



Venus Express: five years of atmospheric observations

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Abstract

Since April 2006 Venus Express has been performing a global survey of the remarkably dense, cloudy, and dynamic atmosphere of our near neighbour. More than 300 radio-occultation experiments covering all latitudes and local times on had been acquired so far. They reveal highly variable temperature structure in the mesosphere and within the clouds. Joint analysis of several experiments indicated coordinated latitudinal changes of the cloud top structure with high dispersed cloud tops in the low latitudes and relatively low dense clouds in the cold collar and the polar region. UV imaging monitors strongly variable cloud patterns showing for the first time middle latitudes and polar regions in unprecedented detail. Tracking cloud features at both UV and thermal infrared wavelengths characterizes the global wind field and its variations, including pioneering reconstruction of the velocity patterns inside the polar eye of the hemispheric vortex. The observations are supported by development of General Circulation Models. Spectroscopic observations in both nadir and occultation geometries continuously sound composition of the mesosphere and discover significant latitudinal variations of water vapour and sulphur dioxide that form cloud particles. Contrary to expectations the observations indicate no apparent correlations with UV brightness patterns. Non-LTE infrared emissions in the lines of O₂, NO, CO₂, OH originating near the mesopause at 95-105 km altitude are being mapped on the night side. The data show that the airglow peak intensity occurs close to the anti-solar point and its location depends on particular specie. A consistent picture of the climate on the neighbouring planet is emerging from the Venus Express observations supported by extensive modelling efforts. The results of the studies will be published in about 40 original papers in the special issue of Icarus to appear in 2011.