An Antarctic cyclone climatology was created based on simulations of the Antarctic Mesoscale Prediction System (AMPS) and the University of Melbourne Cyclone (UM) detection and tracking algorithm for the period 2001-2009. Over 17,000 cyclone tracks were included in the climatology and 20% of these cyclones were mesoscale in terms of their size. Mesoscale systems were common south of the Antarctic Circumpolar Trough (ACT) over the coastal oceans of the Indian Ocean sector and in the Ross Sea, while large synoptic systems occurred most frequently in the ACT. A novel technique was applied to study the relationships between cyclone characteristics and surface properties over the Southern Ocean and the coastal areas of Antarctica.

Our comprehensive study has revealed that up to half of the cyclones simulated by AMPS correlated with the surface latent heat flux, sensible heat flux or temperature gradient. These cyclones either modified the surface or were being modified by it. In the former category 85% of the systems were synoptic cyclones associated predominantly with baroclinicity and advection, and the atmospheric boundary layer had a little influence in the generation and development of cyclones. On the contrary, in the latter category 36% of the systems were mesoscale cyclones gaining energy from instabilities in the boundary layer associated with strong turbulent fluxes.