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Improvement of Mars' orientation and rotation model from the LaRa experiment onboard ExoMars.

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The LaRa experiment onboard ExoMars consists in two-way Doppler measurements from a direct radio-link between the Martian Lander and deep space tracking stations on the Earth (Dehant et al., this meeting). On the basis of these measurements, it will be possible to monitor the Lander position relative to the Earth and in turn to improve the determination of the Mars' orientation and rotation parameters (MOP), i.e. the rotation rate variations (or Length of Days LOD), the precession rate and the nutations of the rotation axis, and the orientation of Mars around its rotation axis (polar motion). In this study we perform numerical simulations of these Doppler measurements in order to quantify the precision that can be obtained on the MOP. We used the GINS software implemented by the French space agency (CNES) and further developed at Royal Observatory of Belgium (ROB) for planetary geodesy applications. This software allows simulating the relative motion of the Lander relative to Earth's tracking stations and computes partial derivatives of the simulated 2-way Doppler data with respect to the MOP. We have especially studied the effect of the Doppler noise, of the duration of the tracking period, and of the occurrence of the tracking passes during that period on the MOP determination. These simulations permit to build a strategy to be applied to future data processing in order to improve the precision on the MOP determination. As these parameters are related to the interior of the planet as well as to its seasonal angular momentum changes induced by the CO2 sublimation/condensation process, we further discuss the expected improvement in our knowledge of the state of the core and of the internal structure of Mars, and of the CO2 mass budget in the Martian

atmosphere and ice caps.