MU radar observations of turbulence possibly due a convective instability below melting layer of precipitation

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A VHF radar enables observations of clear air dynamics in close combination with precipitating systems (e.g. *Wakasugi et al.,* 1985). More commonly reported by meteorological radars, the features of bright band (enhanced particle echo power) can also occur in VHF echo power profiles of precipitation (e.g. *Chu* et al., 1991, *Rao et al.,* 1999). As at higher radar frequencies, the bright-band is due to Rayleigh scattering from snow or ice covered by a shell of liquid water due to melting near the 0°C isotherm. Therefore, the detection of a bright-band is the signature of a melting layer, and thus suggests air cooling due to water phase change. On the other hand, sublimation of precipitating ice particles below mid-level clouds in dry and weakly stratified air was shown to be conducive to convective instabilities and aviation turbulence due to cooling effects. It was called "Mid-level Cloud base Turbulence (MCT) by *Kudo* (2013) and *Kudo et al.* (2015). Here, we propose that a similar mechanism generating convective turbulence can also occur below a melting layer of precipitation due to cooling effects. This assertion is based on MU radar observations performed in range imaging mode on 07 June 2016 during the ShUREX2016 campaign (*Kantha et al.,* this issue). The MU radar detected clear air echoes whose properties were altogether consistent with turbulence and convective cells of up to 1.0 km in depth generated below a melting layer (~3.5 km). The turbulent structures decayed and re-formed as the bright band intensity decreased or increased. In the present works, we describe the radar observations in details. Numerical simulations based on models presented by *Kudo* (2013) suggest that convective instabilities and turbulence are also possible below melting levels, making our assertion plausible.

References

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