NUMERICAL SIMULATION OF SOME CONSEQUENCES INDUCED BY THE COMET SL-9 IN THE JOVIAN ATMOSPHERE. S. V. Utyuzhnikov and A. V. Konyukhov, Moscow Institute of Physics and Technology, Dolgoprudny 141700, RUSSIA.

Recently the problem of the impact of a comet into the atmosphere of a planet attracted widespread attention of researchers. In particular, the impact of the Shoemaker-Levy 9 comet into Jovian atmosphere has aroused considerable interest. We point out the publications [1–5] in which the impact is simulated numerically. Surely, the list of papers can be greatly extended.

The entry of the Comet SL-9 into the Jovian atmosphere is studied in gas dynamic approximation. An icy comet undergoes a fragmentation subject to interaction with the atmosphere and goes into the gaseous state. The phase transition occurs very rapidly. Therefore, it can rendered to as an explosion. After the explosion the gas cloud proceeds to move downward at a speed of about 50 kilometers per second. The pressure in the cloud after the explosion significantly exceeds the pressure in the surrounding atmosphere. Therefore, high intensity shock wave is induced by the penetrating gas dynamic cloud. In addition, the cloud itself is intensively expanded. A series of shock waves, contact discontinuities, and rarefaction waves is formed in the gas dynamic flow.

To numerically model the gas dynamic flow, a computational algorith on moving adaptive grids is proposed. The flow is governed by equations, which are written in curvilinear coordinate system. Thus there is no need to interpolate grid functions to the new grid in passing to the next time level. An ENO-algorithm is adopted with a special limiter in the vicinity of the sound line. The comparison is given for different types of entropy correction. The algorithm is shown to be efficient. The solutions obtained on a coarse adaptive grid and a fine uniform grid are compared. A high intensity forward shock wave is induced by a fragment of a comet penetrating in the atmosphere of a planet. After the deceleration of the cloud the forward shock wave loses its intensity as it proceeds to move downward. Since the fragment enters the atmosphere at an angle of inclination, a part of the forward shock wave moves upward in the stratified atmosphere with amplified intensity. The evolution of the cited phenomenon is studied.

Besides the comet there is another powerful source of atmospheric perturbations: the coma about a fragment of the comet. The coma is formed by the action of solar radiation and solar wind. The radius of coma exceeds the radius of the fragment by two orders of magnitude. The coma is decelerated more rapidly than the comet itself since it consists of rarefied gas. The coma is separated from the core and is decelerated in the upper layers of the atmosphere.

An explanation is proposed for the glow and plumes in the Jovian atmosphere. The computational data are in good agreement with the observed data.

References: [1] Ahrens T. J. et al. (1994) *GRL, 21*, 1087–1090. [2] Crawford T. G. et al. (1994) *Shock Waves, 4*, 47–50. [3] Klumov B. A. et al. (1994) *Reports of the Academy of Sciences, 337*, 28–35 (in Russian). [4] Mac Low M.-M. and Zahnle K. (1994) *Icarus, 108*, 1–17. [5] Sekanina Z. (1993) *Science, 262*, 382.