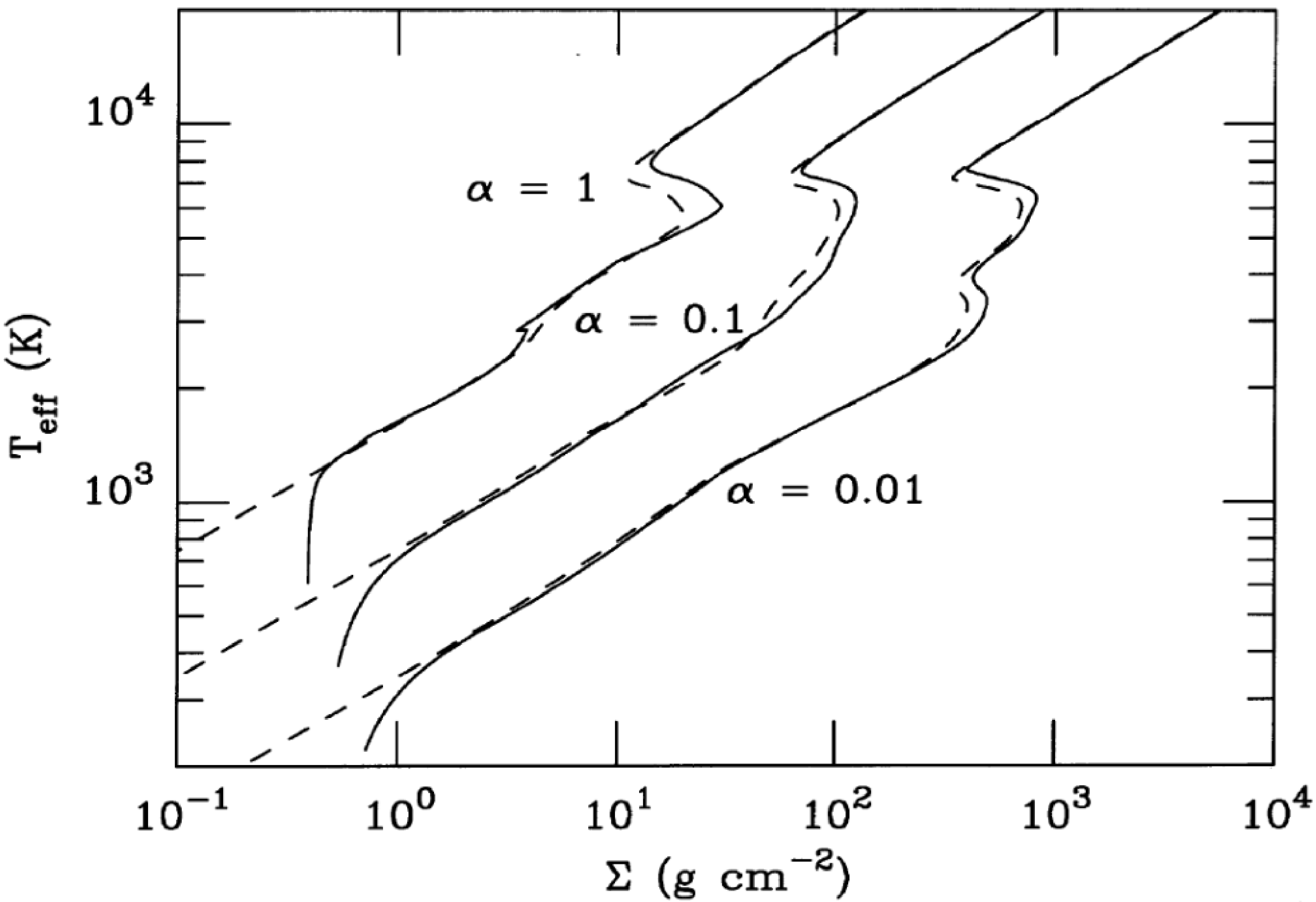
DIM basic hypotheses

- Thin disk approximation:
  - Keplerian motion
  - Radial gradients small as compared to vertical gradients
  - Vertical structure decouples from radial structure
  - Radial gradients small as compared to vertical gradients
  - Vertical hydrostatic equilibrium
- Alpha viscosity
  - Also for vertical structure
  - Hydrostatic and thermal equilibrium assumed, with an effective alpha different from the actual one
- Thermal equation in z direction: time-dependent terms proportional to heat dissipation in steady state, i.e. to P

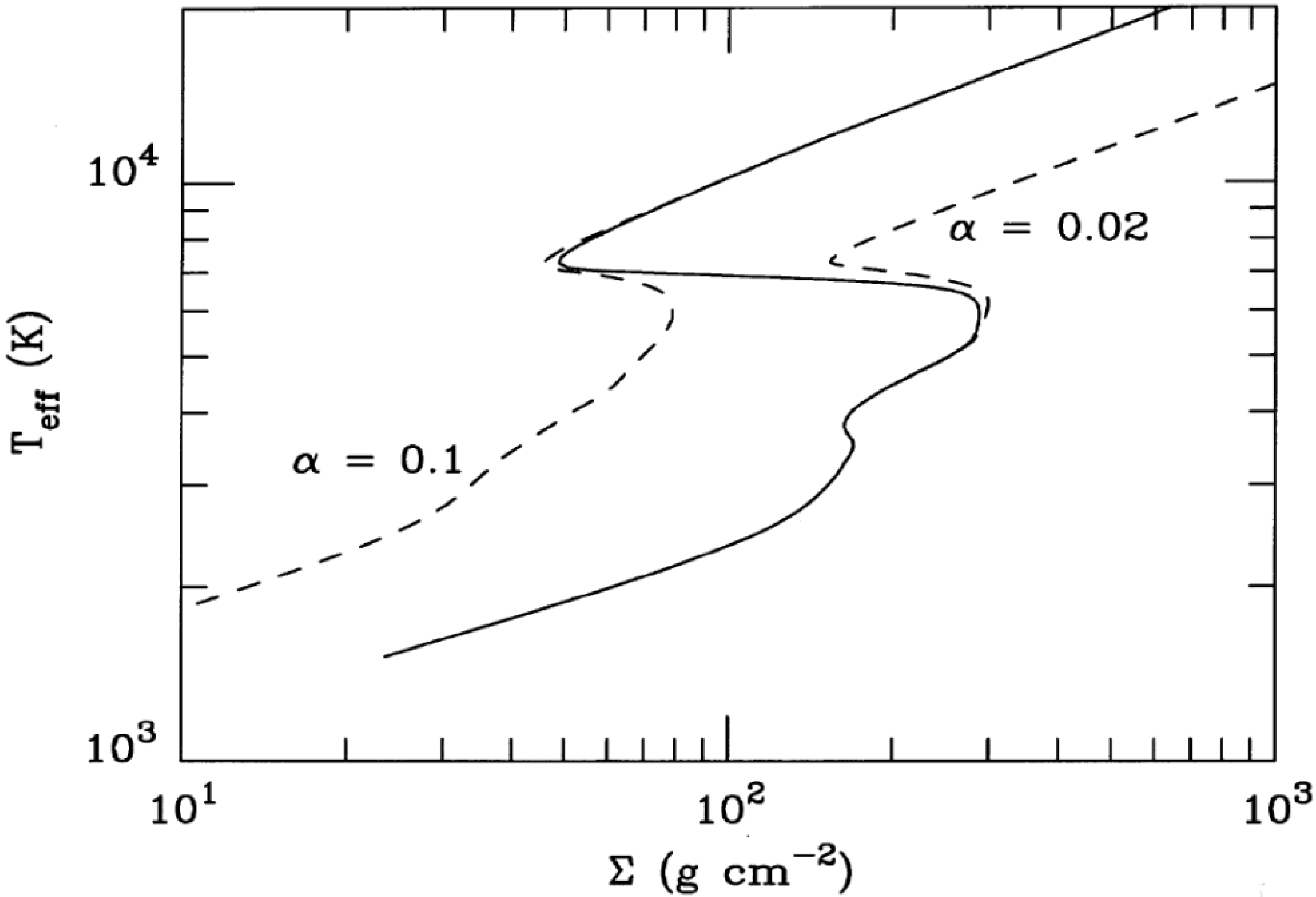
=> effective α, different from actual α

- $T_{eff} = T_{eff}(\Sigma, T_c, r)$

  $\nu = \nu(\Sigma, T_c, r)$
- If thermal equilibrium, $T_c = T_c(\alpha, \Sigma, r)$ => S curves
- α different on the hot and cold branches: $\alpha = \alpha(T_c, \ldots)$



10^4
10^3
T_{eff} (K)
$\alpha = 1$
$\alpha = 0.1$
$\alpha = 0.01$
10^{-1}
10^0
10^1
10^2
10^3
10^4
Σ (g cm^{-2})



10^4
10^3
T_{eff} (K)
$\alpha = 0.02$
$\alpha = 0.1$
10^1
10^2
10^3
Σ (g cm^{-2})

- Disc stable if

$$\dot{M} < M_A = 4\ 10^{15}\ M_1^{-0.88} r_{10}^{2.65}\ \text{g/s everywhere}$$

or $$\dot{M} < M_B = 9.5\ 10^{15}\ M_1^{-0.89} r_{10}^{2.68}\ \text{g/s everywhere}$$

i.e. if

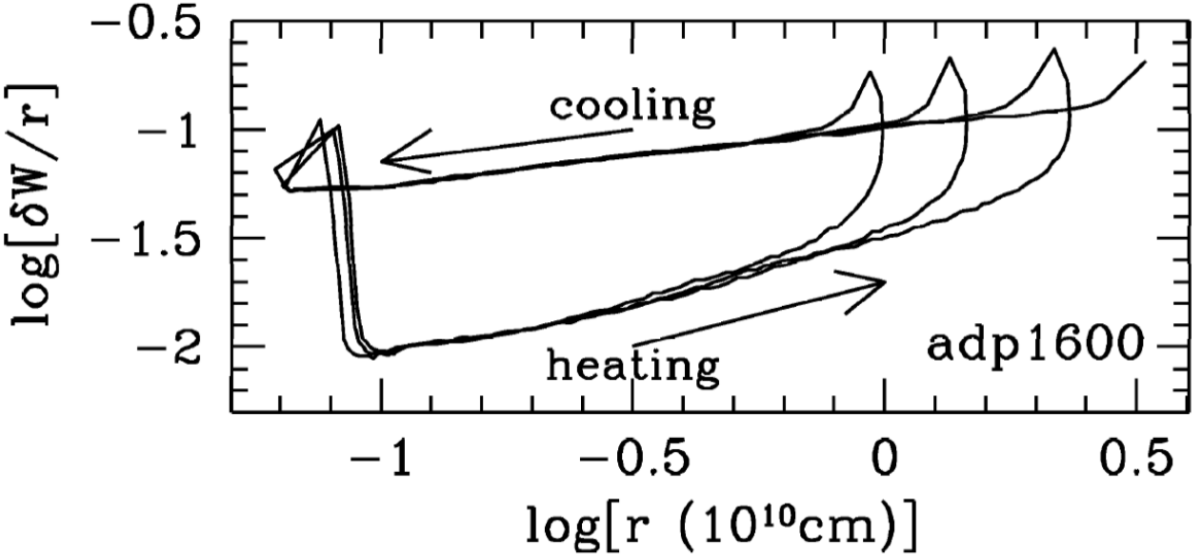
$$\dot{M} < M_A(r_{in}) = 9\ 10^{12}\ M_1^{-0.88}\ r_9^{2.65}\ \text{g/s (WD)}$$

$$1\ 10^{5}\ M_1^{-0.88}\ r_6^{2.65}\ \text{g/s (NS)}$$

or $$\dot{M} < M_B(r_{out}) = 4.5\ 10^{18}\ M_1^{-0.89} r_{11}^{2.68}\ \text{g/s}$$

Additional ingredients

- Tidal torques:
  - Angular momentum conservation equation
  - Heating term
  - $T_{tid} \sim (r/a)^5$ or $\exp((r-r_{tid})/\delta r)$
- Hot spot
- Inner disc truncation by e.g. magnetic field
- Irradiation by a hot white dwarf
- Mass transfer fluctuations
- Chemical composition (He discs)
- => 3 movies



- Heating front: width ~ a few h, velocity $v_f \sim \alpha_h c_s$
- Cooling front: broader and slower

- Inside/out outbursts general case
- Outside/in outbursts if $\dot{M}$ larger than ~ $\dot{M}_A(r_{out})$; do not start at the disc edge, but at $r_{in} << r << r_{out}$
- Peak mass accretion rate: ~ $\dot{M}_B(r_{out})$ if the heating front reaches the outer disc edge
- Quiescence time = diffusion time; to 1st order independent on $\dot{M}$, varies as α_{cold}^{-1}
- Low $\dot{M}$: sequence of small and large outbursts; the heating front does not reach the outer edge

Drawbacks, uncertainties, problems

- α viscosity, temperature dependent
- Heating fronts narrow,
- Model predict that quiescent level increases with time; not observed