ON THE CHALLENGE OF UNDERSTANDING THE EARLY MARS ENVIRONMENT WITH CLIMATE MODELS F. Forget[1]
[1]Laboratoire de Météorologie Dynamique, IPSL, Paris, France (forget@lmd.jussieu.fr)

Since the 1980s, many studies have been performed to characterize the possible climate on early Mars assuming a CO_2 atmosphere up to several bars, and taking into account the fact that the Sun's luminosity at 3.8 Ga was most likely 75% of its present value with possibly additional greenhouse gases, radiatively active clouds, or even asteroid impacts.

Such a characterization has been challenging because of the complex gas spectroscopy, the difficult parametrization of CO_2 and H_2O clouds processes or even photochemical hazes in the atmosphere, and the four-dimensional aspects of a planetary climate (most of these studies were performed using one-dimensional radiative convective models).

Recently, major progresses have been obtained using full 3D global climate models.

However, it remains very challenging and difficult to reconcile the existence of significant amount of surface liquid water able to create Valley Networks and lake-related landforms as well as hydrated sedimentary minerals

I will review the current status of early Mars Climate models and the remaining challenges and enigma.