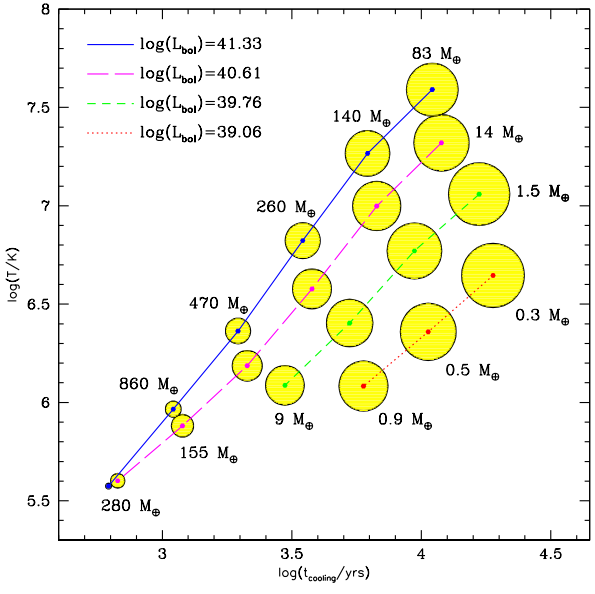
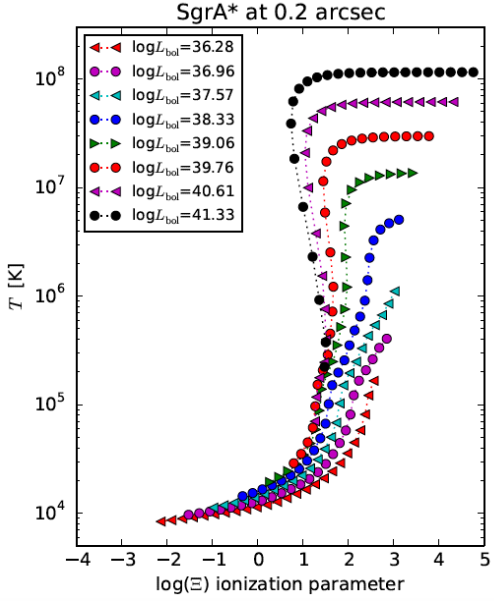
Multi-phase environment of compact galactic nuclei: the role of the Nuclear Star Cluster

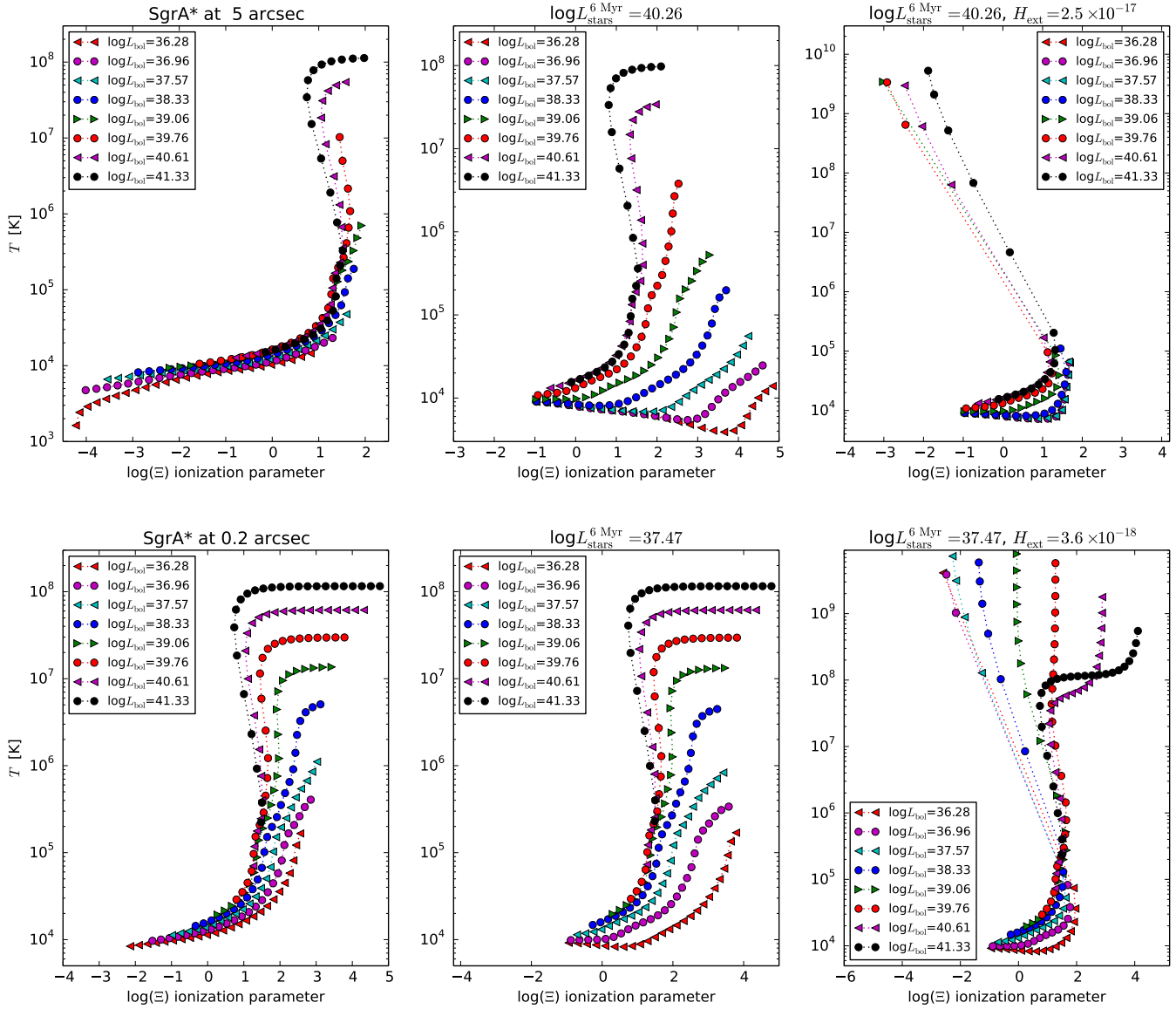
Agata Różańska[1], D. Kunneriath[2], B. Czerny[3], V. Karas[2], Tek P. Adhikari[1]

[1] CAMK PAN, Warsaw, Poland, [2] Astronomical Institute, Ac. of S, Prague, Czech Republic, [3] Center for Theoretical Physics PAS, Warsaw, Poland

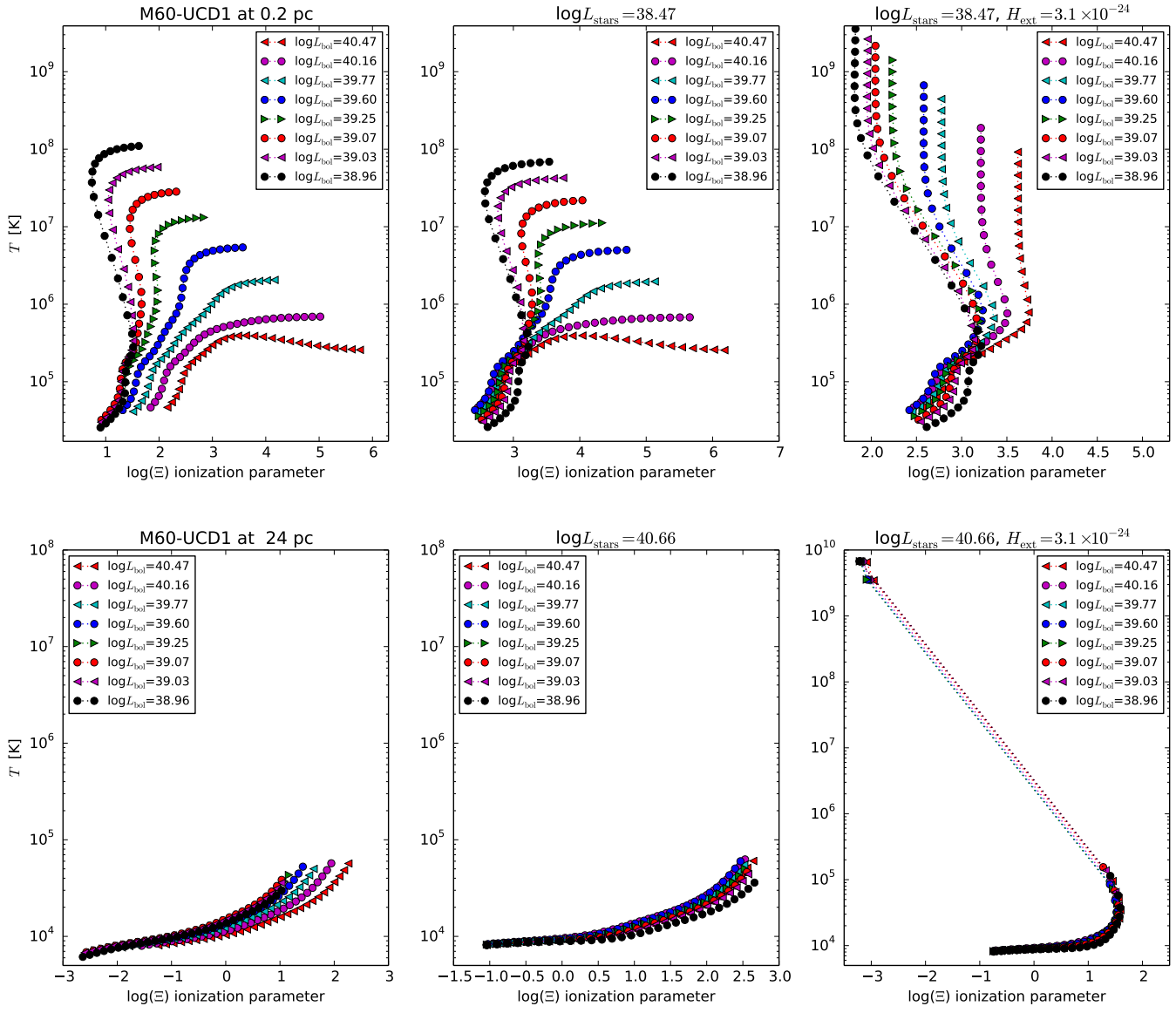




Sgr A*, Nuclear Star Cluster (NSC), 6 Myr



M60-UCD1, NSC up to 24 pc, 13 Gyr



The role of NSC in systems with SMBH

- Thermal Instability (TI) develops, it can help cold clumps to survive in hot medium and accrates on SMBH
- Sgr A* is the best resolved example of a galactic nuclei with a NSC, TI operates under suitable conditions.
- Cold clouds can remain within the hot medium for $\sim 10^4$ yr
- Ultra-Compact Dwarf galaxy UCD1 near M60 - prototypical system with a small half-light radius and large mass-to-light ratio
- Mechanical heating by stellar winds is not as intense as in Sgr A* and we expect spontaneous formation of cold clouds in the inner part of the galaxy, close to the stagnation radius since the cooling timescales are shorter than the outflow/inflow timescales $\sim 10^7$ yr
- The complete non-stationary picture of the multi-phase medium can be obtained 3D time dependent simulations.

The role of NSC in systems with SMBH

- Thermal Instability (TI) develops, it can help cold clumps to survive in hot medium and accrates on SMBH
- Sgr A* is the best resolved example of a galactic nuclei with a NSC, TI operates under suitable conditions.
- Cold clouds can remain within the hot medium for $\sim 10^4$ yr
- Ultra-Compact Dwarf galaxy UCD1 near M60 - prototypical system with a small half-light radius and large mass-to-light ratio
- Mechanical heating by stellar winds is not as intense as in Sgr A* and we expect spontaneous formation of cold clouds in the inner part of the galaxy, close to the stagnation radius since the cooling timescales are shorter than the outflow/inflow timescales $\sim 10^7$ yr
- The complete non-stationary picture of the multi-phase medium can be obtained 3D time dependent simulations.

The role of NSC in systems with SMBH

- Thermal Instability (TI) develops, it can help cold clumps to survive in hot medium and accrates on SMBH
- Sgr A* is the best resolved example of a galactic nuclei with a NSC, TI operates under suitable conditions.
- Cold clouds can remain within the hot medium for $\sim 10^4$ yr
- Ultra-Compact Dwarf galaxy UCD1 near M60 - prototypical system with a small half-light radius and large mass-to-light ratio
- Mechanical heating by stellar winds is not as intense as in Sgr A* and we expect spontaneous formation of cold clouds in the inner part of the galaxy, close to the stagnation radius since the cooling timescales are shorter than the outflow/inflow timescales $\sim 10^7$ yr
- The complete non-stationary picture of the multi-phase medium can be obtained 3D time dependent simulations.

The role of NSC in systems with SMBH

- Thermal Instability (TI) develops, it can help cold clumps to survive in hot medium and accrates on SMBH
- Sgr A* is the best resolved example of a galactic nuclei with a NSC, TI operates under suitable conditions.
- Cold clouds can remain within the hot medium for $\sim 10^4$ yr
- Ultra-Compact Dwarf galaxy UCD1 near M60 - prototypical system with a small half-light radius and large mass-to-light ratio
- Mechanical heating by stellar winds is not as intense as in Sgr A* and we expect spontaneous formation of cold clouds in the inner part of the galaxy, close to the stagnation radius since the cooling timescales are shorter than the outflow/inflow timescales $\sim 10^7$ yr
- The complete non-stationary picture of the multi-phase medium can be obtained 3D time dependent simulations.

The role of NSC in systems with SMBH

- Thermal Instability (TI) develops, it can help cold clumps to survive in hot medium and accrates on SMBH
- Sgr A* is the best resolved example of a galactic nuclei with a NSC, TI operates under suitable conditions.
- Cold clouds can remain within the hot medium for $\sim 10^4$ yr
- Ultra-Compact Dwarf galaxy UCD1 near M60 - prototypical system with a small half-light radius and large mass-to-light ratio
- Mechanical heating by stellar winds is not as intense as in Sgr A* and we expect spontaneous formation of cold clouds in the inner part of the galaxy, close to the stagnation radius since the cooling timescales are shorter than the outflow/inflow timescales $\sim 10^7$ yr
- The complete non-stationary picture of the multi-phase medium can be obtained 3D time dependent simulations.

The role of NSC in systems with SMBH

- Thermal Instability (TI) develops, it can help cold clumps to survive in hot medium and accrates on SMBH
- Sgr A* is the best resolved example of a galactic nuclei with a NSC, TI operates under suitable conditions.
- Cold clouds can remain within the hot medium for $\sim 10^4$ yr
- Ultra-Compact Dwarf galaxy UCD1 near M60 - prototypical system with a small half-light radius and large mass-to-light ratio
- Mechanical heating by stellar winds is not as intense as in Sgr A* and we expect spontaneous formation of cold clouds in the inner part of the galaxy, close to the stagnation radius since the cooling timescales are shorter than the outflow/inflow timescales $\sim 10^7$ yr
- The complete non-stationary picture of the multi-phase medium can be obtained 3D time dependent simulations.