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Merging the UV and thermal-IR views of Venus from the Venus Express observations

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Venus is completely covered by a thick cloud layer, the upper part of which was characterized by earlier space-borne observations. In the UV-blue range the non-uniform spatial and vertical distribution of absorbers at the cloud tops produces the well-known UV markings that have puzzled observers since the time of their discovery. At thermal IR wavelengths the observed brightness temperature features (cold collar, polar dipole) indicate variations of temperature and aerosol structure at the cloud tops. So far the UV and thermal-IR pictures of Venus have existed independently. VIRTIS and VMC observations from Venus Express provide for the first time simultaneous imaging of the Venus southern hemisphere in the broad spectral range that permits merging of the UV and thermal-IR "portraits" of Venus into a consistent picture of the large-scale morphology of the cloud tops. The UV bright mid-latitude band at 50-65 S consists of dense conservatively scattering aerosols that extend up to ˜69 km altitude, thus masking the UV absorbing layer hidden deeper in the atmosphere. Further towards the pole the cloud top altitude and its opacity decrease, exposing UV absorbing layers that results in a dark "polar cap". In terms of thermal-IR observations this region, occupying a circular zone at 70+/-5 degrees latitude, is named the "cold collar". It is characterized by a strong temperature inversion developed at the cloud tops. The "cold collar" encompasses the "polar dipole" - a giant vortex that in the thermal IR appears as bright and in UV images as a dark oval feature.