Geophysical Research Abstracts
Vol. 21, EGU2019-11798-1, 2019
EGU General Assembly 2019

Development of Atmospheric Boundary Layer based on UHF Wind Profiler Radar Observation

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The intensity of return signal by the atmosphere depends mainly on the water vapor and on the thermal gradients resulting in the refraction. When the dielectric properties of the medium changes along the ultra-high frequency wave path, they induce a diffusion, reflection or refraction of the wave in any directions. In the clear atmosphere these phenomena are related to the air refractive index in function of pressure, temperature and humidity. The first source of the refractive index is the atmospheric turbulence which tends to mix air parcels with different properties. Wind profiler radar can retrieves wind vectors, heat fluxes, turbulent dissipation rate and boundary layer height.

UHF Wind profiler radars are operated by the Korea Meteorological Administration at nine sites on the Korean Peninsula. Diurnal variations of the reflectivity, the vertical wind velocity and the turbulent dissipation rate show a typical clear air evolution. The maximum of reflectivity delineates the top of atmospheric boundary during the daytime. The turbulence is concentrated below this canopy with high value of dissipation rate between sunrise and sunset. The skewness coefficient is calculated with the Doppler velocity of vertical beam. It is so negative on average that the vertical velocity distribution spreads much more over the right side (toward updrafts). After sunset, when the turbulence ceases, a nocturnal low level jet may also develop and reach 15 m/s near a height of 400 m.