Ocean surface evaporation \(E\) and the latent heat \(LE\) it carries are the major components of the hydrologic and thermal forcing on the global oceans. However, there is practically no direct in situ measurements. Evaporation estimated from bulk parameterization method depends on the quality and distribution of the volunteer-ship reports which are far less than satisfactory. Spaceborne passive microwave sensors provide an unique way to monitor ocean evaporation with sufficient temporal and spatial resolutions and coverage for the study of global ocean environment. For example, Liu [Liu, 1990] developed a retrieval method for ocean evaporation using measurements by the Scanning Multichannel Microwave Radiometer (SMMR). This method was also applied successfully to another operational microwave radiometer, the Special Sensor Microwave Imager (SSMI). However, no error analysis has been done to examine the performance limitation of current spaceborne sensors, especially the recently launched TRMM Microwave Imager (TMI) on board the Tropical Rain Measuring Mission (TRMM) satellite. To this end, a data set of simulated brightness temperature at TMI frequencies are constructed with atmospheric profiles from ECMWF reanalysis. There are totally half a million profiles sub-sampled from global ocean covering one year time span. The simulated data set is then binned in the multi-dimension environment variable space to examine the sensitivities of brightness temperatures to ocean surface evaporation. Since those sensitivity studies are based on ECMWF profiles, no artificial or unrealistic constrains was used. With this sensitivity information, we performed an error analysis on evaporation retrieval as a function of environment variables including precipitable water vapor, near surface wind speed and sea surface temperature. It is assumed that stepwise linear multivariate relations exist between \(E\) and brightness temperatures. The estimated error represents theoretical accuracy limits on \(E\) estimation from spaceborne passive microwave data.