Near Monochromatic Ducted Gravity Waves Associated With A Convective System Close To The Pyrenees

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Near monochromatic gravity waves (GWs) associated with a mesoscale convective system (MCS) were detected during the Boundary Layer Late Afternoon and Sunset Turbulence (BLLAST) field campaign in Lannemezan (France) on 21 June 2011. These GWs are analysed using available instrumental data (e.g. an array of micro-barometers, a microwave system Humidity And Temperature PROfiler (HATPRO) and an ultra-high frequency (UHF) wind profiler). Pressure oscillations of up to 0.5 hPa were recorded after a pronounced pressure drop of 1.4 hPa, identified as the MCS weak low. Wavelet analysis and evaluated wave parameters confirm the occurrence of such GWs (period ~ 9 minutes, horizontal wavelength ~ 7 km) which propagated from southwest to northeast, i.e. in the same direction of propagation as the MCS. Observational evidence suggests the downdrafts associated with the rear-inflow jet at the weak low zone of the MCS as the most likely generator mechanism of the GWs. However, the complex orography and proximity of the Pyrenees to the field campaign could also play an important role. Wave propagation was possible through the ducting mechanism, favoured by the existence of a critical level in a wind sheared environment around 2000 m above ground level. Wave-like motions related to the GWs passage were also observed in other atmospheric parameters close to the surface and within the lower troposphere. The GWs effects on the surface fluxes have also been analysed through Multi-Resolution Flux Decomposition (MRFD) methods.