The many faces of the Venus' polar vortex

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The polar region of Venus shows a dynamics very peculiar and quite different from the rest of the planet. The region poleward of 60-70 deg latitudes shows in average an almost solid body rotation with essentially no vertical wind shear, in contrast to the mid-to-low latitudes where the vertical shear is significant, with winds doubling from the lower clouds to the clouds top. The ring surrounding the polar region is known as cold collar and it represents a separation zone of two different dynamical regimes. This barrier owns a thermal structure with significant vertical thermal inversion and large temperature contrast at the clouds top between the inner part of the vortex and its surrounding.

The elliptical shape with apparently two centers of rotation of the Venus' vortex, observed by the Pioneer Venus in 1980 in the northern hemisphere for the first time at 15 microns, induced to label it as "dipole", and since then, we refer to the Venus vortex as the "dipole of Venus". The VIRTIS (Visible and InfraRed Thermal Imaging Spectrometer) instrument on board the Venus Express mission, right at the beginning of the mission, observed for the first time a very similar shape in the southern hemisphere at a wavelength of 5.1 microns, probing at the clouds top. This confirmed simultaneously the symmetry N-S of Venus and, at a first glance, the stability of the dipole after many years since 1980.

However, after many systematic observations of VIRTIS in orbit, we can now say that the dipole is not a stable feature on Venus and it is just one shape among the others, so that the polar region itself shows a variability of its dynamics that needs to be further studied. We present here the results after many observations of VIRTIS of the polar vortex and its surroundings in a short and long time scales.