R009-P29
ポスター 4 ：11/26　AM1/AM2 （9:00-12:00）

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Synoptic-scale vortices in the lower cloud layer reproduced by AFES-Venus GCM

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The Japanese Venus Climate Orbiter Akatsuki captures Venus images of lower latitudes. The onboard 2-μ m camera (IR2) detected a synoptic-scale vortex between 20^o and 30^o latitude, exclusively in the northern hemisphere, appearing as spiral-shaped clouds on the planet's nightside. Similar large-scale vortices were simulated using a general circulation model (GCM) named AFES-Venus.

In these simulations, the vortex forms around 60 km high within the lower cloud layer, featuring poleward and upward winds on the east (leading) side and equatorward and downward winds on the west (trailing) side. By comparing this structure with the observed spiral-shaped cloud distribution around the vortex, the upward (downward) winds correspond to the dark (bright) region, implying that the cloud could be formed by the upward winds. The AFES-Venus model also suggests the existence of a mid-latitudinal jet with an asymmetry between the northern and southern hemispheres, potentially triggering shear (barotropic) instability with an e-folding period of around 5 days, which could impact vortex development. When a vortex becomes more prominent in one hemisphere, the jet's peak shifts to the opposite hemisphere, enhancing meridional shear and leading to the creation of a new vortex. This interaction between the mature and newly formed vortices in both hemispheres creates winds that cross the equator, reversing the direction of momentum transport and causing the strength of the vortex and jet to alternate between hemispheres over time. While the exact process behind the periodic alternation of these asymmetric vortices between the hemispheres is not yet understood, the formation of mid-latitudinal jets with north-south asymmetry and barotropic instability within the cloud layer may help explain the complex cloud patterns seen on Venus' nightside.