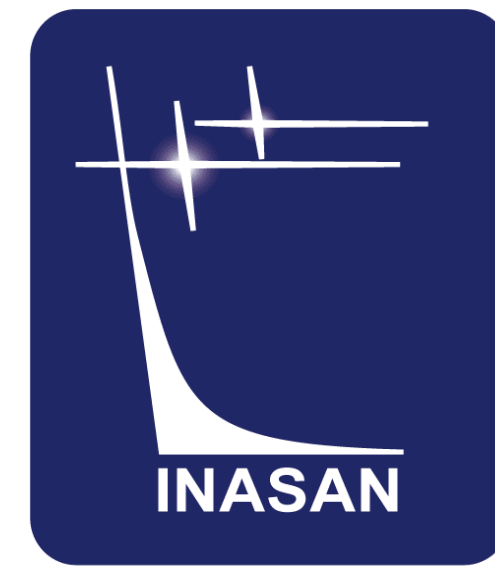


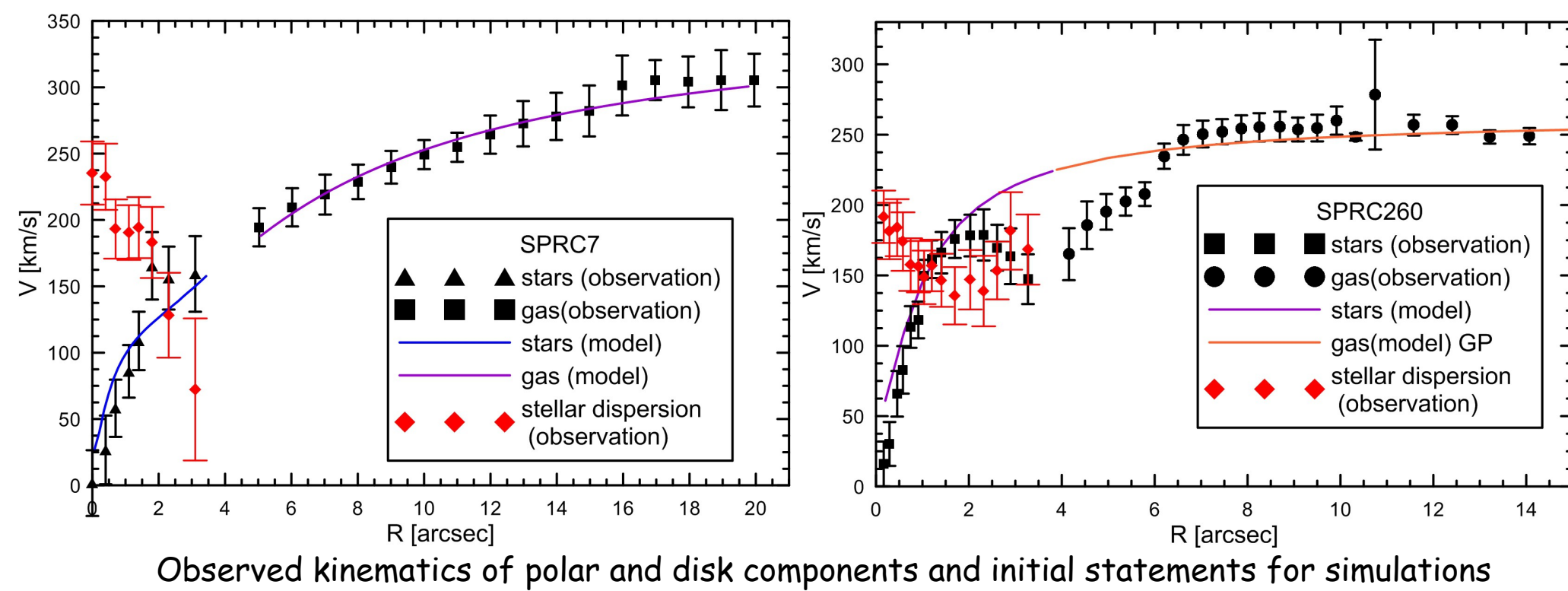
POLAR RINGS DYNAMICS IN TRIAXIAL DM HALO

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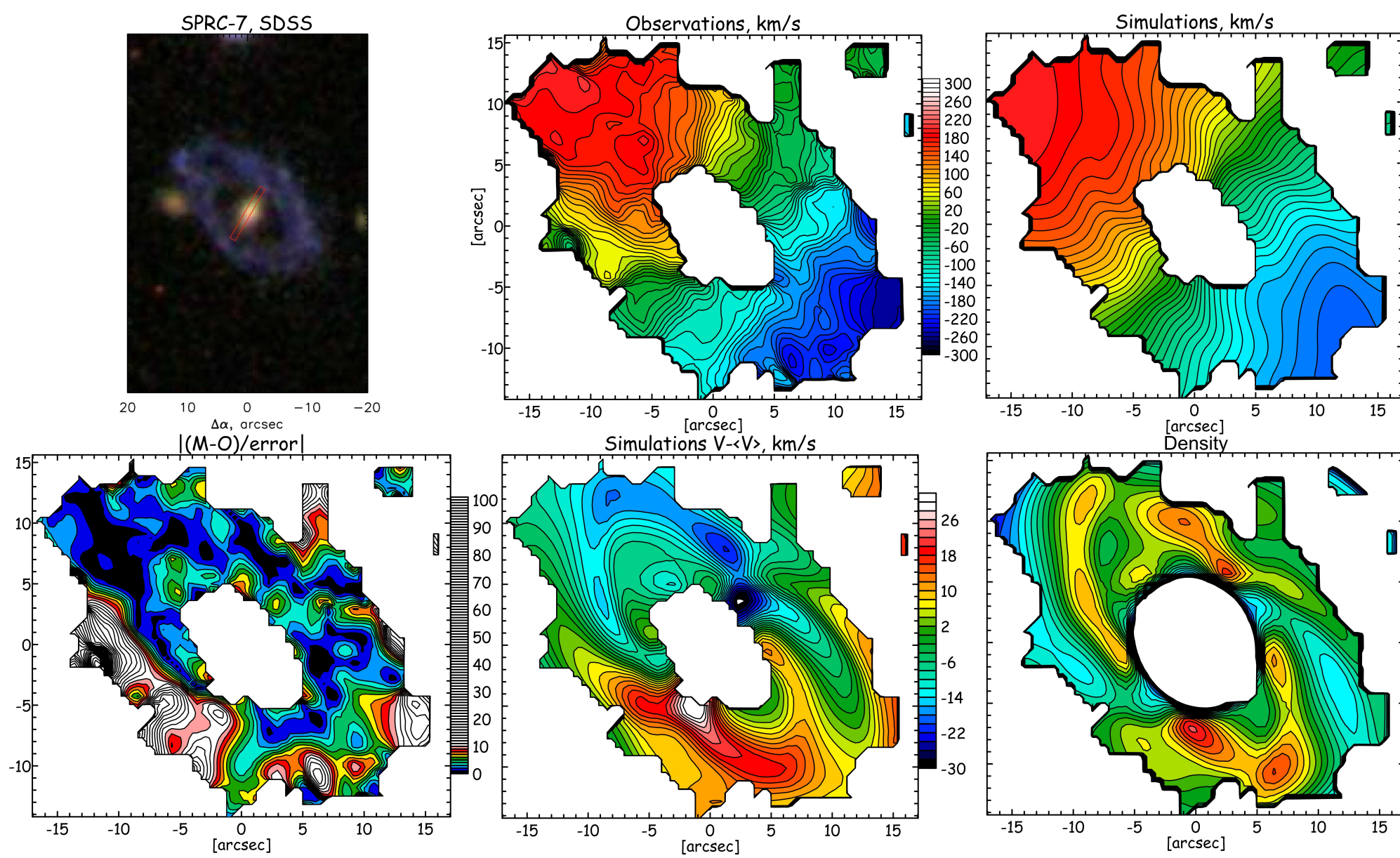


INTRODUCTION: Polar ring galaxies (PRG) are powerful tool for investigation of the DM distribution in galaxies. Using 3D hydrodynamic calculations we simulate dynamics and evolution of polar component in the potential of the galaxy disk and DM halo. We analyzed kinematics of stellar component of the central SO galaxies as well as the ionized gas kinematics in the external ring structures of two galaxies.

OBSERVATIONS: Spectroscopic observations from 6-m telescope of the Russian Academy of Sciences are used to study of two polar rings galaxies from the catalogue [Moiseev+ 2011, MNRAS,418,244]: SPRC-7 and SPRC-260. SPRC-7 is the inclined system with relative angle 70° towards to central galaxy, meanwhile SPRC-260 is classic polar case with $i=89^\circ$.

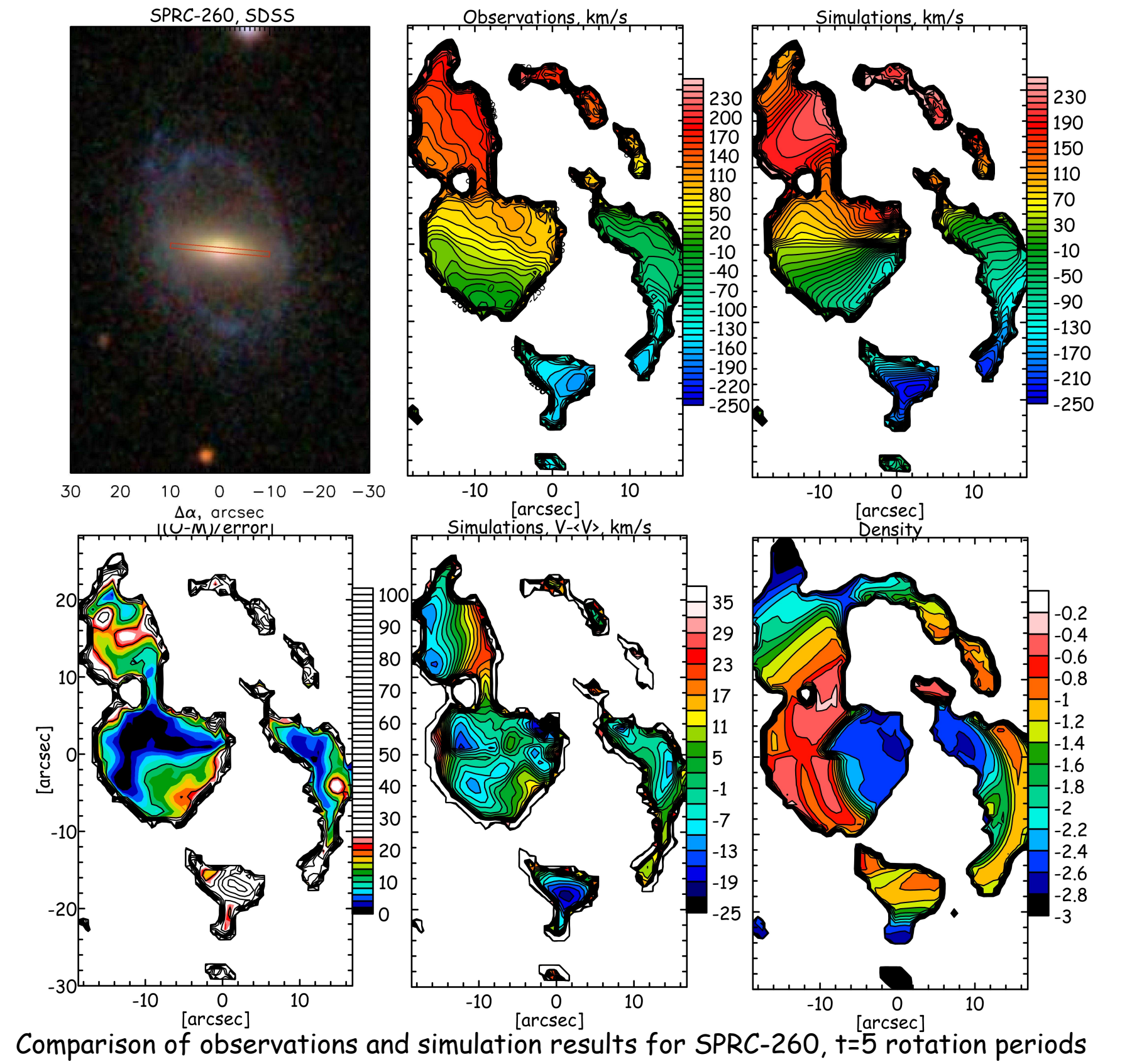


SIMULATIONS: In our simulations we solve 3D hydrodynamical equations in cylindrical coordinates neglecting selfgravitation of gas. Ring plane we orientated in plane $r, \phi, z=0$. External potential consists of isothermal DM halo and contribution from the flattened SO galaxy. Observed 2D velocity fields are compared with the model predictions for different dark halo shape. We build χ^2 distribution for observed and simulated (for different halo shape parameters $q=a/b, s=c/b$) velocity field of polar gaseous component and another distribution for another distribution for central galaxy kinematics. Numerical simulations were made on supercomputers of NIVC MSU "Lomonosov" and "Chebyshev"

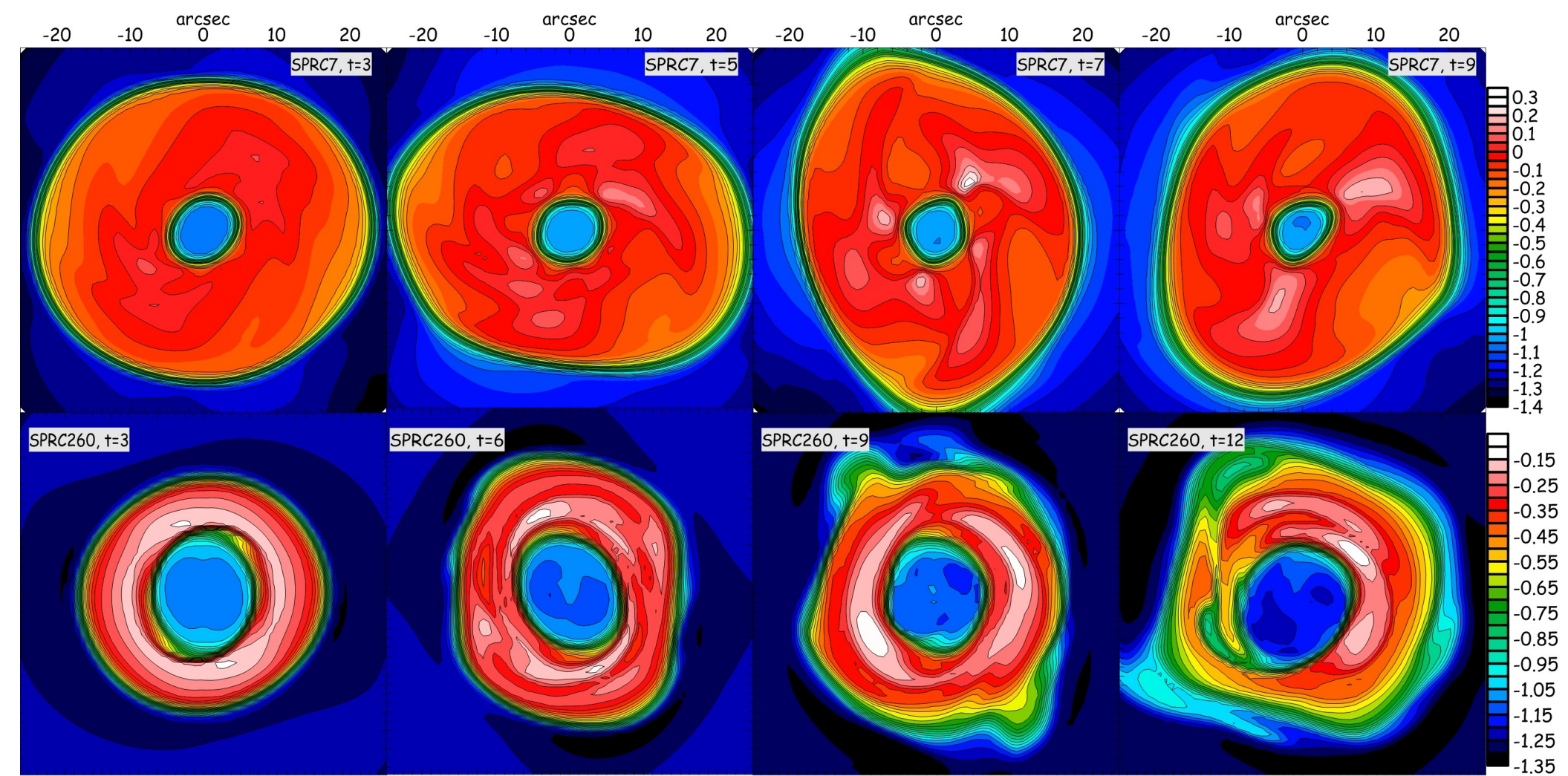


Comparison of observations and simulation results for SPRC-7, $t=5$ rotation periods

Simulated velocity field (M) agreed in common with observations (O). Relative derivation $(M-O)/(\text{error})$ is rather small in the whole region (<10), among south-west part where it's about 50-100. This part may be associated with bending of polar ring. Relative velocity perturbation correlate with features in spacial density distribution.

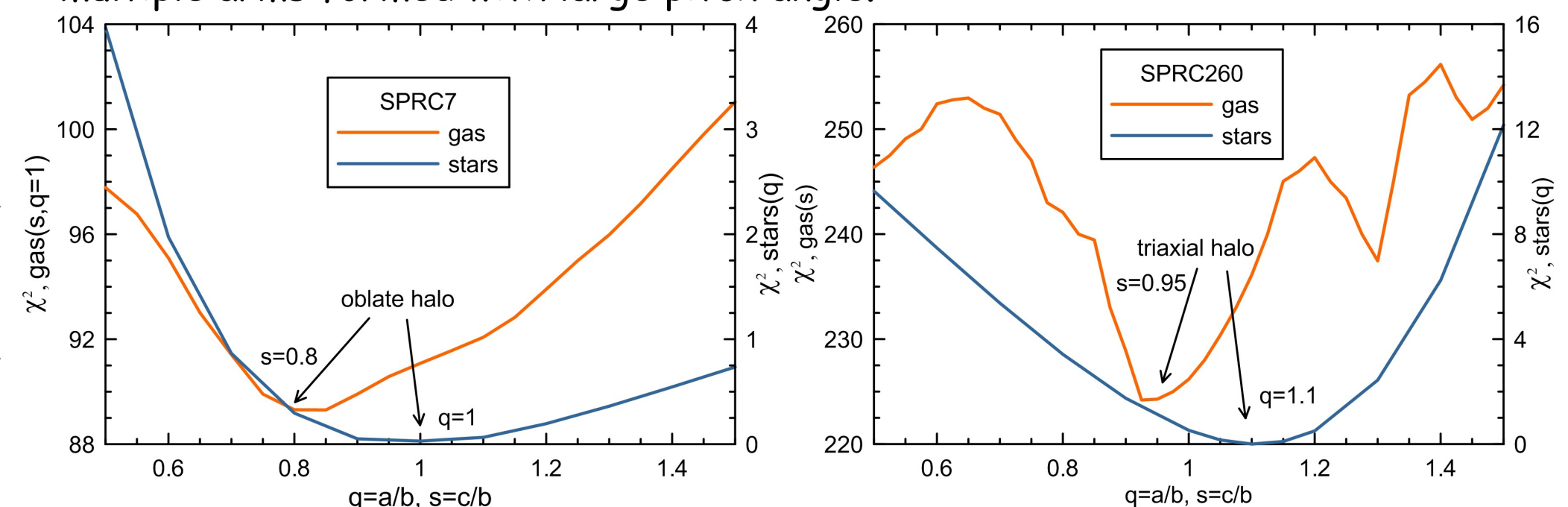


Comparison of observations and simulation results for SPRC-260, $t=5$ rotation periods



Time-dependent evolution of gas density in polar plane for SPRC-7 and SPRC-260, $\Delta t = 1$ is rotation period

We show that the polar component is dynamically stable on the scale of ~ 10 dynamical times (about few Gyr). For SPRC260 there is a 2-arms tightly wound spirals structure formation, which transforms to lopsided system. For SPRC7 multiple arms formed with large pitch angle.



Time-averaged ($t=5-10$) χ^2 distribution for stellar and gaseous kinematics

Best fits (minima of χ^2 distributions) pointed out oblate character of DM halo density distribution in polar plane for both galaxies: SPRC7 — $s = 0.8$, SPRC260 — $s=0.95$.

CONCLUSION: Comparing of models and observations of PRG let us to conclude that, in assumption of polar components stability the most favourable halo shape is oblate.