A cloud chemistry model coupling a detailed chemical reactivity mechanism in gas and aqueous phase to a cloud microphysics model has been extended to simulate mixed phase cloud. Microphysical processes are describing the interactions between the vapour phase, the liquid phase (cloud and rain water) and the ice phase (pristine ice, snow and graupel) in the cloud. For soluble chemical species, their transfer by mixed phase microphysical processes has been included. In addition to microphysical transfer between iced hydrometeors, the probable main process incorporating soluble chemical species in iced hydrometeors is the retention in ice phase as riming or freezing occurs. The model is applied to a moderate precipitating mixed phase cloud forming in a continental air mass in winter. The main features of the cloud are described and the evolution of key chemical species as function of time and temperature is discussed. A sensitivity run without ice highlights the influence of ice phase on the gas phase composition of the cloud. Then, a detailed analysis of the microphysical rates and chemical rates linked to retention effects show that for this cloud event, the effect of the ice phase on gas phase composition is driven by riming of cloud droplets onto graupels, which leads to retention or not of soluble chemical species in the ice phase. Finally, the impact of crystal geometry on the collection efficiencies, on the riming of cloud droplets on graupels and on the retention of chemical species in ice phase is studied.