A scheme representing cloud structure in a general circulation model has been developed which combines the ‘tripleclouds’ parameterization, introducing horizontal inhomogeneity in the model grid box in each layer, with ‘exponential-random’ overlap, in which clouds in adjacent layers are not overlapped maximally, but according to a vertical decorrelation scale. This scheme has been implemented in the Australian Community Climate and Earth System Simulator (ACCESS) which is a fully coupled model developed in the Centre for Australian Weather and Climate Research (CAWCR). The impact of this new representation of cloud structure on the model climate is evaluated by performing a series of experiments using the ACCESS model. The results show that the scheme has a positive impact on the radiation calculations, leading to improving the cloud radiative forcing and model sea surface temperature simulations.