MARTIAN ATMOSPHERIC DUST DYNAMICS: MODELING AND NUMERICAL COMPUTATION.

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Introduction: The dust aerosols have an important effect on the solar radiation in the Martial atmosphere and both surface and atmospheric heating rates, which are also basic drivers of atmospheric dynamics [1]-[3].

Under different Martian atmospheric scenarios, the measure of the amount of solar radiation at the Martian surface will be useful to gain some insight into the following issues:

a) UV irradiation levels at the bottom of the Martian atmosphere to use them as an habitability index.
b) Incoming shortwave radiation and solar heating at the surface.
c) Relative local index of dust in the atmosphere.

Aerosols cause an attenuation of the solar radiation traversing the atmosphere and this attenuation is modeled by the Lambert-Beer-Bouguer law, where the aerosol optical thickness plays an important role. Through Angstrom law, the aerosol optical thickness can be approximated as a second order moment and then this law allows to model attenuation of the solar radiation traversing the atmosphere by a fractional diffusion equation [4]-[7].

The analytical solution of the fractional diffusion equation is available in the case of one space dimension and three space dimensions with radial symmetry. When we extend the fractional diffusion equation to the case of two or more space variables, we need large and massive computations to approach the solutions through numerical schemes. In this case a suitable strategy is to use the cloud computing to carry out the simulations.

In this study, we discuss some questions of the model and experimental data. We present analytic solutions for this modeling problem in one and three space dimensions and numerical methods that allow us to obtain computational simulations of the solutions. Also, the fractional model provides information that can be understood in term of higher order moments and this relation stablishes a meeting point and discussion regarding to the experiments. In this context, we are working in the fitting of the fractional model to dust observational data [8].

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