

**Fluvial Deposition in Titan's Lakes – the Role of Grain Size.** P. P. Witek<sup>1</sup> and L. Czechowski<sup>2</sup>, <sup>1</sup>Faculty of Physics, University of Warsaw, Poland (ppwit@igf.fuw.edu.pl / Fax: +48-22-5546882), <sup>2</sup>Faculty of Physics, University of Warsaw, Poland (lczech@op.pl).

**Introduction:** Surface runoff is part of volatile cycles on Earth and Titan. Parts of land surface on these bodies have been modified by fluvial erosion and deposition. Lakes of liquid hydrocarbons identified in Titan's polar regions are surrounded by branching networks of valleys carved by rivers; this indicates sediment transport to the lake. It is known that sedimentary deposits take different shapes depending on several factors. One of them is the size of the grain. The grains are naturally sorted in terrestrial rivers, with larger diameter close to the source and finer sand and clay in the lower course of long rivers [1]. The same is expected on Titan. We use finite elements method to simulate sedimentary processes for different dominant grain sizes in terrestrial and Titanian environment.

**Parameters of the Models:** We consider several possible compositions of Titanian sediments, from pure water ice to low density organic sludge. In terrestrial conditions we simulate transport of quartz grains by water.

**Sample Results:** We created the set of delta-like landforms by changing the grain size distribution for the same initial conditions and geometry.

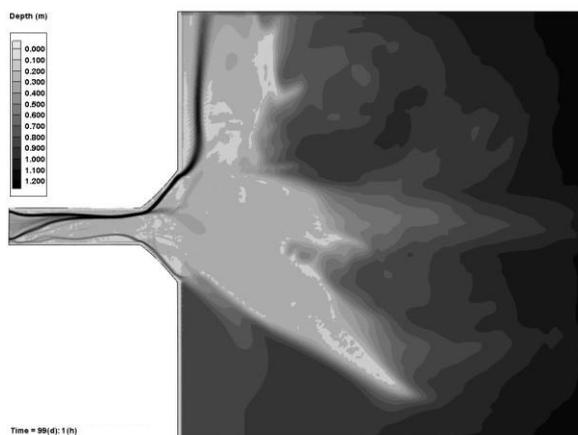


Figure 1: Result of sediment transport simulation: lake depth on Titan after 99 simulated days. Icy grains with diameter of 0.1 mm.

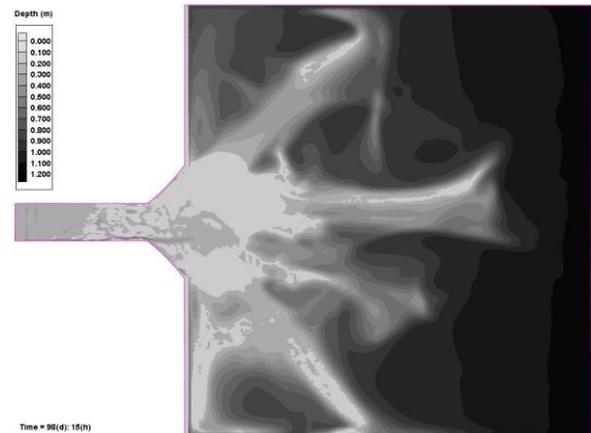


Figure 2: Result of sediment transport simulation: lake depth on Titan after 99 simulated days. Icy grains with diameter of 0.5 mm.

**Basic Equations:** In our investigation we use two-dimensional depth-averaged hydrodynamic numerical model, based on the Reynolds approximation of momentum equations and the continuity equation. Additional equations are used to describe bed-load transport, suspended sediment transport and deposition (see [2]).

**Summary and Conclusions:** Our simulations show similarities in development of sedimentary landforms in Titanian and terrestrial lakes. In both environments, coarser sands produce steeper slopes of deltas; for finer sands, the environment is more dynamic. Determination of the role of grain size in shaping these deposits is another step towards better understanding of Titanian fluvial geomorphology.

#### References:

- [1] Orton, G.J., Reading, H.G., 1993. Variability of deltaic processes in terms of sediment supply, with particular emphasis on grain size. *Sedimentology*, 40, 3, 475-512.
- [2] Jia Y., Wang S., 2001. CCHE2D: Two-dimensional Hydrodynamic and Sediment Transport Model For Unsteady Open Channel Flow Over Loose Bed. Technical Report No. NCCHE-TR-2001-1