stably stratified atmosphere, that is, a fluid in which density varies mostly vertically (Holton, 2004).
Gravity waves manifest themselves as regular cloud structures or quasi-periodic disturbances on atmospheric temperature profiles (Piccialli et al., 2014). Though their origin on Venus is not clear, possible theories include Kelvin Helmholtz instability, surface topography and convective instability below the upper cloud (Peralta et al., 2008; Piccialli et al.,2014).
Reports of observations of features interpreted as gravity waves are frequent on Earth's atmosphere (Sanchez-Lavega, 2011), on the atmosphere of Mars (Maattanen et al.,2010; McConnochie et al. 2010), on Jupiter's temperature profile (Young et al., 2005) and at its cloud level (Arregi et al. 2009).
On Venus' atmosphere, gravity waves have been detected both on temperature profiles acquired by the Pioneer Venus Probes (Seiff et al., 1980; Counselman et al., 1980) and visually on the base (44-48 km altitude) and upper (62-70 km) cloud deck with ultraviolet, visible and infrared observations with VIRTIS (Peralta et al., 2008) and VMC (Markiewicz et al., 2007; Piccialli et al. 2014), both onboard Venus Express.
Atmospheric gravity waves are very important since they can transport energy and momentum by propagating both vertically and horizontally within the atmosphere (Holton, 2004) and could play a key role in the maintenance of the atmospheric circulation on Venus.
This study aims to continue the systematic search and analysis of gravity waves on Venus performed previously by Piccialli et al.2014 and Peralta et al., 2008 using archived data from the Venus Express instruments VMC and VIRTIS. We visually inspect each image in search of wave patterns on selected layers of cloud (at different wavelength ranges) and further characterise its observable features such as geographical position, wavelength, wave packet length and width, orientation and where possible phase speed.