Title: Numerical modeling of liquid water flows in ice bodies' interiors

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Abstract: We studied the flow induced by water jets in the subsurface oceans on the Solar system moons - Europa and Enceladus. In water plumes of Enceladus Cassini spacecraft detected small silica particles with radii $\approx 6-9$ nm. As shown by experiments, these particles grow in size with time spent in the ocean. The small size of particles suggests that the material transport from the the jets on the oceanic floor to the source of the plume at the moon's surface is highly efficient. In the thesis we investigate the characteristic transport time by solving the Navier-Stokes equation for incompressible fluid. For this purpose we have developed a Fortran program in two-dimensional Cartesian geometry based on the finite-difference staggered-grid method. Another program, using the second order Runge-Kutta method, was written to reconstruct the trajectories of the particles in the ocean. Using these tools we estimated the effectiveness of material transport under different conditions, namely presence of global lateral flow, width of the water jet, the Reynolds number and the number of jets.

Keywords: Navier-Stokes equation, numerical model, icy satellites