a) Past

Pressure Level (hPa)

Layer C
Layer B
Layer A

$-05°C$ $\theta_e = 338\ K$

$\theta_{e(C)}$

$+10°C$ $\theta_e = 330\ K$

$\theta_{e(B)}$

$+15°C$ $\theta_e = 338\ K$

$\theta_{e(A)}$

$+20°C$ $\theta_e = 348\ K$

b) Present

Increase in Temperature and Moisture

T_{500} $\theta_e = 340\ K$

$-06°C$ Decrease in Temperature Increase in Moisture

Increase in troughing $\theta_e = 333\ K$

$+10°C$

$+17°C$ Increase in Temperature Decrease in Moisture $\theta_e = 335\ K$

$+23°C$ $\theta_e = 345\ K$

Longitude (deg. E)

c) Trends and impacts

Variable	Trend	Impact
$GDI = CBI + MWI + II$	↑	Increase in TS potential and intensity
$ME = \theta_{e(C)} - \beta$	↑	Cooling and moistening in the mid-levels and warming and drying at the lower levels
$LE = \theta_{e(A)} - \beta$	↓	
$CBI = \gamma \times ME \times LE$ (if $LE > 0$; else $CBI = 0$)	−	Non-significant trends in CBI
$MWI = \mu \times (T_{500} - \tau)$ (if $T_{500} - \tau > 0$; else $MWI = 0$)	↑	Cooling of the mid-troposphere
$II_D = \theta_{e(B)} - \theta_{e(A)}$	↑	Relaxation of the vertical gradient of θ_e
$II_S = T_{950} - T_{700}$	↑	Increase in the vertical gradient of T
$II = \sigma \times (II_S + II_D)$ (if $II_S + II_D \leq 0$; else $II = 0$)	↑	Decrease in convective inhibition
Vertical Windshear i.e., $|\vec{V}_{500}| - |\vec{V}_{850}|$	↑	Better convective organization of TS, and enhances the longevity and intensity of MCSs

c) Feedback loop

Increase in 500 hPa troughs (Kelvin Waves or other tropical waves) cool the mid-levels (Raghavendra et al. 2019)

Decrease in vertical stability

Increase in thunderstorm intensity (Raghavendra et al. 2018; Hart et al. 2019)

Decrease in convective inhibition

Taller and more intense thunderstorms warming and moistening the upper levels

Warming/drying trend and decrease in PR$_{surf}$
• *Higher cloud bases?*
• *Increase in virga?*

Increase in vertical gradient of 950–700 hPa temperature

Decrease in surface rainfall (Hamada et al. 2015)

warming and drying of the lower-troposphere (Bush et al. 2020; Zhou et al. 2014)