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Venus Express - what have we learned?

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Abstract: Venus Express has proved to be a highly capable low cost Venus orbiter, created by reusing the Mars Express platform populated mainly with scientific payload instruments from Mars Express and Rosetta. It operated successfully in Venus orbit from April 2006 until finally running out of propellant in Nov 2014. Venus Express has provided a wealth of information on a large variety of topics on the atmosphere, surface and plasma environment of the planet. The atmosphere in the southern hemisphere was studied in detail by three instruments dedicated to atmospheric investigations, from the near IR to the UV, and additional information was derived from radio science measurements. The structure and composition of the atmosphere was mapped in three dimensions from 40 km to 140 km altitude. Significant temporal and spatial variations were found, in composition, density and temperature. Imaging in the UV and near-IR on the night side revealed strong latitudinal variations and significant temporal changes in the global cloud top morphology, as well as identification of various types of waves at a range of altitudes.

In this talk we will focus on some of the unexpected results from Venus Express: the surprising small influence of the geomagnetic field in the overall rate of atmospheric escape; large changes from year-to-year in the mean wind speed measured at cloud-tops; and tantalising hints of ongoing volcanic activity, gleaned from thermal mapping and sulphur dioxide monitoring. Some of the last results returned by Venus Express are in situ thermospheric densities, measured during an aerobraking campaign undertaken in June-July 2014, which revealed high variability at these altitudes. Finally, we outline the legacy of Venus Express and the science questions left unanswered for future Venus missions to address.