

GRRMHD simulation of sub-Eddington accretion discs

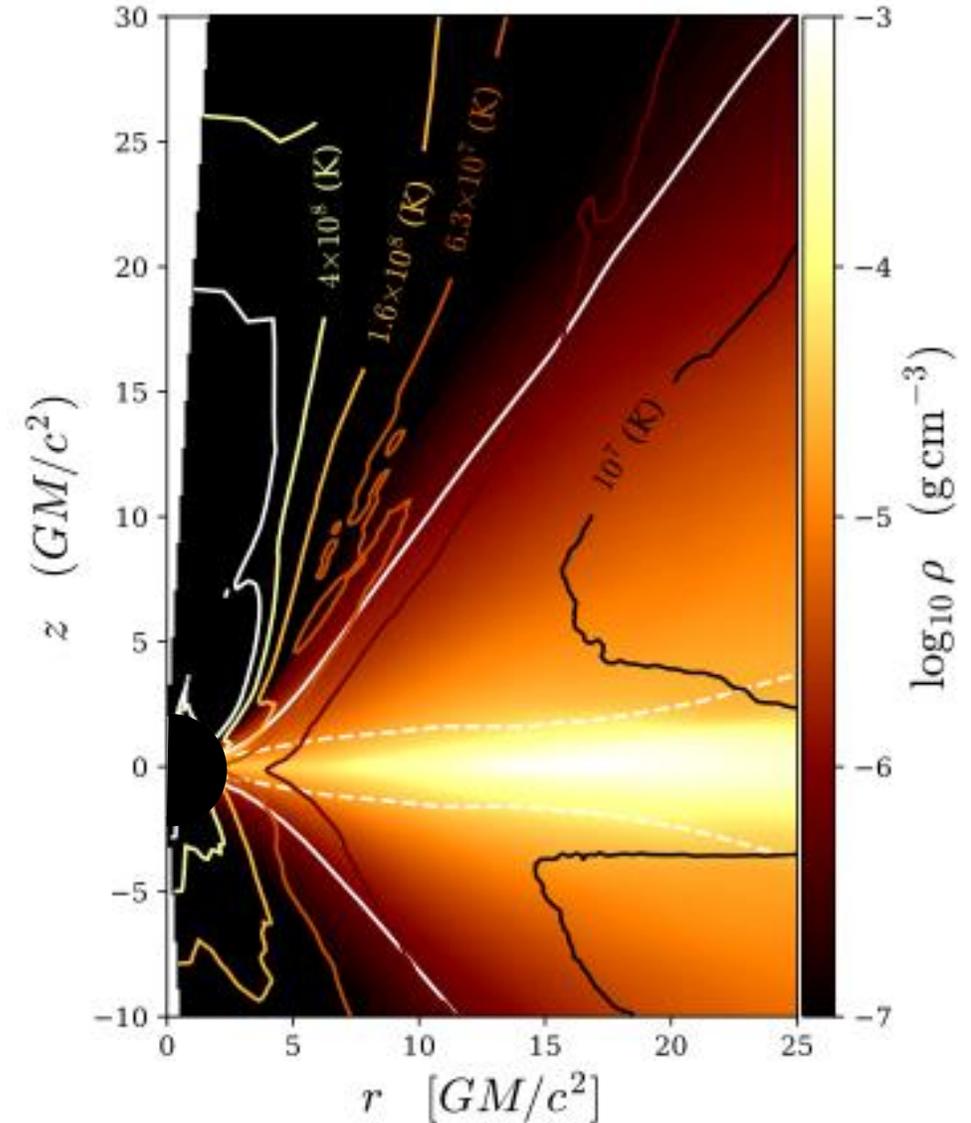
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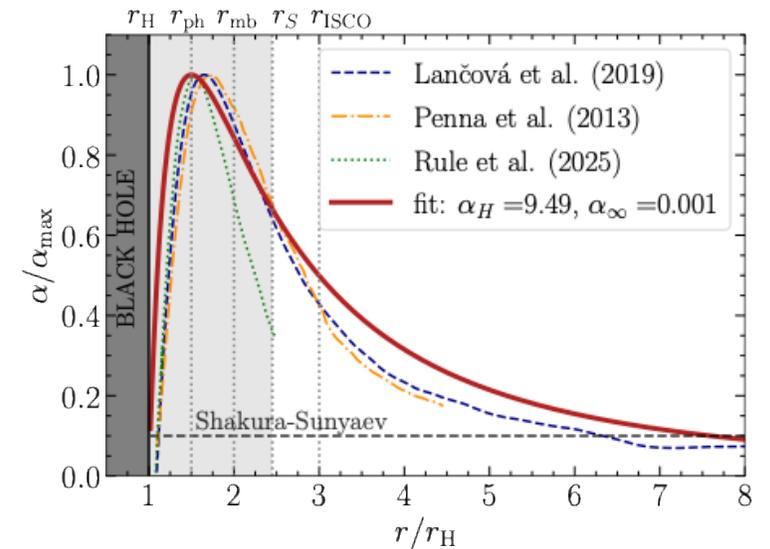
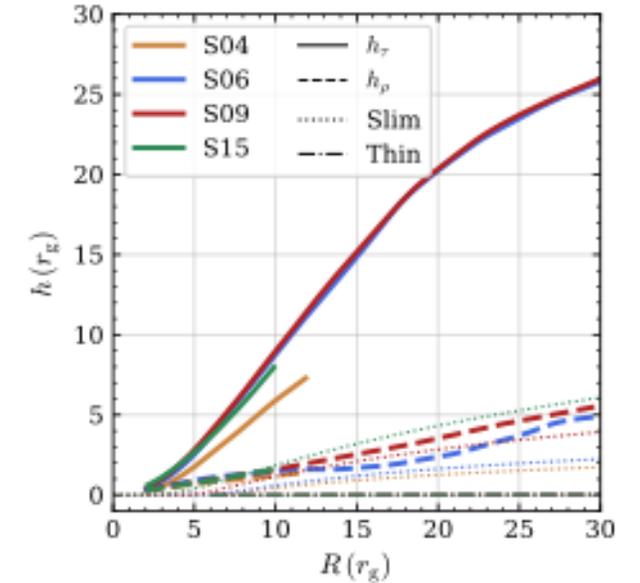
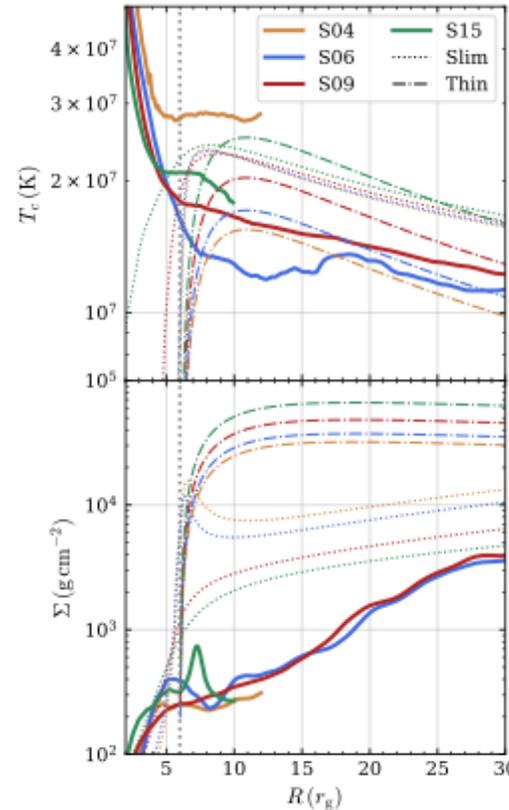
The puffy disc

- Sub-Eddington, radiation-pressure dominated (mass accretion rate in range 0.4-1.5 of Eddington limit)
- Stabilised by magnetic pressure
- Geometrically thick photosphere
- Stellar mass non-rotating black hole
- High soft state of microquasars
- Very different from analytical models
- Lančová+2019, 2023; Wielgus+2022;



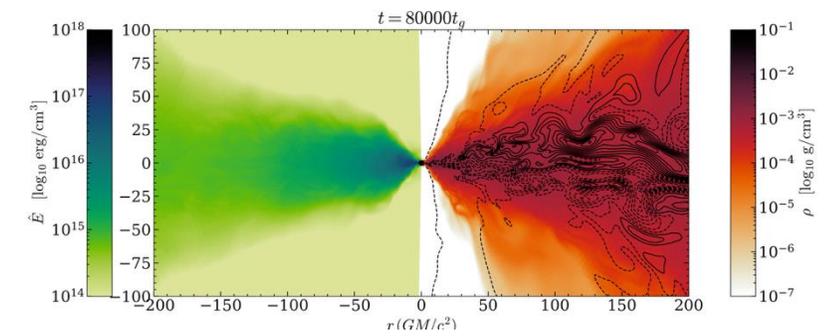
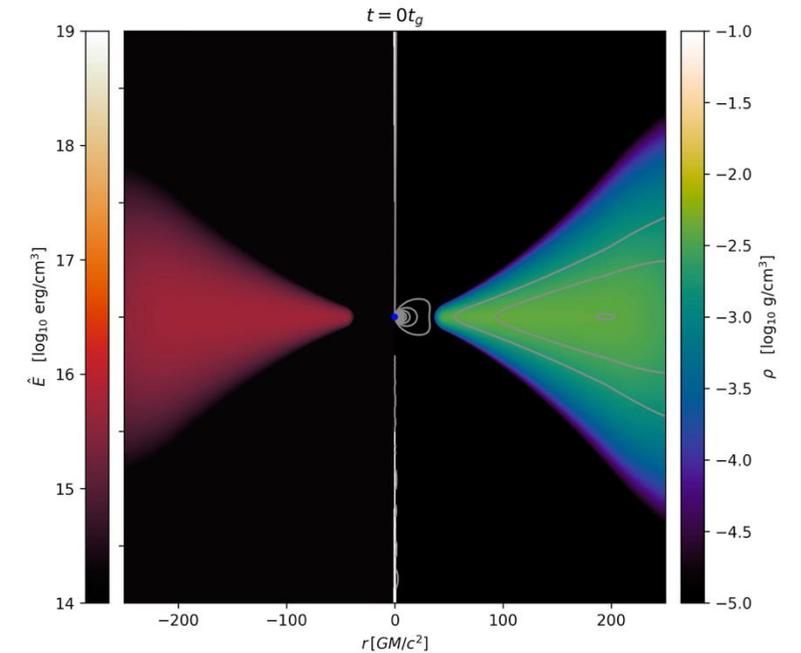
Puffy vs analytical models

- Observable surface at almost 45°
- Inner edge located under the ISCO
- Lower surface density (magnetic pressure)
- Lower central temperature (strong advection cooling)
- Universal behaviour of viscous α in simulations
- Lančová+ in prep., Abramowicz+ in prep.

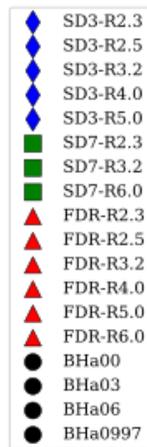
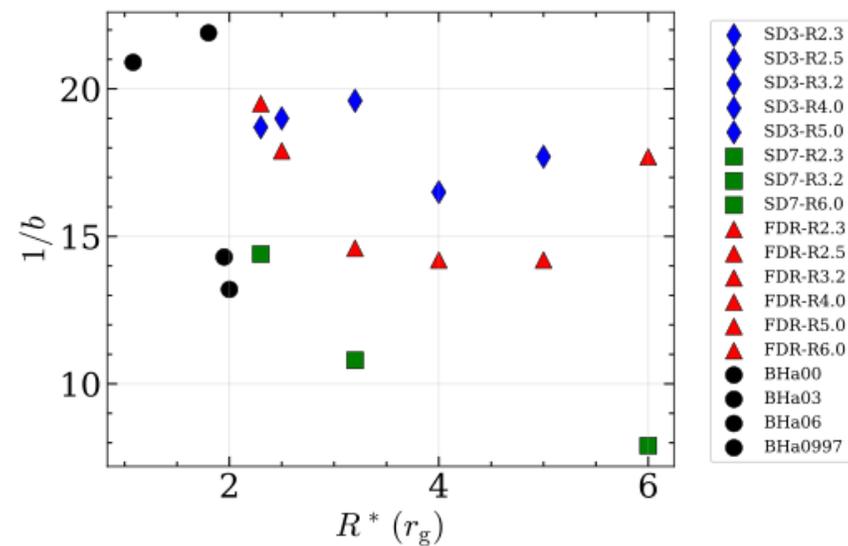
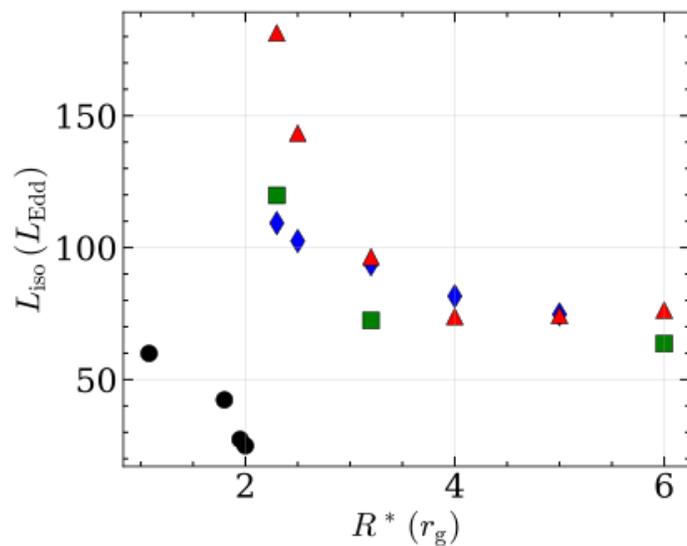
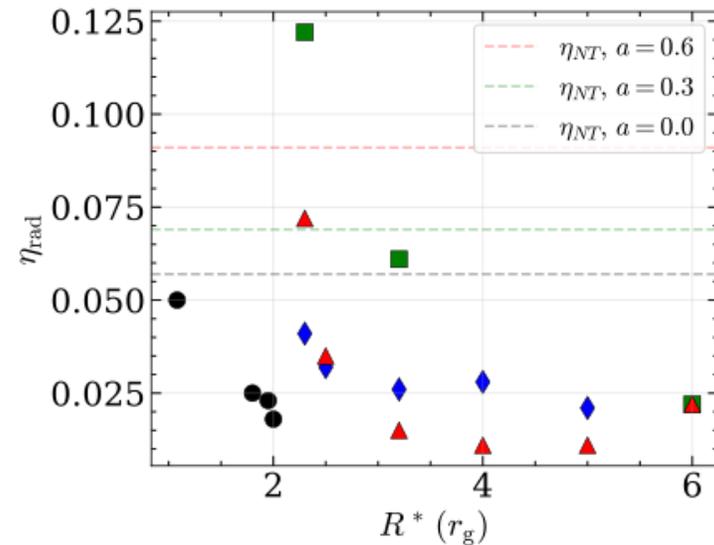
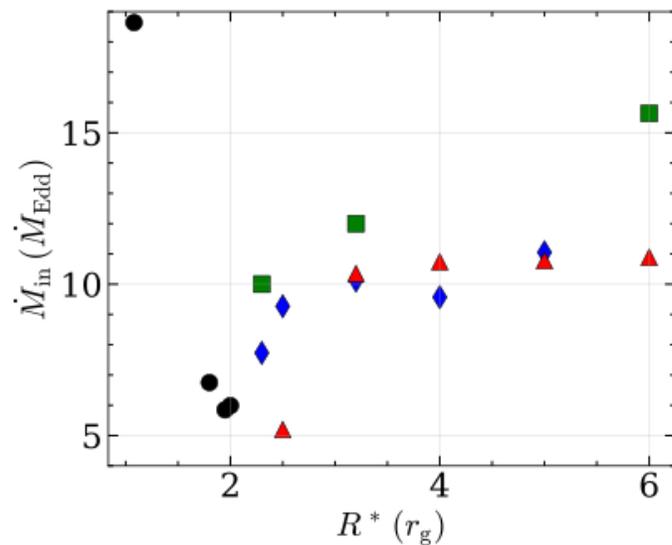


Accretion on a compact star and black hole

- Accretion on a compact star with dipolar magnetic field
- Varying compactness and surface magnetic field strength
- Comparison to BH accretion with increasing spin
- Kayanikhoo+ in prep.



Simulation	R^* (r_g)	r_{DP} (r_g)	B^* (10^{10} G)	B (r_{DP}) (10^{10} G)
SD3-R2.3 ¹	2.3	R^*	3	3
SD3-R2.5	2.5	R^*	3	3
SD3-R3.2	3.2	R^*	3	3
SD3-R4.0	4.0	R^*	3	3
SD3-R5.0	5.0	R^*	3	3
SD7-R2.3 ¹	2.3	R^*	7	7
SD7-R3.2	3.2	R^*	7	7
SD7-R6.0	6.0	R^*	7	7
FDR-R2.3 ¹	2.3	6	36	2
FDR-R2.5	2.5	6	28	2
FDR-R3.2	3.2	6	13	2
FDR-R4.0	4.0	6	6.8	2
FDR-R5.0	5.0	6	3.5	2
FDR-R6.0	6.0	6	2.	2
BHa00	2.0^2	–	–	–
BHa03	1.95^2	–	–	–
BHa06	1.80^2	–	–	–
BHa0997	1.08^2	–	–	–



Thank you for your
attention!

