On the incorporation of CO2 atmosphere into the Martian crust, a reappraisal review

Kei Kurita[1]

[1] ERI,Univ. of Tokyo

The surface environment of Mars has been considered to suffer a large change which is closely associated with change in the mass of the atmosphere. Existence of dense CO2 atmosphere in the past is suggested to account for the plenty of evidence of the surface existence of liquid water. Plausible mechanisms for escape of CO2 to space or to incorporate into the interior have been still under consideration and decisive explanation has not yet been proposed. This presentation aims to review recent view of the incorporation mechanism of CO2 atmosphere into the subsurface region of Mars. Since the condensation temperature of CO2 is much lower than H2O, the martian surface is completely sealed out by H2O ice when CO2 atmosphere begins to condensate. In this situation a possible form of the subsurface CO2 would be either carbonate or CO2 hydrate. To make large scale reservoir of carbonate the existence of adequate state of the water ocean is necessary. To begin with, subsurface incorporation of CO2 atmosphere critically depends on the existence and its timing of water ocean. The chemistry of the ocean controls rate and amount of the carbonate to be formed. Until now spectroscopic remote sensing have failed to detect large scale existence of carbonate in the northern lowland, which is considered once-water covered region. This may indicate the chemistry of the ocean was not suitable for the formation of the carbonate. Another possibility is incorporation of CO2 as a clathrate hydrate. To form clathrate high pressure environment is necessary. The existence as a form of clathrate critically depends on availability of plausible situation of such high pressure environment. In the presentation several possible situations are proposed based on the recent Japanese studies on the formation of CO2 clathrate .