1 Bondi Hoyle

Bondi & Hoyle (1944); The rate of accretion can be give as::

$$\dot{M} = \frac{4\pi G^2 M^2 \rho_\infty}{v^3} \tag{1}$$

2 What's the difference, ("If Any!!") between Proto-stellar disks & AGN disks ???!!!!

Table 1: What are the similiarties and differences between Proto-stellar and AGN accretion disks?

	Proto-stellar disks	AGN disks
h/r	~ 0.1	
Adiabatic/isothermal?	Mainly adiabatic	
B-field strength	Interesting issue. Thought to be sensitive to MRI at later stages at least. However, there are some arguing that global magnetic fields may play a key in transporting angular momentum away.	
Mechamism(s) for turbulence generation	Self-gravity at early times, MRI later	
Dust chemistry	Certainly many people working on chemistry in these discs	
Dust opacity	Regarded as important for cooling	
Iron present?	Yes, and regarded as having, initially at least, an ISM composition.	

3 ADAFs, RIAFs, etcs.

4 ADAFs, RIAFs, etcs.

see reviews by Quataert [2001]; Narayan [2005]; early versions of RIAF models were called advection-dominated accretion flows [ADAFs] or ion tori;

Table 2

Temperature (cf. Virial temperature)	COLD	HOT
geometry (h/R)	thin, $\lesssim 0.1$	thick, ~ 0.5
gas opacity	optically thick	optically thin ($\tau < 1$)
$\dot{M}$	generally high	low(er)
radiation pressure	negligible	non-negligible
radiative cooling	generally efficient	generally inefficient
angular velocity	generally Keplerian	sub-Keplerian
Outflows? Jets?	Yes? No.	Yes, Yes
Feedback mode	"Radiative/Wind/Tranistionn"	"Jet/Kinetic/Maintenances"
Named examples	"Slim"	advection dominated accretion flow (ADAF)
		(adiabatic inflow-outflow solution; ADIOS)
	Shakura-Sunyaev disk	(convection-dominated accretion flow; CDAF)
	(a.k.a "thin" + α)	radiatively inefficient accretion flow (RIAF)
		"luminous hot" (LHAF)
		SLE (Shaprio, Lightman, Eardley, 1976, ApJ, **204**, *187*)
Type of objects	quasars	Low-luminosity AGN (LLAGN)
		BHXBs in "Hard and Quiescent" state

$$T_{\rm vir} = \frac{\mu m_p}{2k_B} V_{\rm vir}^2 \simeq 3.6 \times 10^5 \left(\frac{V_{\rm vir}}{100\,{\rm km/s}} \right)^2 \qquad (2)$$

$$T(R) = \left\{ \frac{3GM\dot{M}}{8\pi R^3 \sigma} \left[1 - \frac{R}{R_*} \right]^{1/2} \right\}^{1/4} \tag{3}$$

$$= \left(\frac{3GM\dot{M}}{8\pi\sigma R_*^3} \right)^{1/4} \tag{4}$$

$$\approx 5 \times 10^5 \left(\frac{M}{10^8 M_\odot} \right)^{1/4} \left(\frac{\dot{M}}{10^{23} \mathrm{kg\,s^{-1}}} \right)^{1/4} \left(\frac{r}{r_g} \right)^{-3/4} \mathrm{K} \tag{5}$$

$$\tag{6}$$

with $T = T_*(R/R_*)^{-3/4}$ for $R \gg R_*$.

$$T(R) = \left(\frac{3GM\dot{M}}{8\pi\sigma R_*^3} \right)^{1/4} \tag{7}$$

$$\approx 5 \times 10^5 \left(\frac{M}{10^8 M_\odot} \right)^{1/4} \left(\frac{\dot{M}}{10^{23} \mathrm{kg\,s^{-1}}} \right)^{1/4} \left(\frac{r}{r_g} \right)^{-3/4} \mathrm{K} \tag{8}$$

$$\tag{9}$$

$$T(R) = \left(\frac{3GM\dot{M}}{8\pi\sigma R_*^3} \right)^{1/4} \tag{10}$$

$$\approx 5 \times 10^5 \left(\frac{M}{10^8 M_\odot} \right)^{1/4} \left(\frac{\dot{M}}{10^{23} \mathrm{kg\,s^{-1}}} \right)^{1/4} \left(\frac{r}{r_g} \right)^{-3/4} \mathrm{K} \tag{11}$$

$$\approx 5 \times 10^5 \left(\frac{M}{10^8 M_\odot} \right)^{1/4} \left(\frac{\dot{M}}{0.6 M_\odot \mathrm{yr}^{-1}} \right)^{1/4} \left(\frac{r}{r_g} \right)^{-3/4} \mathrm{K} \tag{12}$$

$$\sim 8 \times 10^5 \left(\frac{M}{10^8 M_\odot} \right)^{1/4} \left(\frac{\dot{M}}{M_\odot \mathrm{yr}^{-1}} \right)^{1/4} \left(\frac{r}{r_g} \right)^{-3/4} \mathrm{K}$$

$$T(R) = \left(\frac{3GM\dot{M}}{8\pi\sigma R_*^3} \right)^{1/4} \approx 5{\times}10^5 \left(\frac{M}{10^8 M_\odot} \right)^{1/4} \left(\frac{\dot{M}}{0.6 M_\odot \mathrm{yr}^{-1}} \right)^{1/4} \left(\frac{r}{r_g} \right)^{-3/4} \mathrm{K}$$

5 This, THIS, THIS!!!!

http://www.scholarpedia.org/article/Accretion_discs

References

Bondi H., Hoyle F., 1944, MNRAS, 104, 273