

Ispitivanje modela formiranja lentikularnih galaksija

Lentikularne galaksije predstavljaju morfološki tip galaksija koje pored veoma izraženog centralnog ovala karakteriše sočivast oblik i struktura diska bez vidljivih odlika spiralnih grana. U ovom radu ispitan je kanal formiranja lentikularnih galaksija putem interakcije spiralnih galaksija sa manje masivnim objektima. Spiralne galaksije predstavljene su preko haloa tamne materije dobijenih iz kosmoloških simulacija, nakon čega je kroz ispitivanje evolucije tih haloa testirano koliko od njih ispunjava uslove koji ukazuju na pomenuti model formiranja lentikularnih galaksija. Definisani uslovi koje halo tamne materije treba da ispunjavaju da bi bili obeleženi kao nosioci lentikularnih galaksija su: da budu odgovarajuće mase ($5 \cdot 10^{11} M_{\text{Sun}} < M < 5 \cdot 10^{11} M_{\text{Sun}}$), da populišu guste sredine – grupe i jata galaksija (ukupna masa $> 10^{13} M_{\text{Sun}}$), da nisu tokom evolucije imali velike sudare, ali da su imali bar jedan mali sudar (interakcija haloa u kojoj je odnos masa < 0.3). Na osnovu ovih uslova napravljen je uzorak sa kandidatima, koji je upoređen sa uzorkom iz posmatračkih kataloga lentikularnih galaksija koje populišu slične sredine. Rezultat ukazuje da ovaj kanal formiranja nije dovoljan da sam objasni broj posmatranih lentikularnih galaksija u jatima galaksija. Za dalje razmatranje neophodno je detaljnije ispitivanje prostora parametara (kroz individualne simulacije) i numeričkih ograničenja (masa čestica, broj haloa na raspolaganju, veličina simuliranog prostora, itd.) vezanih za ovu metodu.

Examining a Possible Channel of Lenticular Galaxies Formation

Lenticular galaxies are a morphological type of galaxies whose bulge is quite pronounced and which have lenticular shape, but still have recognizable disc structure without any distinct spiral characteristics. In this paper one of the possible channels for the formation of lenticular galaxies is examined – formation by the interaction of spiral galaxies with less massive objects. Spiral galaxies throughout this work are represented and examined through their dark matter halos which are derived from cosmological simulation, after which their evolution is tracked and tested for a fraction of them which fulfill the conditions indicated by the discussed channel of formation. The defined conditions through this channel for dark matter host candidates of lenticular galaxies are: appropriate mass of halo ($5 \cdot 10^{11} M_{\text{Sun}} < M < 5 \cdot 10^{11} M_{\text{Sun}}$), that they populate denser environments – groups and clusters of galaxies (total mass $> 10^{13} M_{\text{Sun}}$), that they had no major mergers throughout their history, but that they had at least one minor merger (interaction where the involved dark matter halos mass ratio < 0.3). Based on those conditions candidates were selected and compared to the lenticular galaxy number density from observational catalogs that populate similar environments. Results show that this channel of formation is not sufficient to explain by itself the number density of observed lenticular galaxies in clusters of galaxies. For future analysis of this method further testing of parameter space (through individual galaxy simulations) and numerical limitations (mass of particles, number of halos involved, size of simulation space, etc.) are necessary.

Milesa Blagojević (1995), Smederevo, Slobode 3, učenica 4. razreda Gimnazije Smederevo

*MENTOR:
Nemanja Martinović, Astronomska
opservatorija Beograd*