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Two years of atmospheric boundary layer tower observation at Dome C, Antarctic plateau

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The lower atmospheric boundary layer at Dome C, on the Antarctic plateau ((75°06' S, 123°20' E, 3233 m a.s.l.) is monitored since January 2008 (Genthon et al., J. Geophys. Res., 2010). Anemometers, thermometers and hygrometers were deployed at 6 levels above the surface to ∼43 m. Harsh local conditions (extreme cold temperatures, frost deposition) have affected the operation of the instruments. Several failed in the winter of 2008 but improvements since have allowed essentially continuous records with limited interruptions since 2009. Cases of thermal convective mixing (adiabatic temperature profile, in summer) as well as cases of very strong inversions (more than 2°C per meter locally, in winter) were recorded. The mean winter (MJJA) temperature is 7°C (3°C) warmer at the lowest (resp. highest) observation level in 2009 than in 2010. The reports from the Antarctic Meteorological Research Center automatic weather station at Dome C indicate that the 2 winters are the warmest and coldest (resp) on record over the past decade. This allows characterizing and contrasting "warm" and "cold' winter boundary layers on the Antarctic plateau, as several occurrences of winter "warm events" have occurred in 2009 whereas surface temperatures have dropped below -80°C in 2010. Operating and processing sonic anemometers and thermometers was particularly difficult but should provide direct measures of turbulence parameters within those extreme boundary layers. Turbulent fluxes computation were tested following "AmeriFlux" protocols (cleaning high-pass filtering, despiking, double-rotation, etc). Validating evaluations of turbulence in such particular conditions is not straightforward though.