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Dynamical model of rivers on Mars

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Abstract

We investigate here the possible flow in Martian valleys and we compare with similar simulations for terrestrial conditions. The numerical model is used. We try to determine the basic properties of the flow, its erosion as well as the transport of the material. The comparison with the terrestrial rivers indicates some important differences.

1. Introduction

On the surface of Mars, under current conditions, liquid water could exist only occasionally in lowest regions of the planet. This water contains probably some components that decrease its freezing point and raised its boiling point. However, billions years ago more dense atmosphere on the Mars allows for the presence of large volume of liquid water. There are a number of structures apparently resulting from flowing liquid water in the past. They are of two types: outflow channels and valley networks. We investigate here the possible flow typical for valleys. The numerical model is used [1, 2]. We try to determine the basic properties of the flow, its erosion as well as the transport of the material. The comparison with the terrestrial rivers indicates some important differences.

2. Some results

Some chosen results are presented in two Figures 1 and 2. They compare flows on the Earth and on Mars. The gravity is the main difference. At Fig. 1, the river's bed topography is taken from [1]. For Fig. 2 initial artificial topography is assumed.

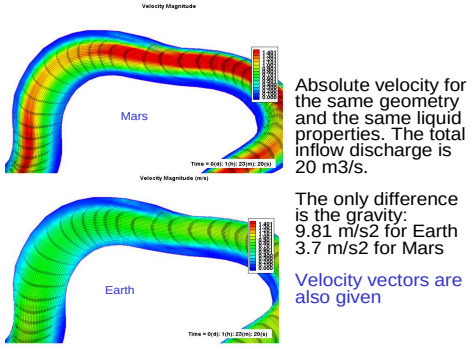

Figure 1. Comparison of the velocity vectors and their magnitude for Mars and the Earth

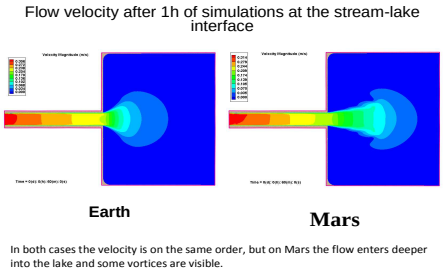

Figure 1. Comparison of the velocity magnitude for flow in the mouth of the stream on Mars and the Earth.

3. Summary and Conclusions

Numerical models allow for simulations of flow in Martian rivers. The results could be compared with terrestrial rivers as well as ancient river channels on Mars.

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References

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[2] Wu W., „CCHE2D Sediment Transport Model (Version 2.1)", Technical Report No. NCCHE-TR-2001-3, 2001