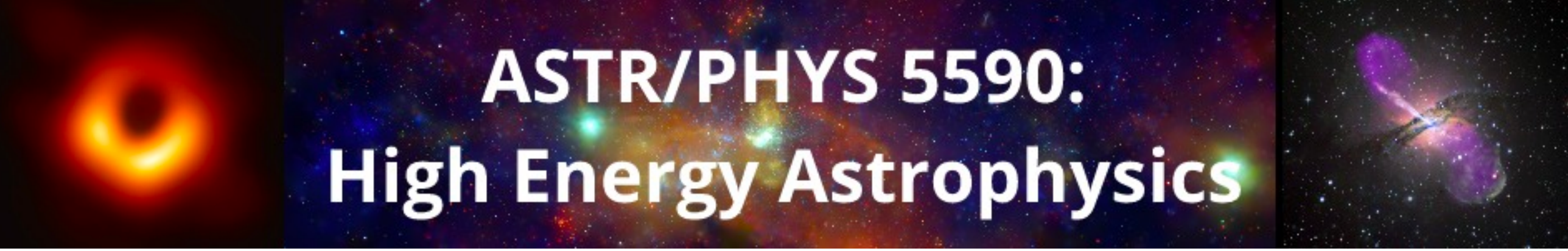


Week 14

HW 8 due *next* Thursday by 2pm (upload to Canvas)

<u>Project Reports</u>
Due April 24th at 3pm

Final exam last day of class: April 21st
Made available @2pm, due back by 4pm

Accretion & Binary Systems (Ch. 14) | SMBHs/AGNs & Particle Acceleration

Accretion Disks

Thin Disk

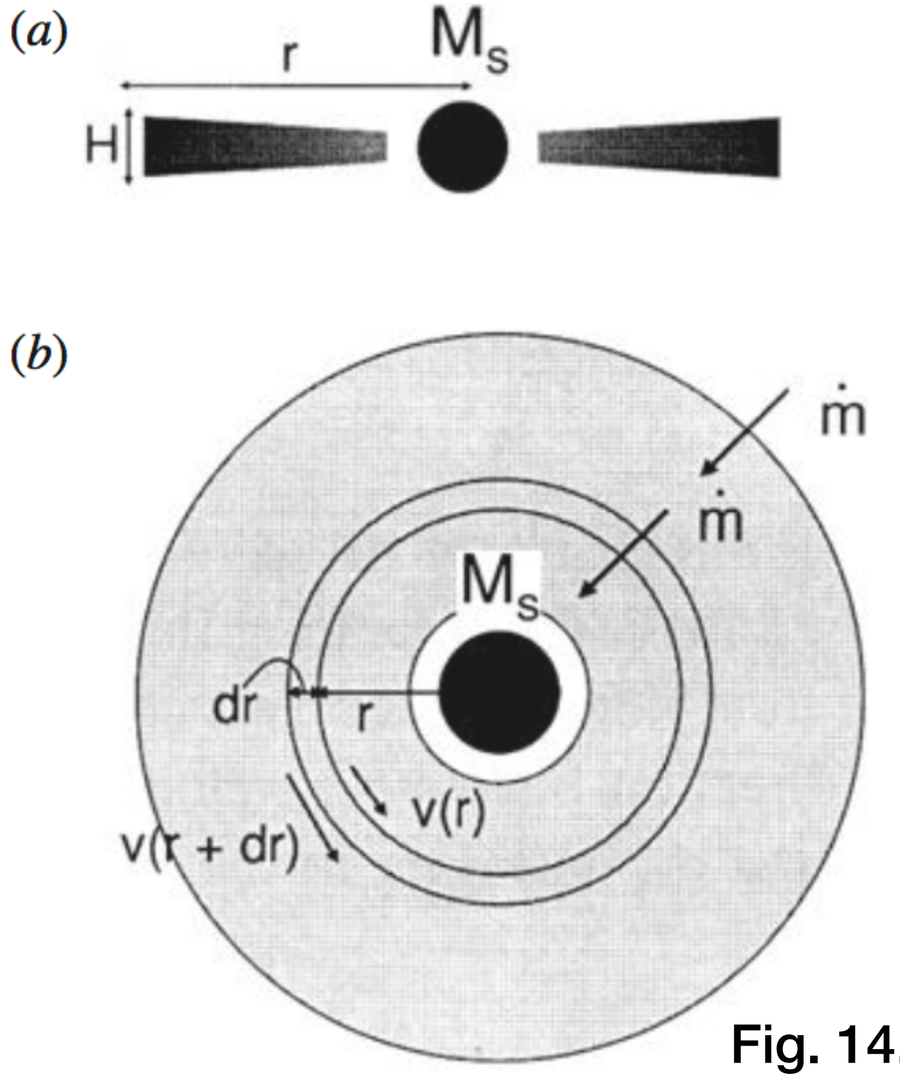


Fig. 14.6

Thick Disk

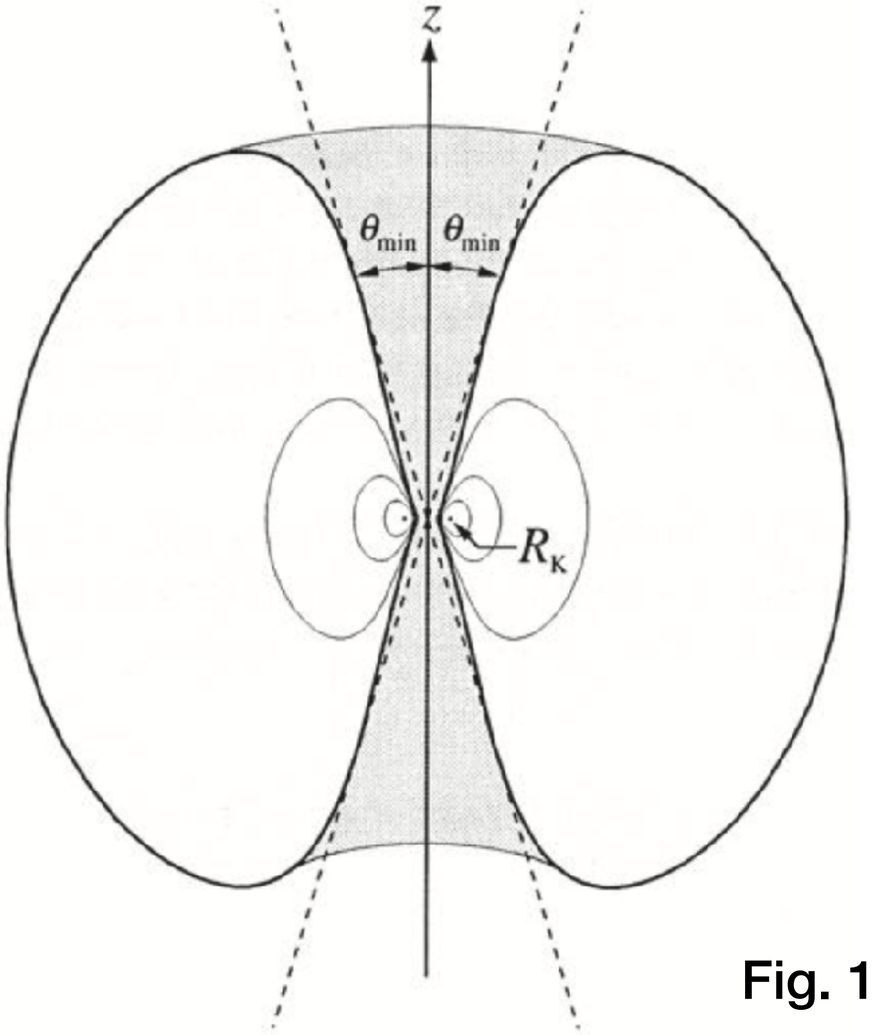
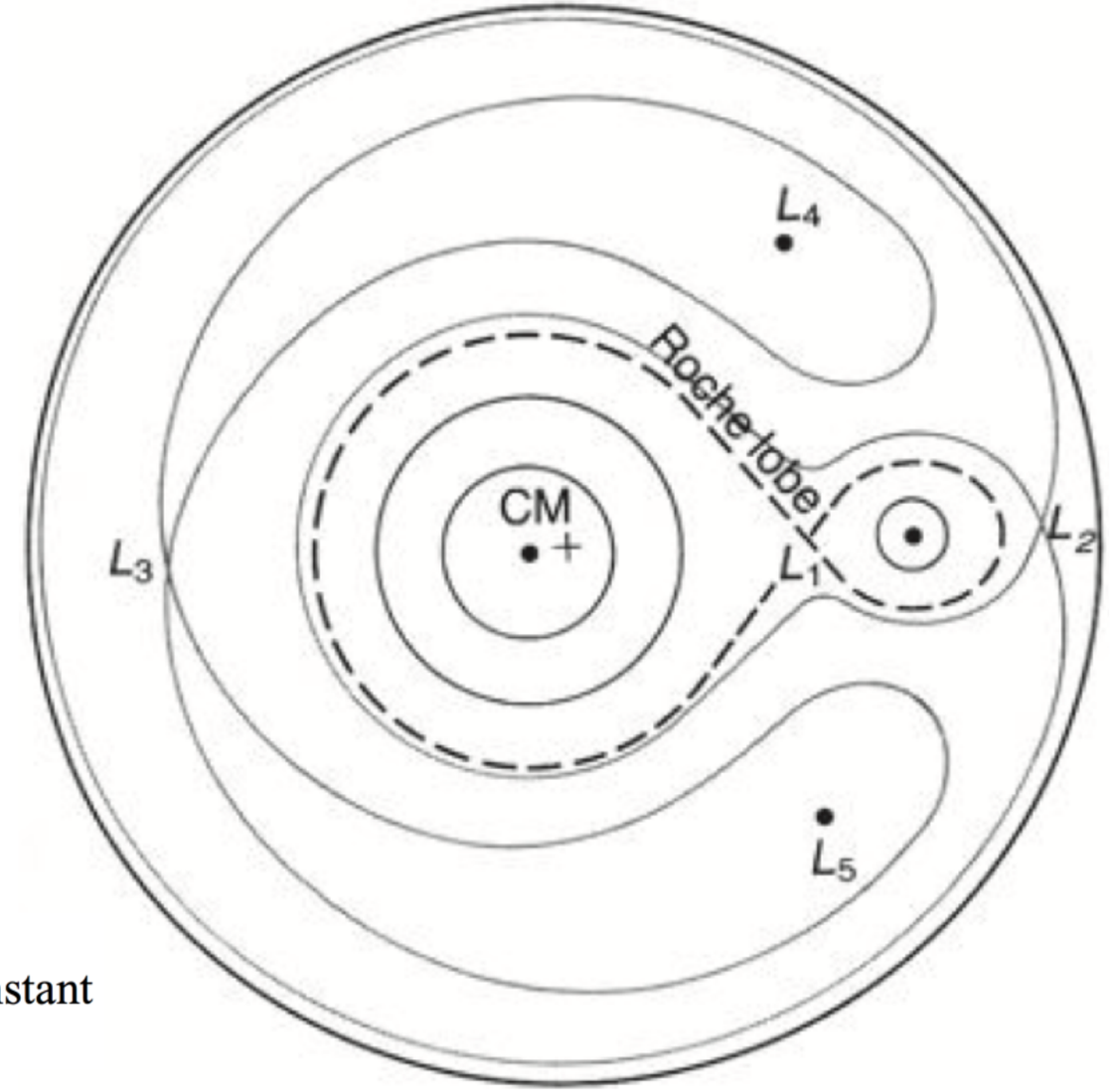


Fig. 14.10

Binary Accretion - the Roche lobe

L1-5: Lagrange points



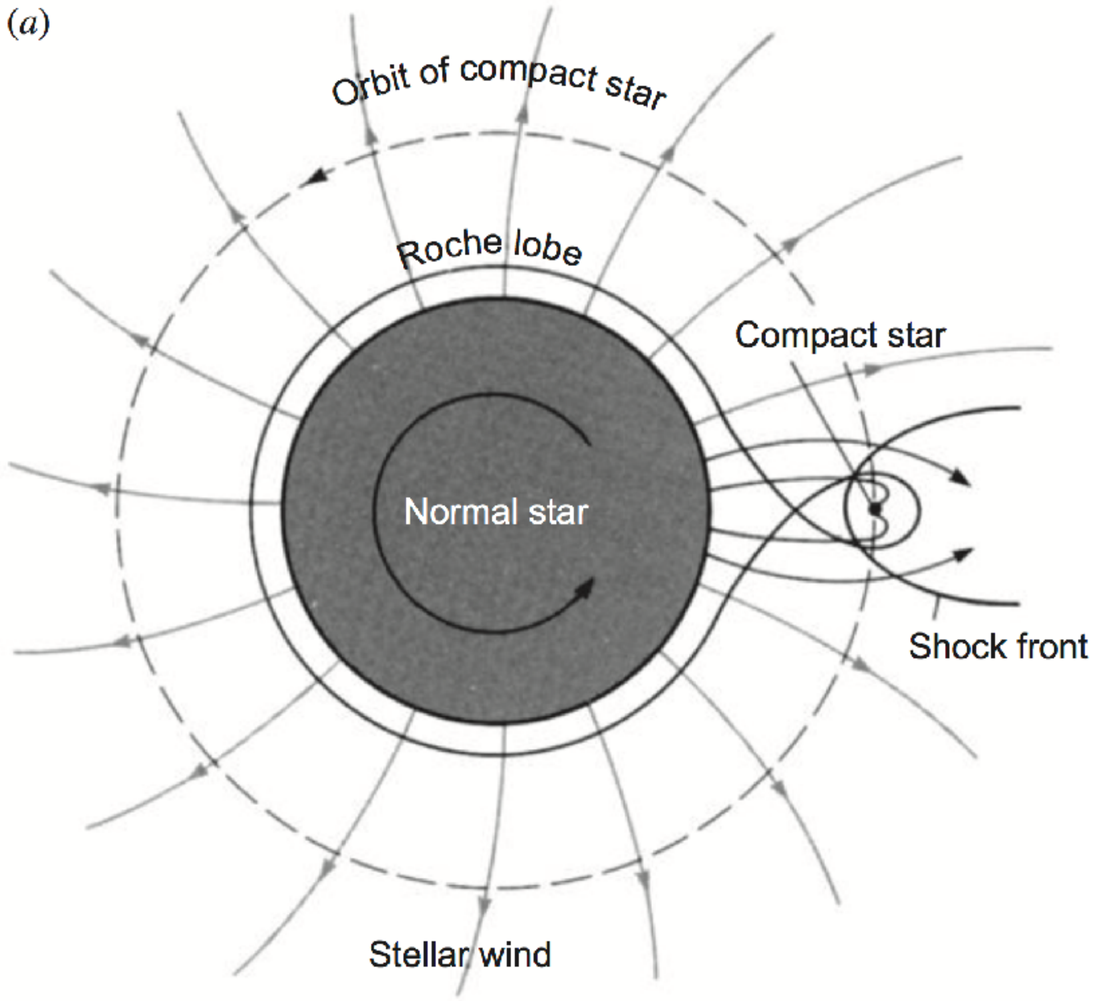
JWST /
eROSITA /
Athena orbits

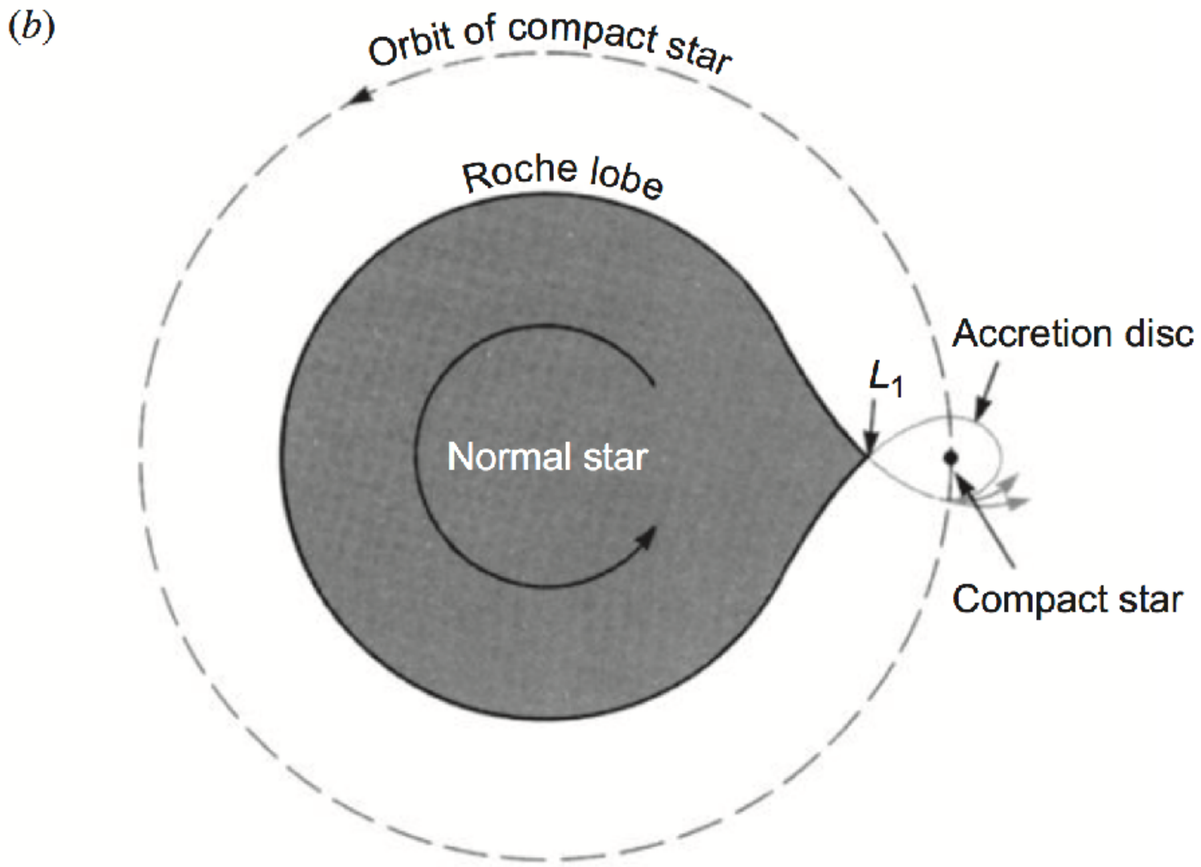
Lines reflect equipotential surfaces given by:

$$\phi = \frac{GM_1}{r_1} + \frac{GM_2}{r_2} - \Omega^2 r^2 = \text{constant}$$

Figure 14.11

2 Modes of Binary Accretion





Donor star OB type with mass loss ~10^{-5} M_{sun} /yr

Donor star evolves to red giant

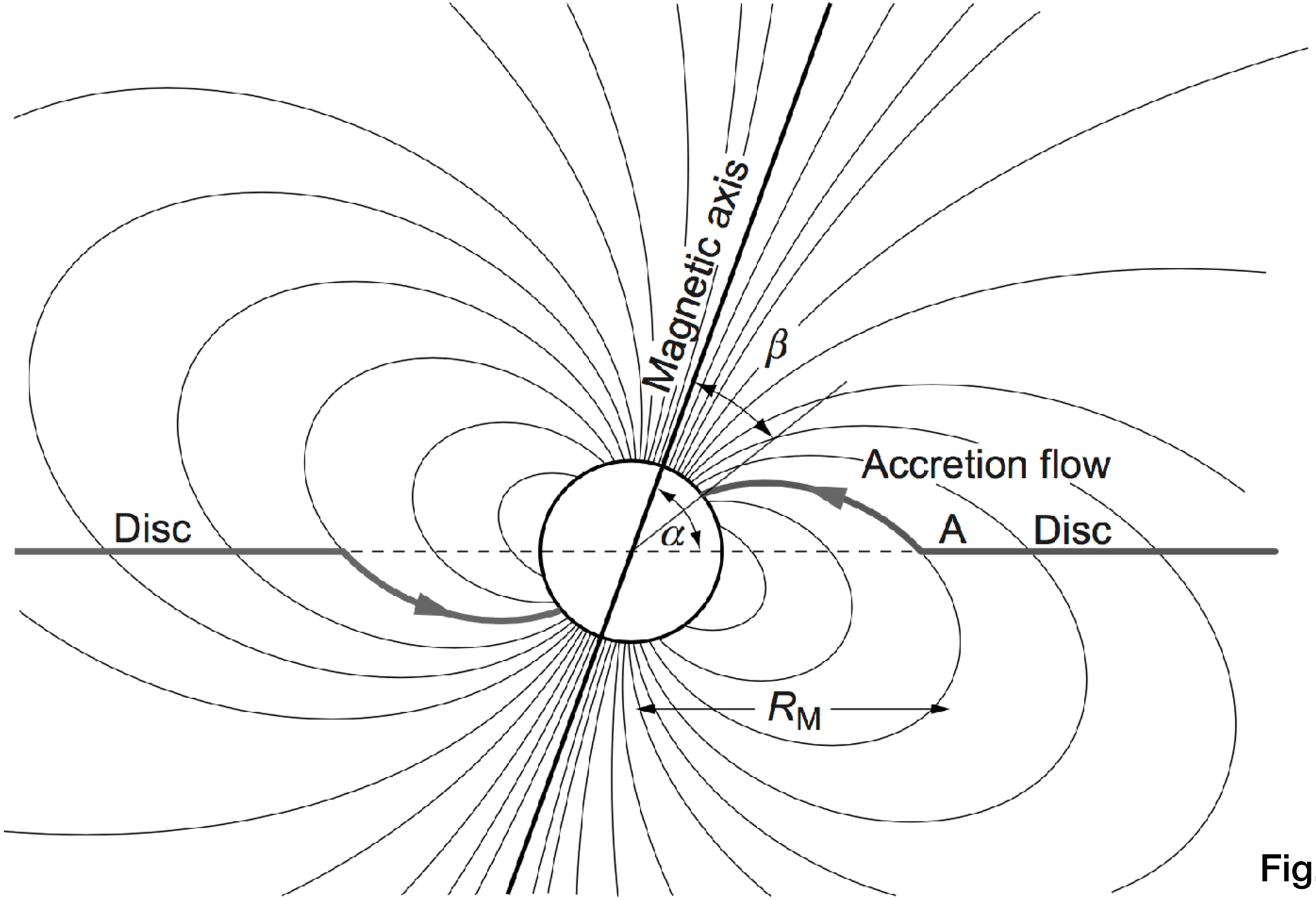


Fig. 14.14

Cataclysmic Variables

side view

top down view

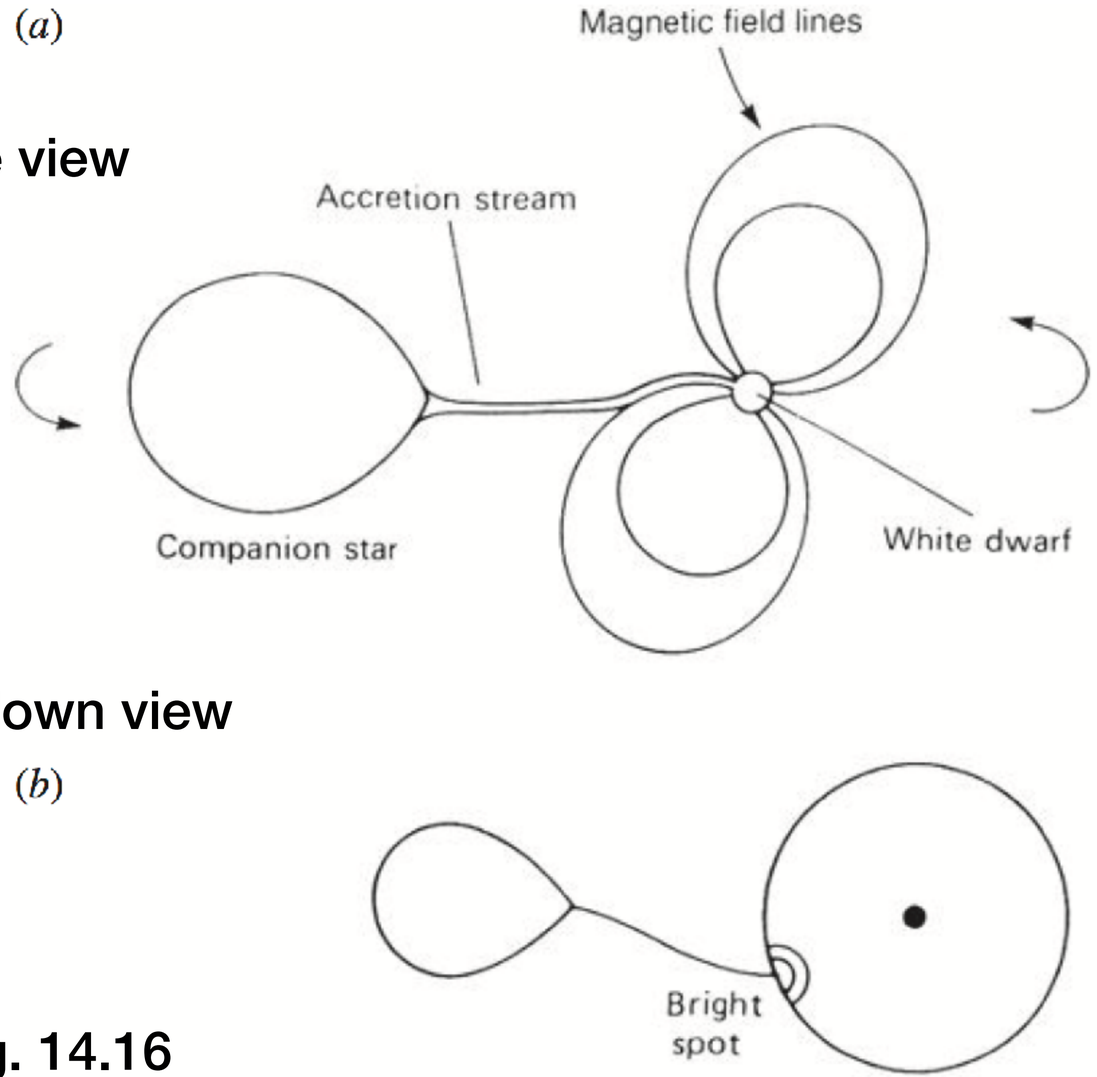


Fig. 14.16

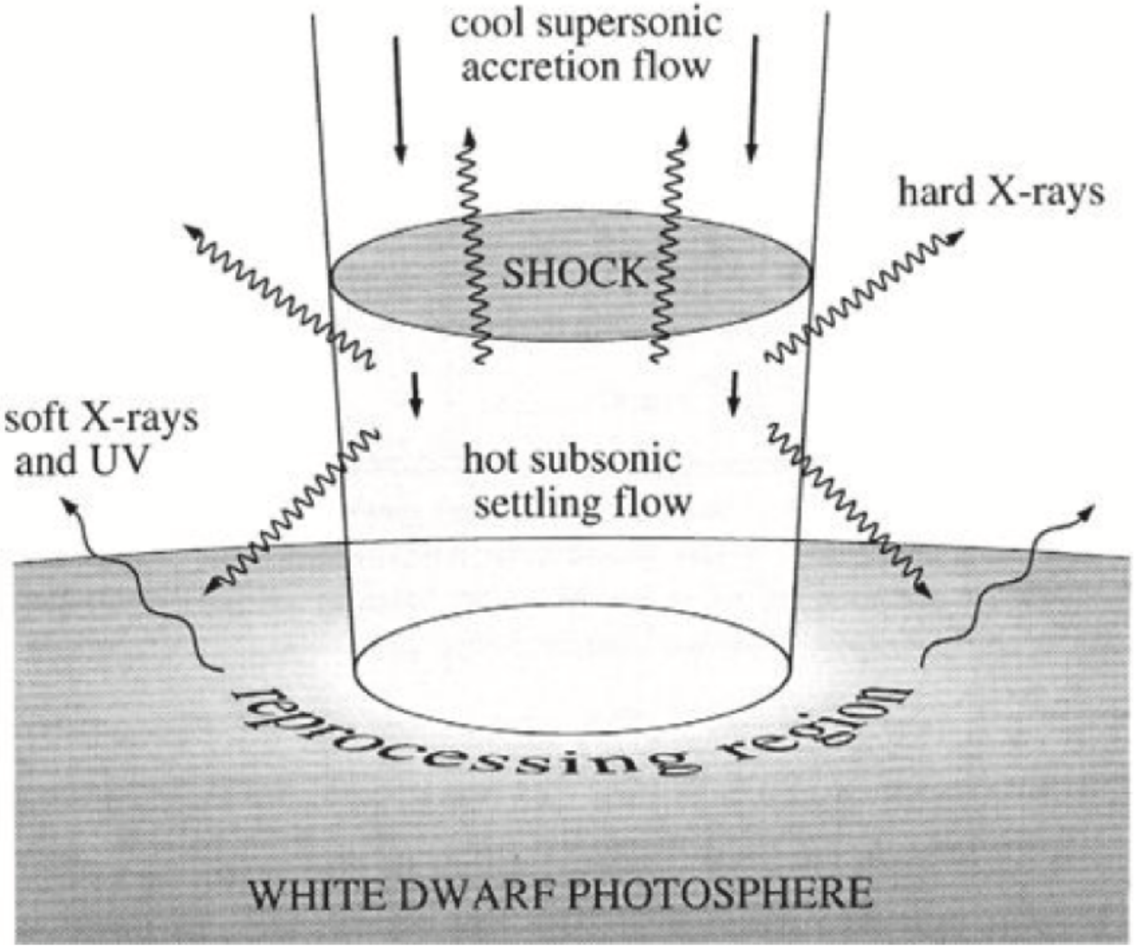
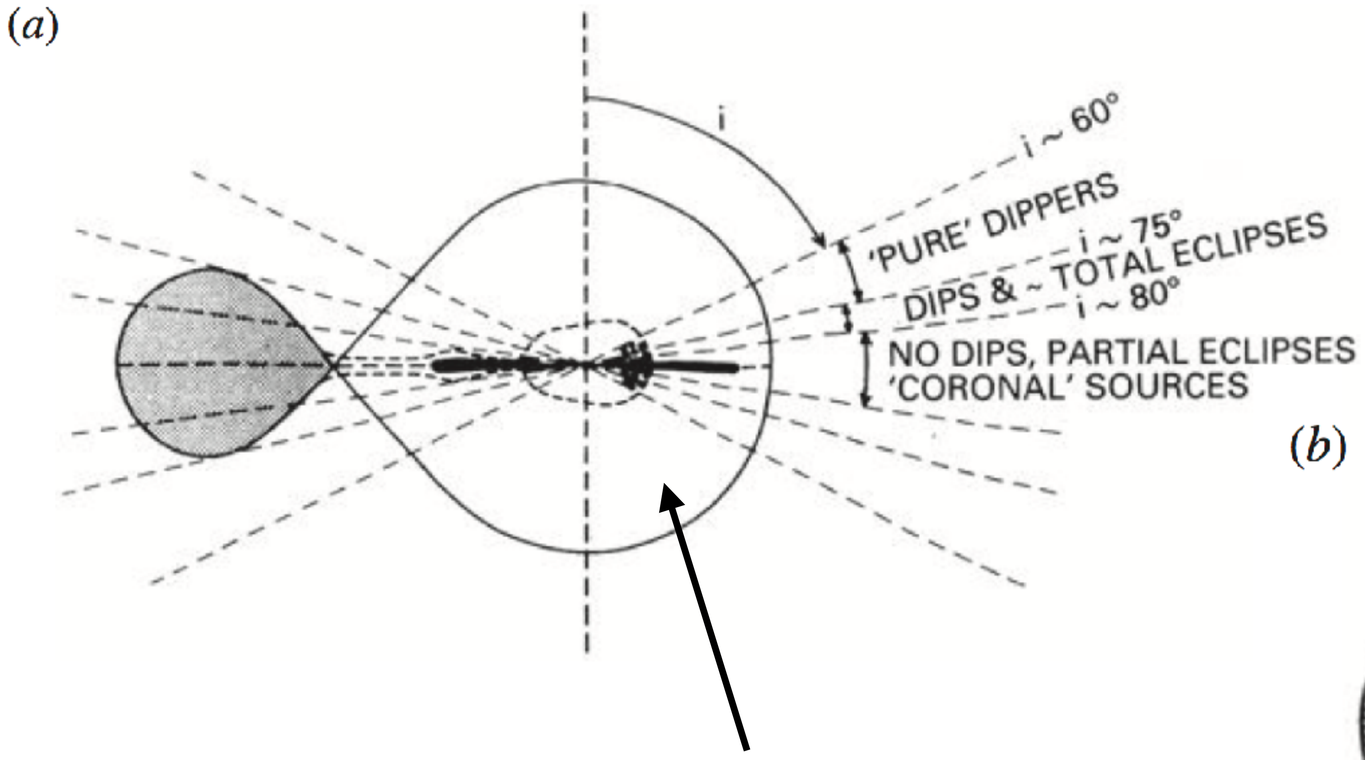


Fig. 14.19

Low Mass X-ray Binaries



X-ray emitting <u>corona</u> fills Roche lobe, above/below disk
(eclipses are gradual, so emitting volume large)

Optically thick absorbing material before it collapses into disk
(large absorbing columns seen, keeps disk thick)

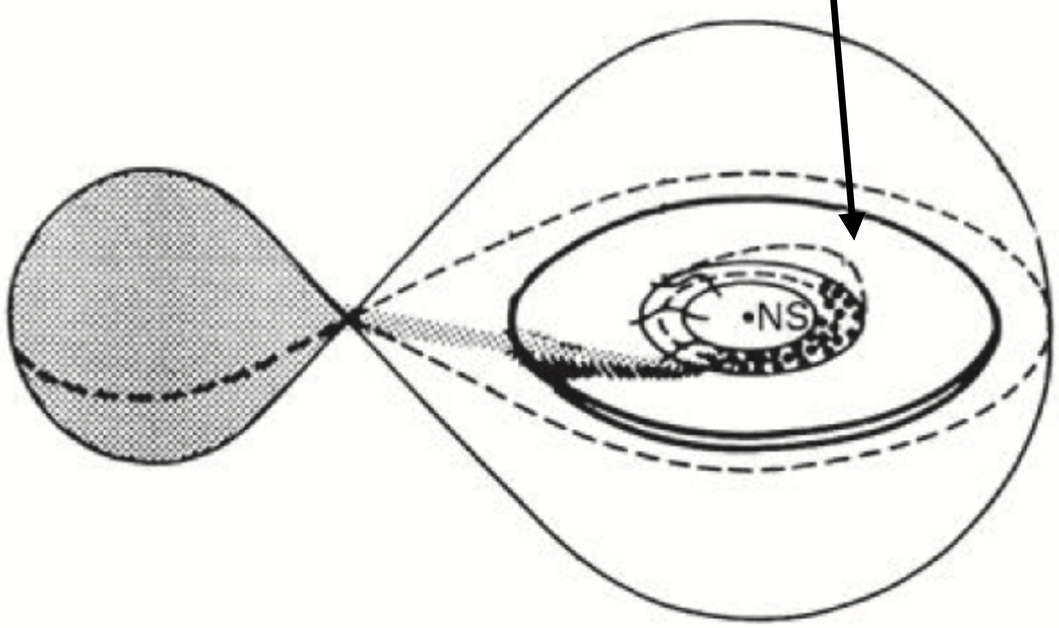
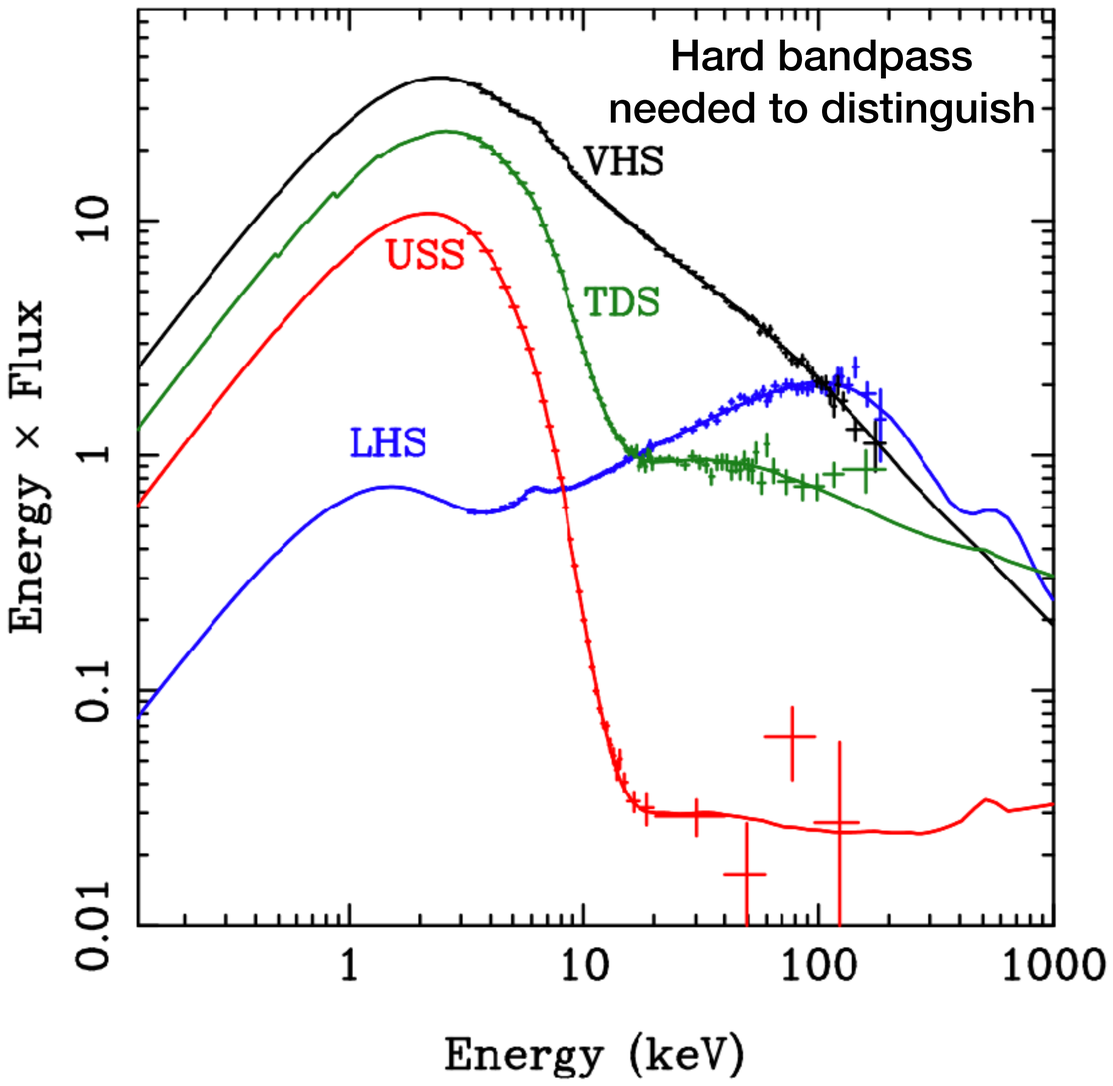
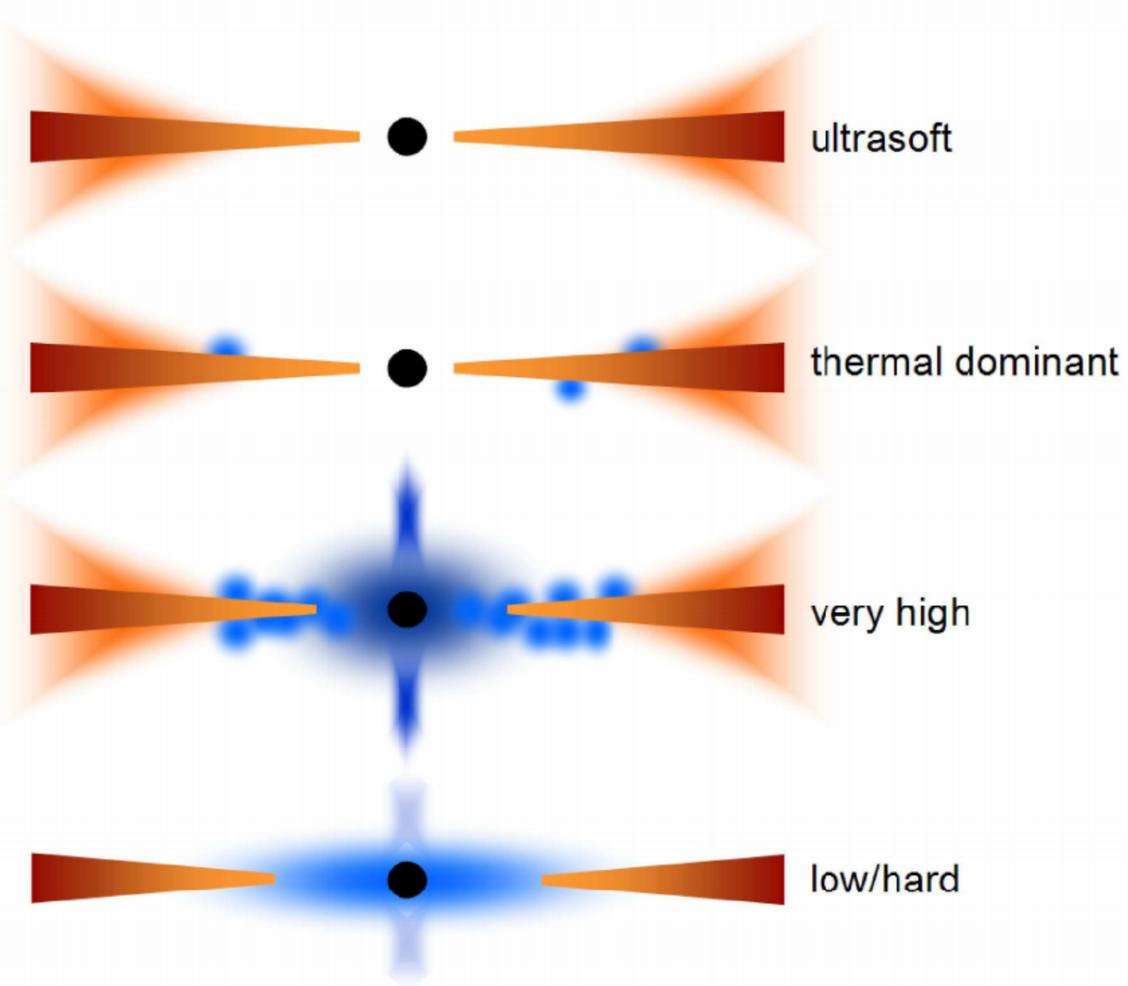


Fig. 14.21

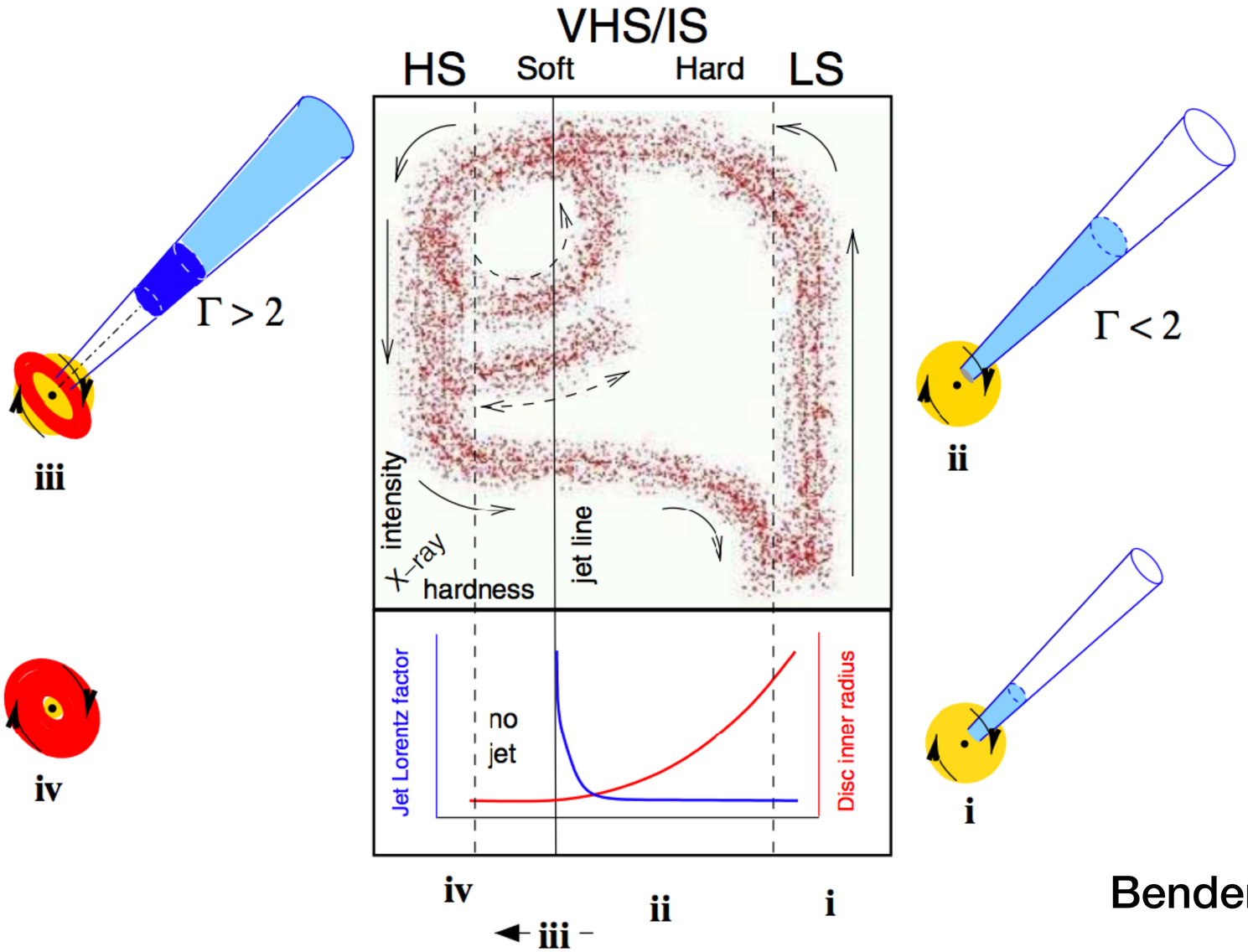
Black Hole X-ray Binaries





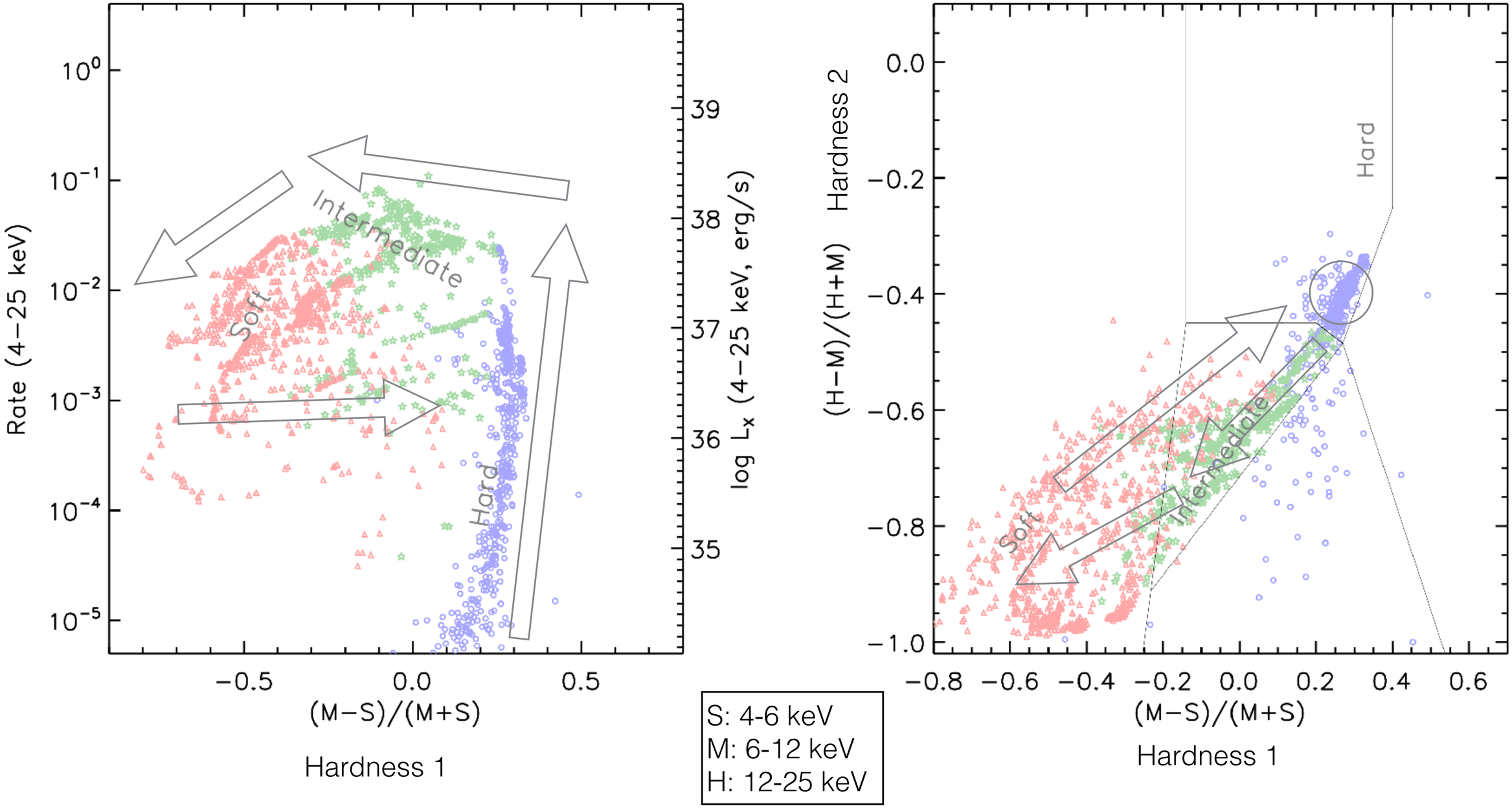
Done et al. 2007

BH XRBs: “Turtle” or “q” Diagram



Bender et al. 2004

NuSTAR Hardness(color)-Intensity Diagram



S: 4-6 keV
M: 6-12 keV
H: 12-25 keV