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Turbulence structure and local Richardson number vertical profiles under stable conditions at Dome C, Antarctica

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An atmospheric field experiment, STABLEDC (STudy of the Atmospheric Boundary Layer Environmental at Dome C plateau station), was held at the French-Italian station of Concordia located over the Antarctic plateau at Dome C (Lat 75° 06' 06 S, Long 123° 20' 74 E, 3250 m a.s.l.) during 2004-2006. During the winter the surface strongly cools down in response to longwave radiation, as a consequence a strong surface inversion begins to form and develop. Since buoyancy inhibits vertical momentum exchanges in the inversion layer, significant wind speed shears develop in this layer. Using radiosoundings the Richardson number profiles have been computed. During the winter, when a long-lived very stable boundary layer it is observed, the Ri number profiles indicate that continuous turbulence may be expected in a thin layer having a depth ranging between 10 m - 50 m where the Richardson number is less of the critical Richardson number equal to 0.25. During the summer the stable boundary layer inversion is less strong and continuous turbulence occurs in a layer ranging between 50 m and 500 m.