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Results from VIRTIS on board Venus Express after the end of the mission operations

G. Piccioni[1], P. Drossart[2], and VIRTIS Venus Express team

[1] INAF-IAPS, Istituto di Astrofisica e Planetologia Spaziali, Area di Ricerca di Tor Vergata, via Fosso del Cavaliere 100, 00133, Rome, Italy
[2] LESIA, Observatoire de Paris, LESIA/CNRS, UPMC, Université Paris-Diderot, F-92195 Meudon, France

Abstract.

After more than 8 years since the orbit insertion, the Venus Express mission is now at its end of mission operations. VIRTIS aboard the Venus Express spacecraft has addressed a significant amount of scientific results from the surface up to the upper atmosphere, in terms of mapping, composition, structure and dynamics. The VIRTIS instrument consists of two channels: VIRTIS-M, an imaging spectrometer with moderate spectral resolution in the range from 0.25 to 5.2 μm and VIRTIS-H, a high spectral resolution spectrometer in the range from 2 to 5 μm co-aligned with the field of view of M (Piccioni et al. 2007a; Drossart et al. 2007a). The resolution of VIRTIS-M is 2 nm from 0.25 to 1 μm, and 10 nm from 1 to 5.2 μm. The resolution of VIRTIS-H is about 2 nm. The atmosphere above the clouds has been observed both on day and night sides, in solar reflection and thermal emission in nadir geometry (Ignatiev et al. 2009; Cottini et al. 2012; Peralta et al. 2012, 2008). Limb observations provided O2(Piccioni et al. 2009; García Muñoz et al. 2009a; Gérard et al. 2013; Migliorini et al. 2013a; Gérard et al. 2008, 2009), OH (Piccioni et al. 2008; Gérard et al. 2010; Soret et al. 2010, 2012), NO (García Muñoz et al. 2009b), CO2 (Drossart et al. 2007b; López-Valverde et al. 2011) and CO (Gilli et al. 2009, 2015, 2011) emissions, through nightglow and fluorescence observations. Spectroscopy of the 4-5 μm range gave access to the cloud structure in the 60-95 km altitude levels (Irwin et al. 2008a; Grassi et al. 2014, 2008, 2010; Luz et al. 2011). The deeper atmospheric windows, limited by CO2 and H2O bands were accessible only in thermal emission on the night side. The sounded levels at 1.7 and 2.3 μm were limited respectively to 30-20 km altitude (Barstow et al. 2012; Bézard et al. 2009; Marcq et al. 2008; Satoh et al. 2009; Tsang et al. 2009, 2010, 2008; Wilson et al. 2008, 2009), while at shorter wavelengths (1.18, 1.10, 1.01, 0.9 and 0.85 μm), the hot surface of Venus was seen through the scattering clouds (Mueller et al. 2008; Helbert et al. 2008; Arnold et al. 2008; Smrekar et al. 2010; **?**). Multiwavelength clouds tracking and thermal fields allowed to study the wind fields and the global dynamics, in particular the complex details of the polar vortex (Garate-Lopez et al. 2013; Garcia et al. 2009; Hueso et al. 2008; Limaye et al. 2009; Luz et al. 2011; Peralta et al. 2012; Piccioni et al. 2007b; Sánchez-Lavega et al. 2008; Titov et al. 2008). A review of the main results is here reported along some question of what is still needed

to progress in the knowledge of our sister planet from ground based observations and future space missions.

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