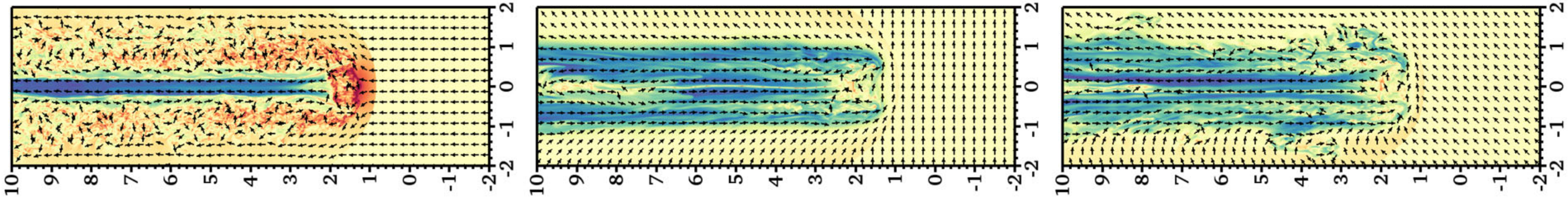
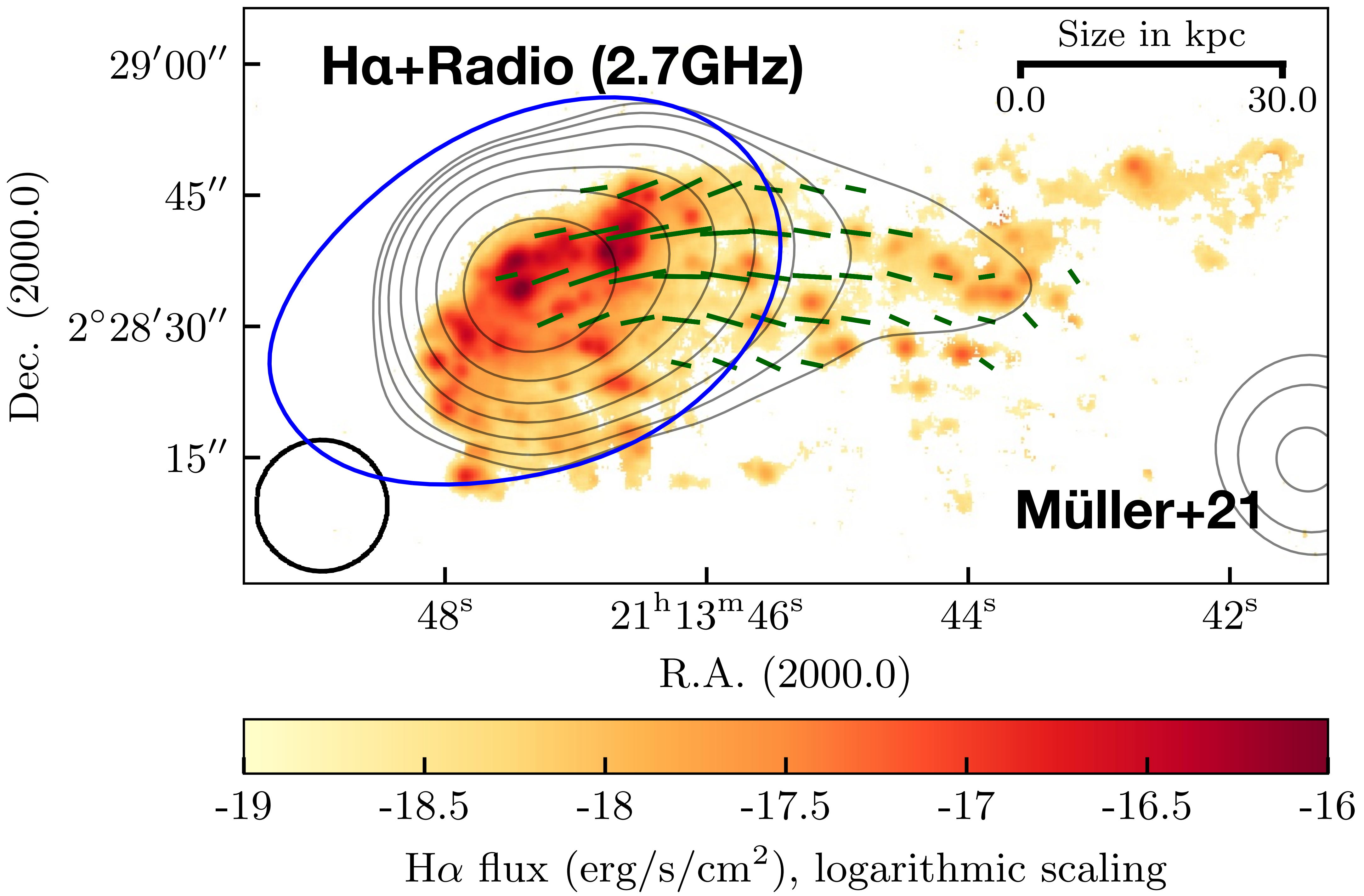
- Tail B-fields are aligned with the direction of the jellyfish tails
  - Mixing is further suppressed by the B-fields aligned with flows

MHD wind-cloud interaction simulations (Banda-Barragán+16)



B-field in JO206

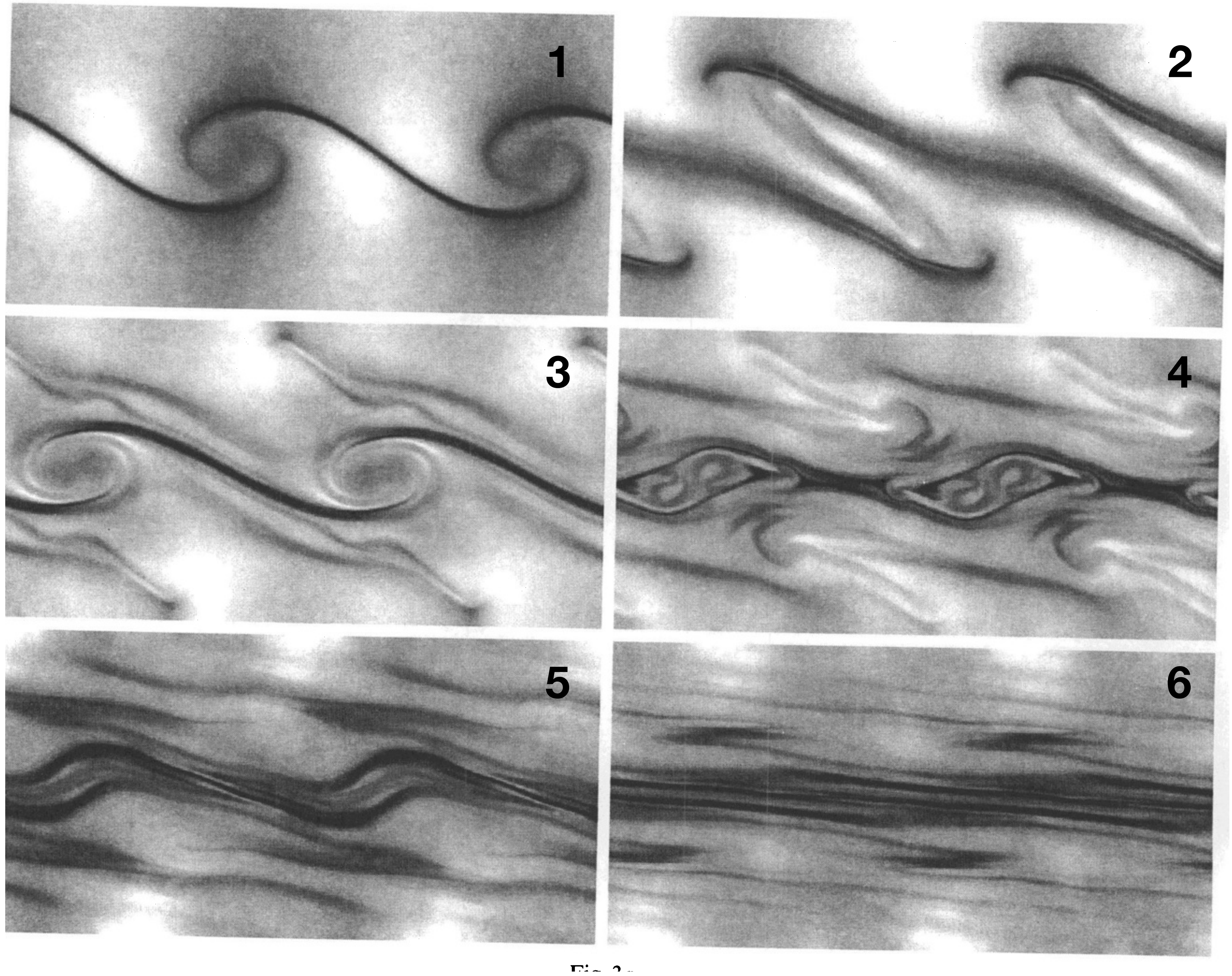


- Impact of magnetic fields on fluids (1)
  - Inducing magnetic pressure that stabilizes a cloud against gravitational collapse

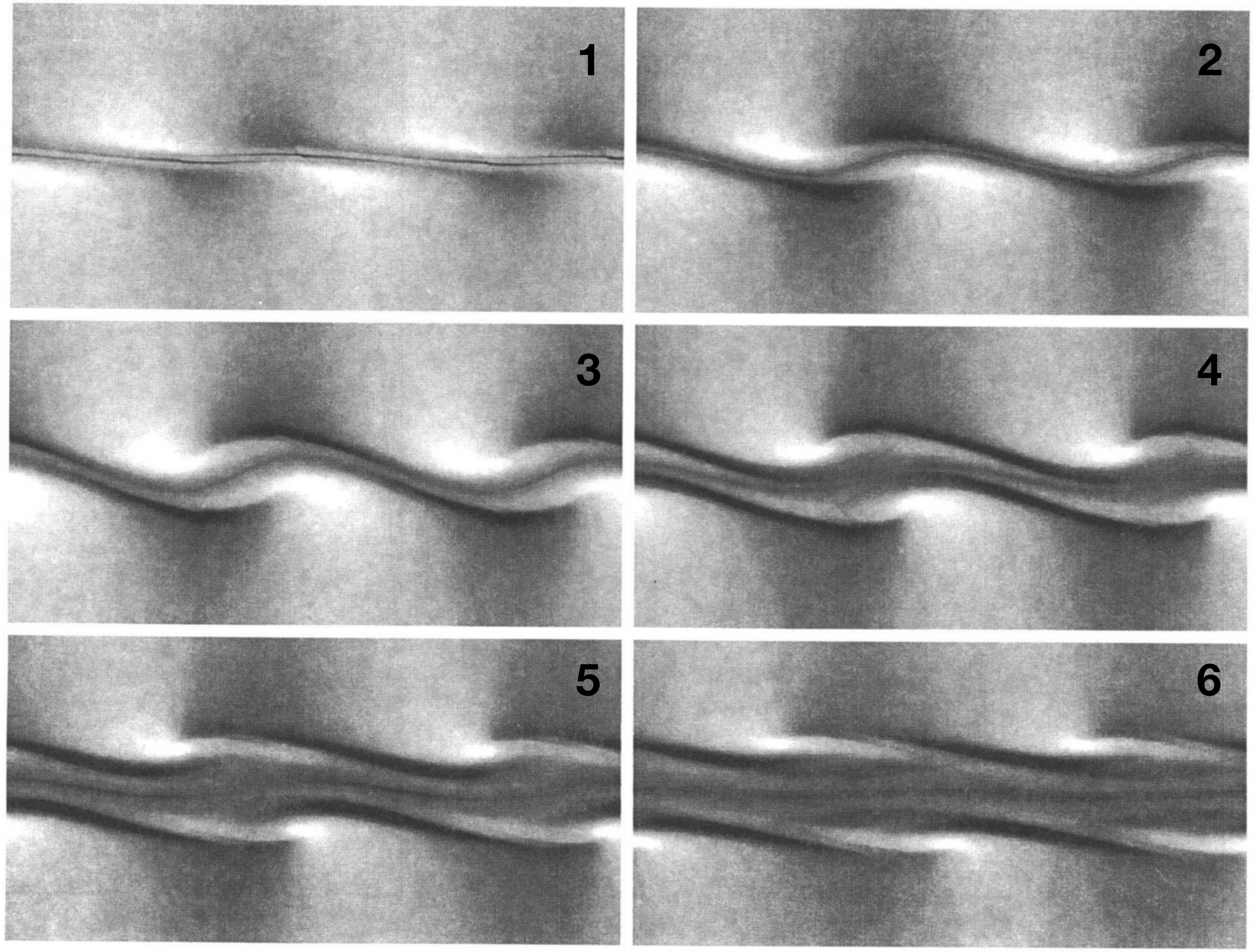
    ➡lowering star formation efficiency (e.g., Federrath+12)
  - Guiding the flows
  - Suppressing instabilities that induce cloud fragmentation or generate turbulence

- Impact of magnetic fields on fluids (2)
  - Magnetic tension can suppress the growth of Kelvin-Helmholtz instabilities

Weak B-field



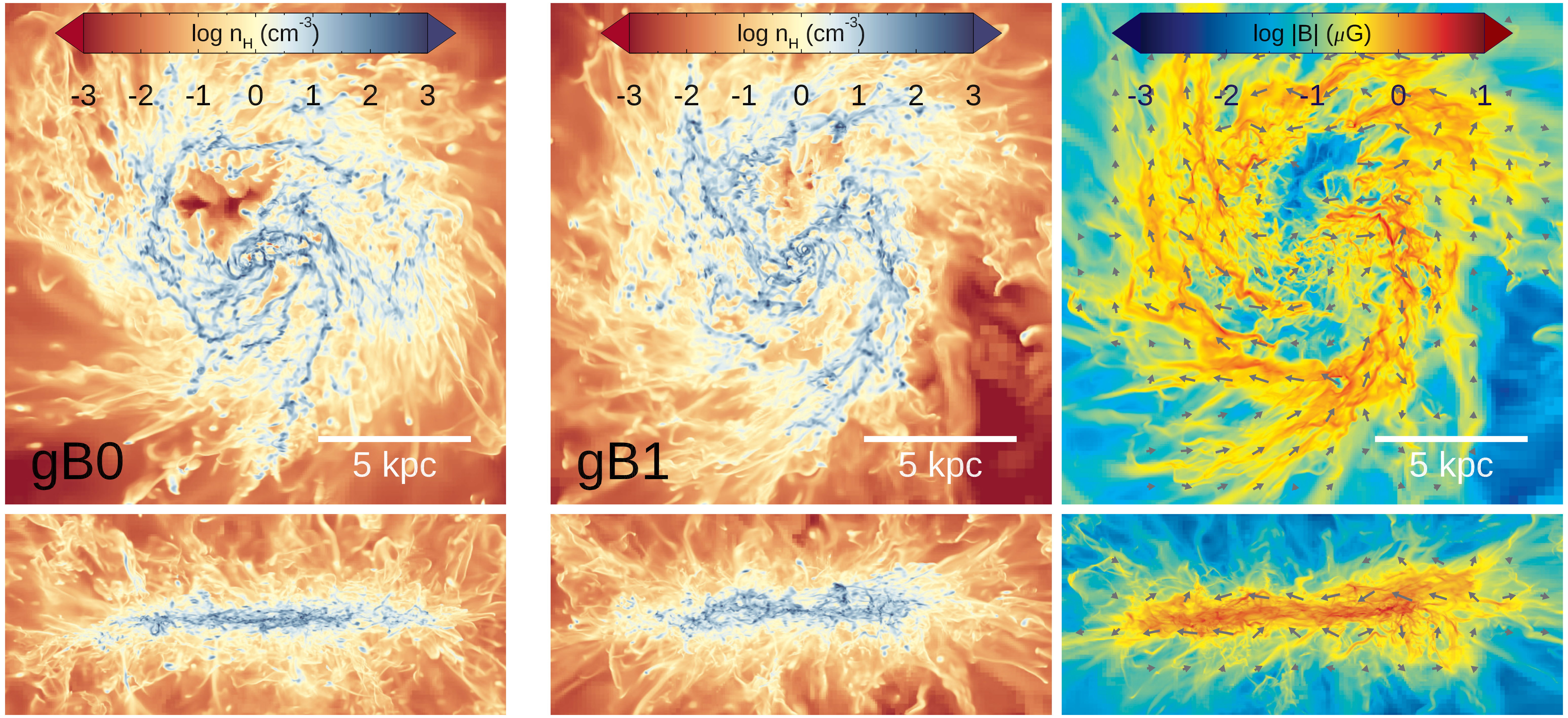
Strong B-field

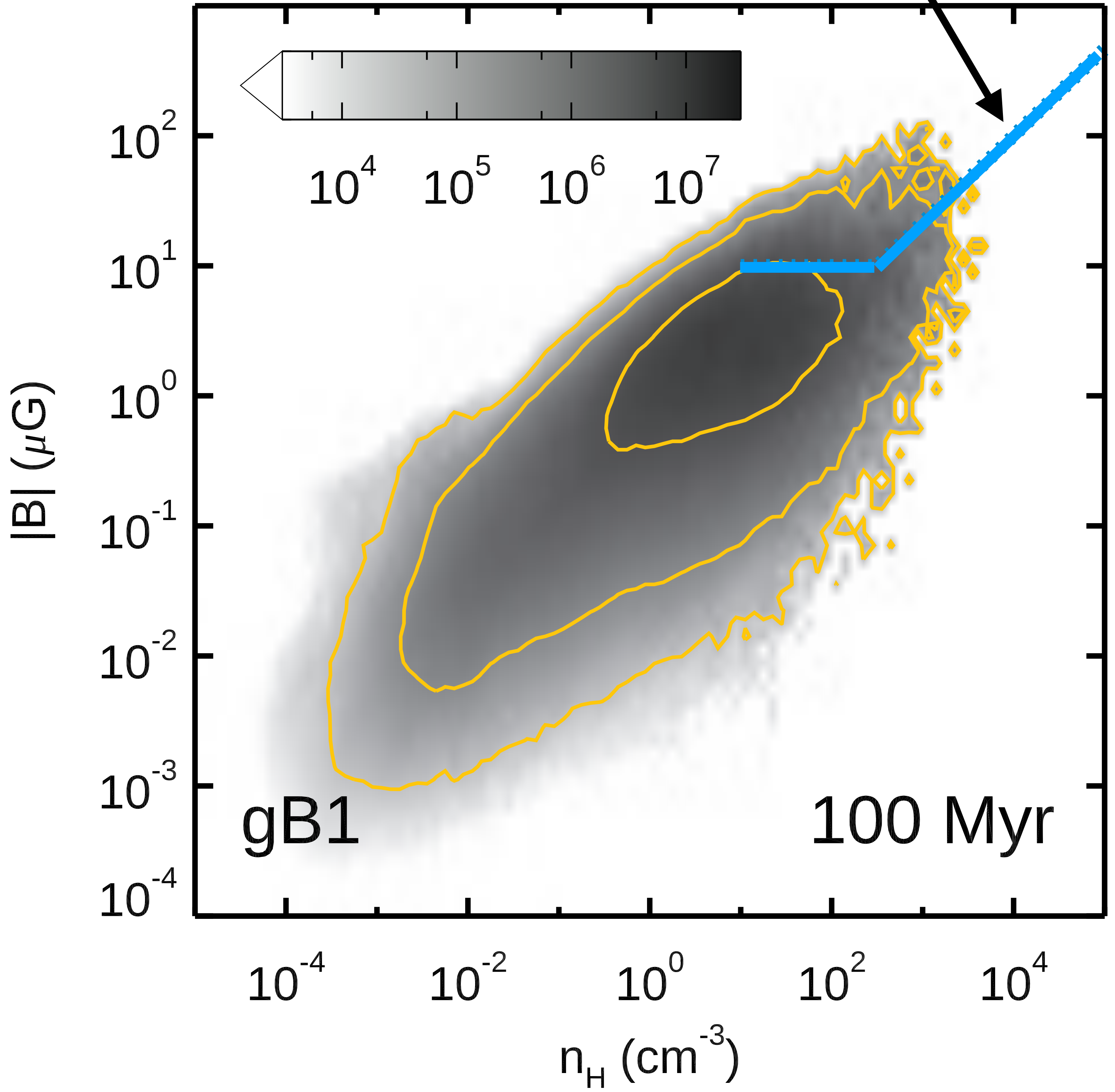


2D MHD simulations
Frank+96

- Simulations
  - Code: **RAMSES-RT** (Rosdahl+13, Rosdahl & Teyssier15)

    + H_2 formation and dissociation processes (Katz+17; Kimm+17, 18)
  - **G9** (Rosdahl+15): $M_{halo}\sim10^{11}M_\odot$, $M_\star\sim3\times10^9M_\odot$, $M_{HI}\sim2\times10^9M_\odot$, $M_{H_2}\sim4\times10^8M_\odot$ (after relaxation)
  - Resolution : $\Delta x=18$ pc, $M_\star=10^3M_\odot$
  - Disks initially have **$B_x=0\mu G$ (gB0) or $0.1\mu G$ (gB1)**





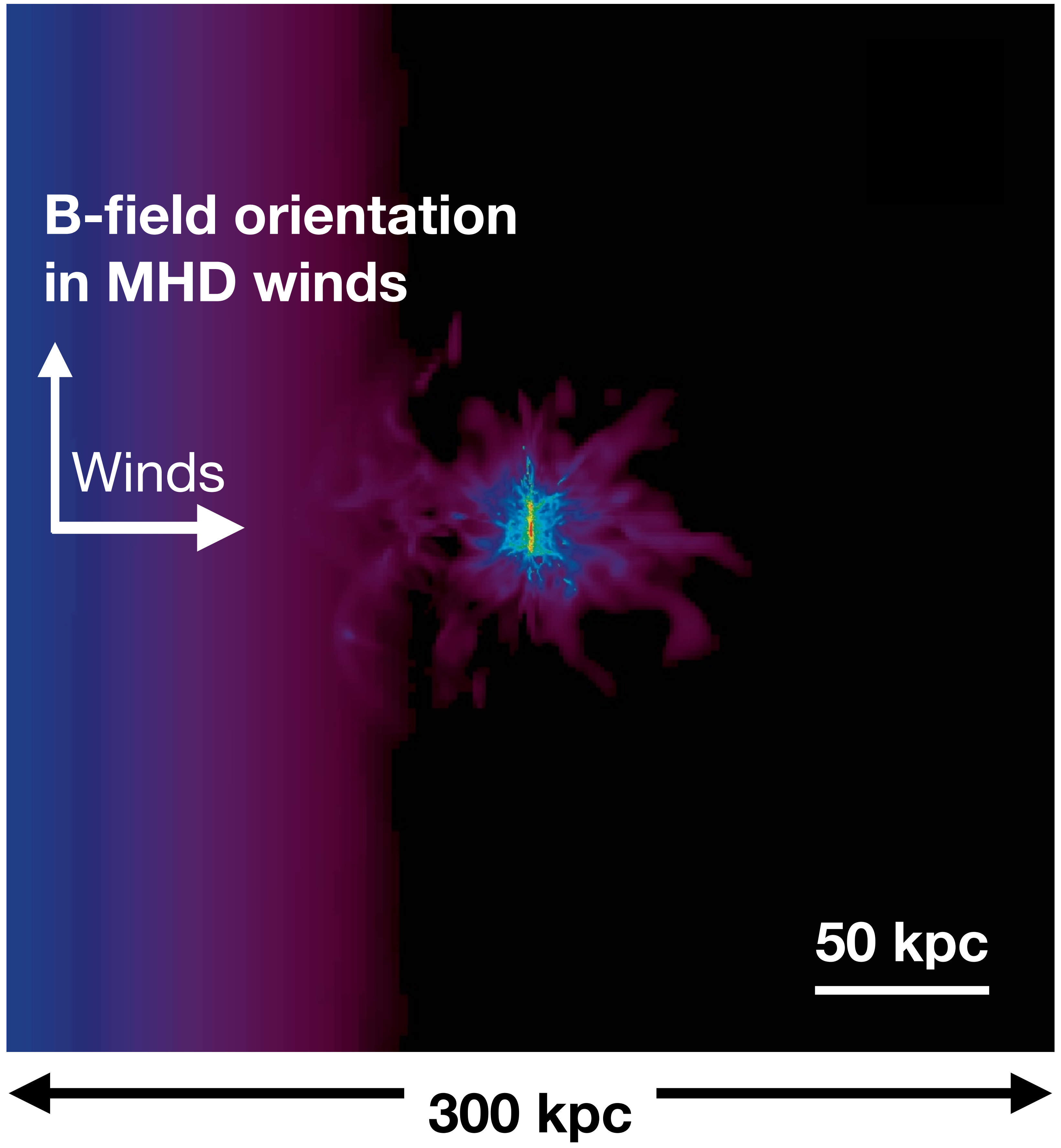
Most probable maximum values of empirical relation from Crutcher+10

- Simulations in a wind-tunnel

  - Winds commonly have v_{ICM}=1,000km/s, n_{H}=3×10^{-3}cm^{-3}, and T=3×10^{7}K

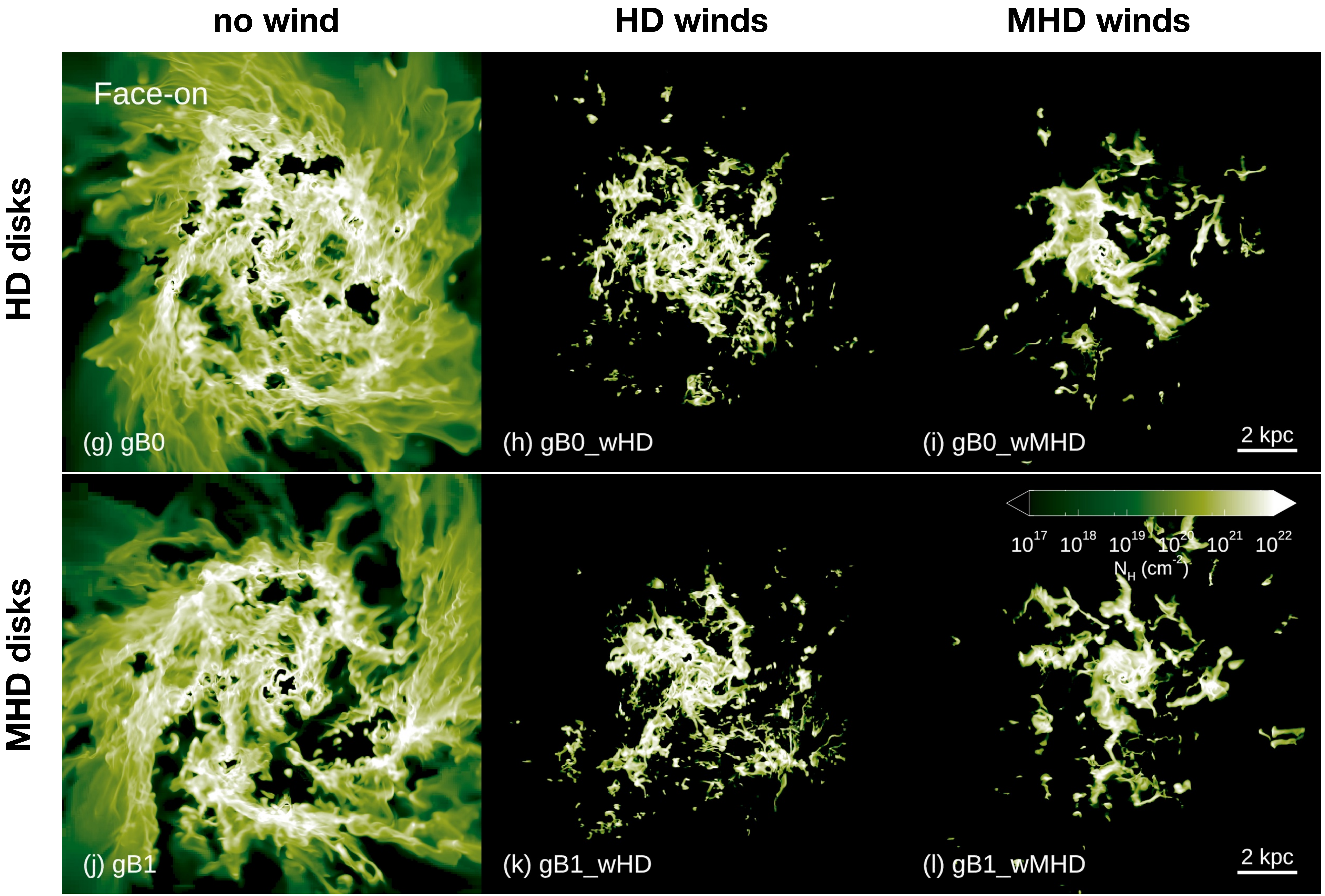
  ➡ adopted to mimic strong ram pressure near the cluster center

  - Two winds have B_x=**0μG (HD winds)** and B_x=**1μG (MHD winds)**



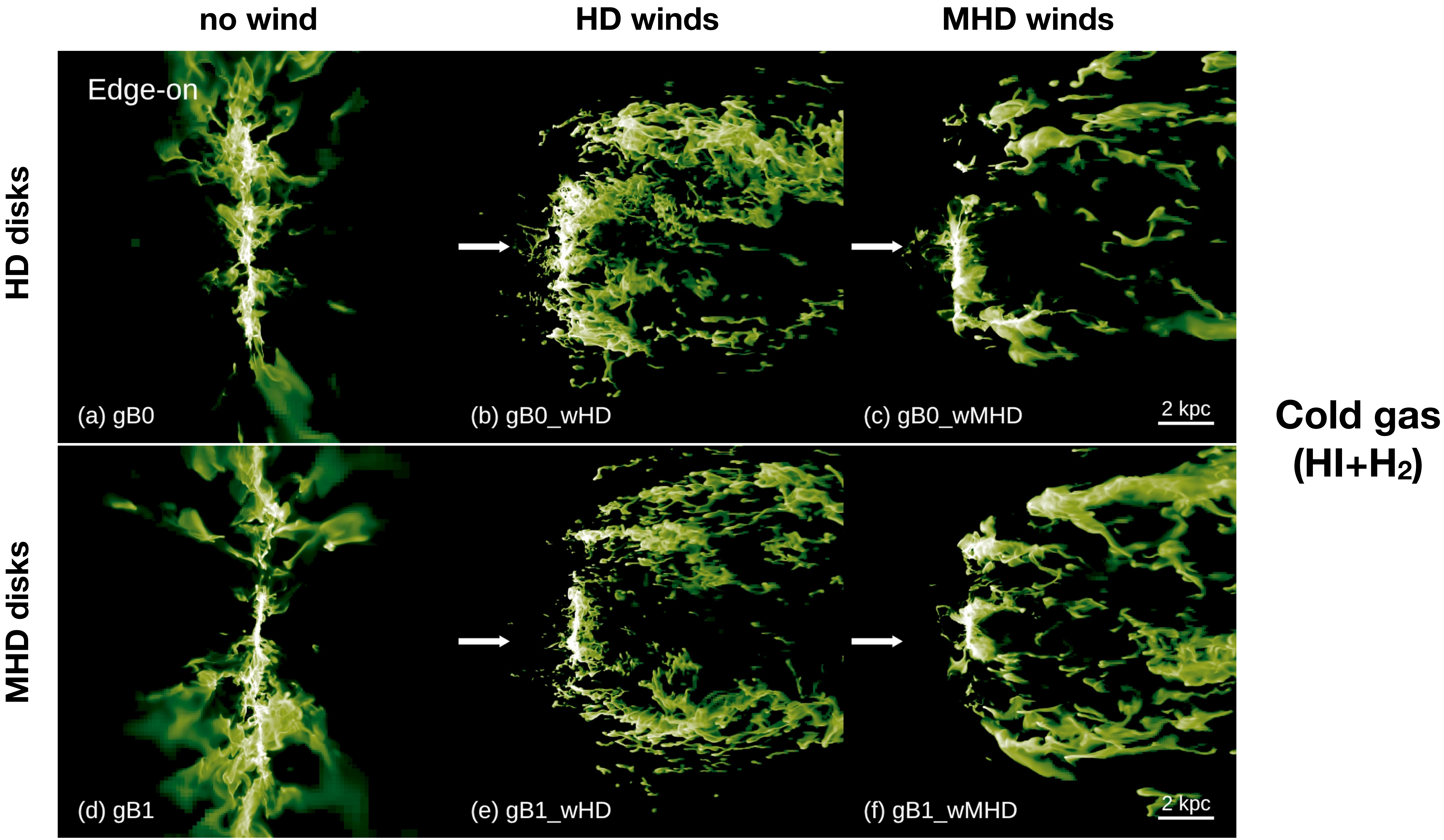
	Model	$n_{\mathrm{H,\,ICM}}$ $[\mathrm{cm}^{-3}]$	v_{ICM} $[\mathrm{km\,s}^{-1}]$	$P_{\mathrm{ram}}/k_{\mathrm{B}}$ $[\mathrm{cm}^{-3}\,\mathrm{K}]$	$\mathbf{B}_{\mathrm{disk,0}}$ $[10^{-6}G]$	$\mathbf{B}_{\mathrm{wind}}$ $[10^{-6}G]$
No winds (control sample)	gB0	10^{-6}	0	0	0	-
	gB1	10^{-6}	0	0	$B_x = 0.1$	-
Pure hydro ICM	gB0_wHD	3×10^{-3}	10^3	5×10^5	0	0
	gB1_wHD	3×10^{-3}	10^3	5×10^5	$B_x = 0.1$	0
Magnetized ICM	gB0_wMHD	3×10^{-3}	10^3	5×10^5	0	$B_x = 1$
	gB1_wMHD	3×10^{-3}	10^3	5×10^5	$B_x = 0.1$	$B_x = 1$

- Cold gas ($HI+H_2$) in the disks in the face-on view (just after the winds arrival)
  - Disk clouds are less fragmented and smoother in the MHD wind runs



Cold gas ($HI+H_2$)

- Cold gas (HI+H_2) in the disks and near tails in the edge-on view (just after the winds arrival)
  - Tail clouds are also less fragmented and smoother in the MHD wind runs

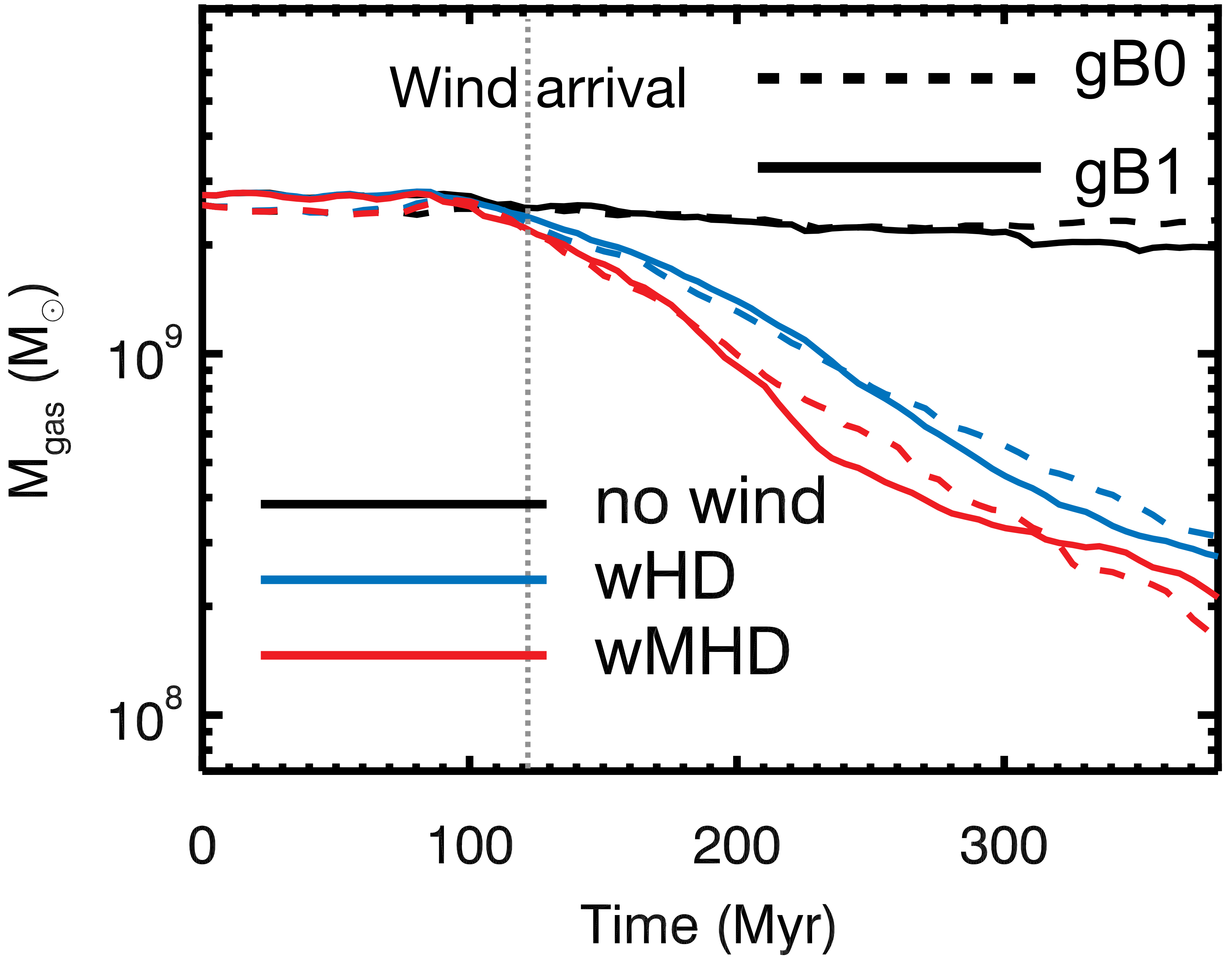


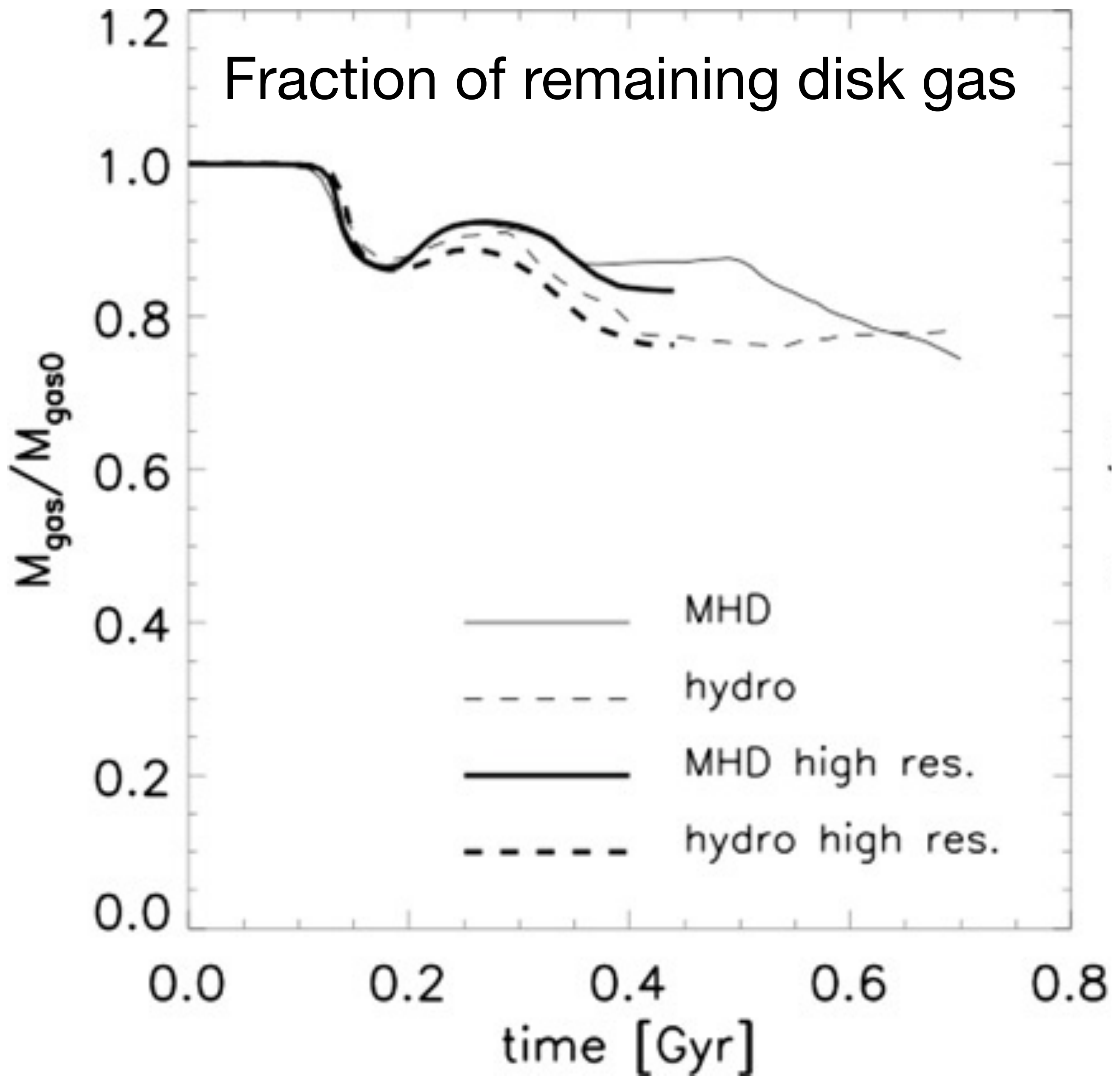
- Disk gas stripping
  - B-fields in disks do not appear to be as significant as those in the ICM for disk gas stripping
  - Disk gas is stripped more by the MHD winds than the HD winds
    - However, previous studies have shown the opposite

➡ Magnetic draping layers suppress mixing, resulting in lower disk gas stripping

(e.g., Ruszkowski+14, Tonnessen+14, Ramos-Martínez+18)

Cold gas (HI+H_2) in disks





Ruszkowski+14

- Magnetic draping layers always reduce the stripping rate of disk gas?
  - Not the case for galaxies with star formation and cooling in this study

➡Stellar feedback makes disks turbulent and porous

➡Gas clouds are easily magnetized and puffed up, being more vulnerable to external perturbations

- RPS tail morphology
  - Tail clouds are more fragmented and smoothed when the galaxies undergo the MHD winds

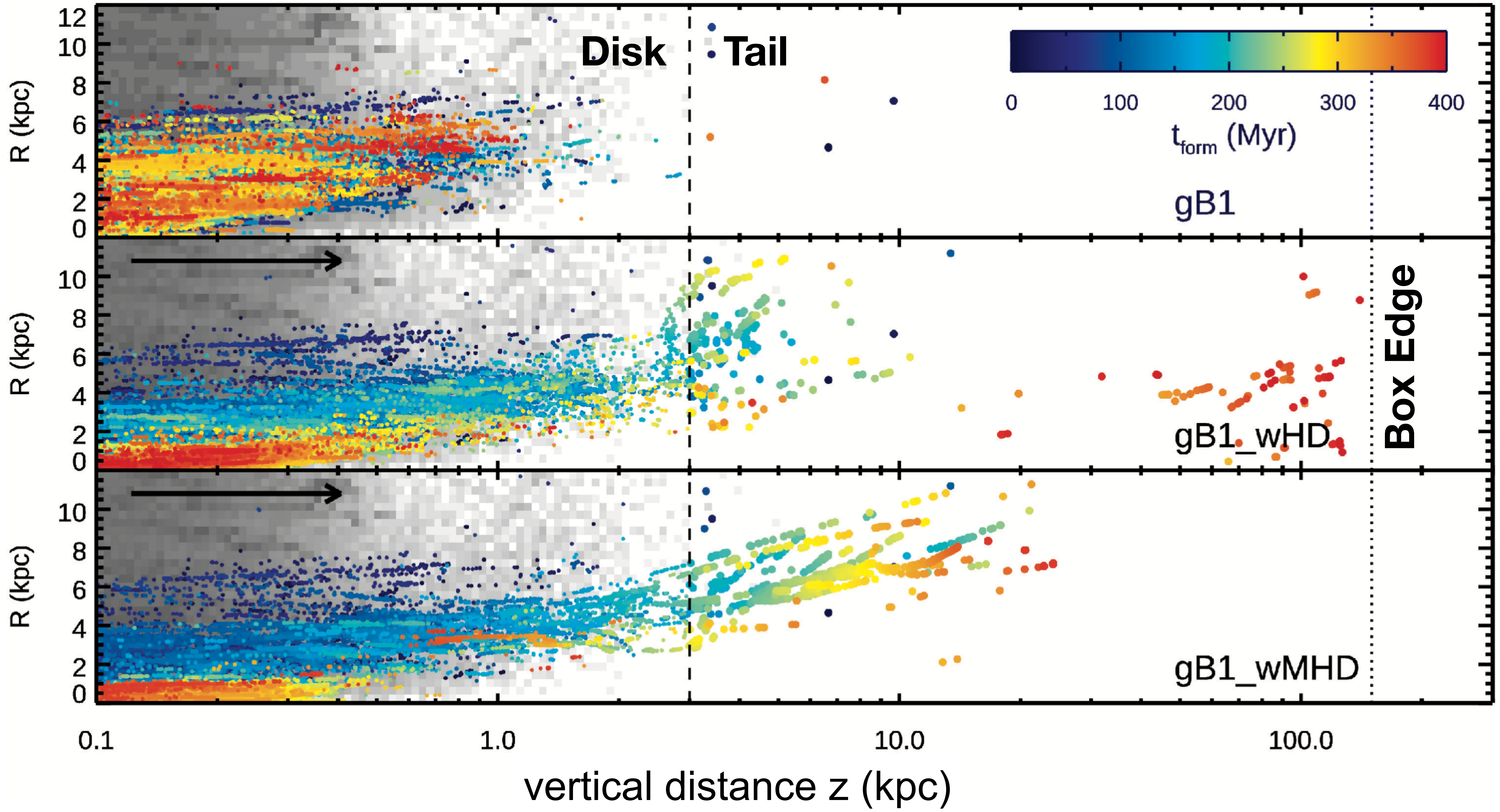
- RPS tail morphology
  - Tail clouds are more fragmented and smoothed when the galaxies undergo the MHD winds

- Tail star formation (Tail - R<12kpc, z>3kpc)
  - Stars form in the distant tail in the HD wind run

    ➡ Plenty of warm ionized clouds form via mixing, which cool, collapse, and form stars in the distant tail
  - Tail stars form only in the near wakes in the MHD wind run

    ➡ Stripped clouds form many stars in the near tail, but gradually evaporate as they travel

Birthplace of stars after wind launch



No RP

HD winds

MHD winds

SF in near and distant tails

Much SF in near wake
No SF in distant tail