



Densities inferred from ESA's Venus Express aerobraking campaign at 130 km altitude

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In June-July 2014, ESA performed a planned aerobraking campaign with Venus Express to measure neutral densities above 130 km in Venus' atmosphere by means of the engineering accelerometers. To that purpose, the orbit perigee was lowered to approximately 130 km in order to enhance the atmospheric drag effect to the highest tolerable levels for the spacecraft; the accelerometer resolution and precision were not sufficient at higher altitudes. This campaign was requested as part of the Venus Express Atmospheric Drag Experiment (VExADE). A total of 18 orbits (i.e. days) were processed using the attitude quaternions to correctly orient the spacecraft bus and solar arrays in inertial space, which is necessary to accurately compute the exposed surface in the ram direction. The accelerometer data provide good measurements approximately from 130-140 km altitude; the length of the profiles is about 85 seconds, and they are on the early morning side (LST=4.5) at high northern latitude (70°N-82°N).

The densities are a factor 2-3 larger than Hedin's VTS-3 thermosphere model, which is consistent with earlier results obtained via classical precise orbit determination at higher altitudes. Wavelike structures with amplitudes of 20% and more are detected, with wavelengths of about 100-500 km. We cannot entirely rule out that these waves are caused by the spacecraft or due to some unknown instrumental effect, but we estimate this probability to be very low.