IVAN LIMONCHENKO, University of Toronto
On homotopy theory of polyhedral products with Golod face rings

In 1950s J.-P.Serre proved that Poincaré series of a commutative local Noetherian ring is bounded by a certain rational function depending on the Betti numbers of the Koszul complex and the minimal number of generators in the maximal ideal. In 1962 E.S.Golod showed that Serre's inequality turns into equality if and only if multiplication and all Massey products in Koszul homology of a local ring are trivial. J.Backelin proved in 1982 that Poincaré series of monomial rings are rational; among monomial rings there is the well-known class of Stanley-Reisner rings (or, face rings) of simplicial complexes.

In this talk we will discuss homotopy theory of polyhedral products over simplicial complexes having Golod face rings over fields. We will describe this class of Stanley-Reisner rings in terms of their Poincaré series, Koszul homology, and the loop homology algebra structure of moment-angle-complexes. Much more can be said if only flag simplicial complexes are considered. We will see how the methods and objects of toric topology allow us to obtain topological interpretations of the algebraic properties of Poincaré series and Koszul homology of Stanley-Reisner rings as well as to get new results.

The talk is partially based on an ongoing research project joint with Kouyemon Iriye, Daisuke Kishimoto, and Taras Panov.