How do ocean temperature anomalies favor or disfavor the aggregation of deep convective clouds?

Sara Shamekh[1], Caroline Muller[2], Jean-Philippe Duvel[2], Fabio D'Andrea[2]

[1]*Columbia University* [2]*Laboratoire de Météorologie Dynamique*

1. Questions addressed

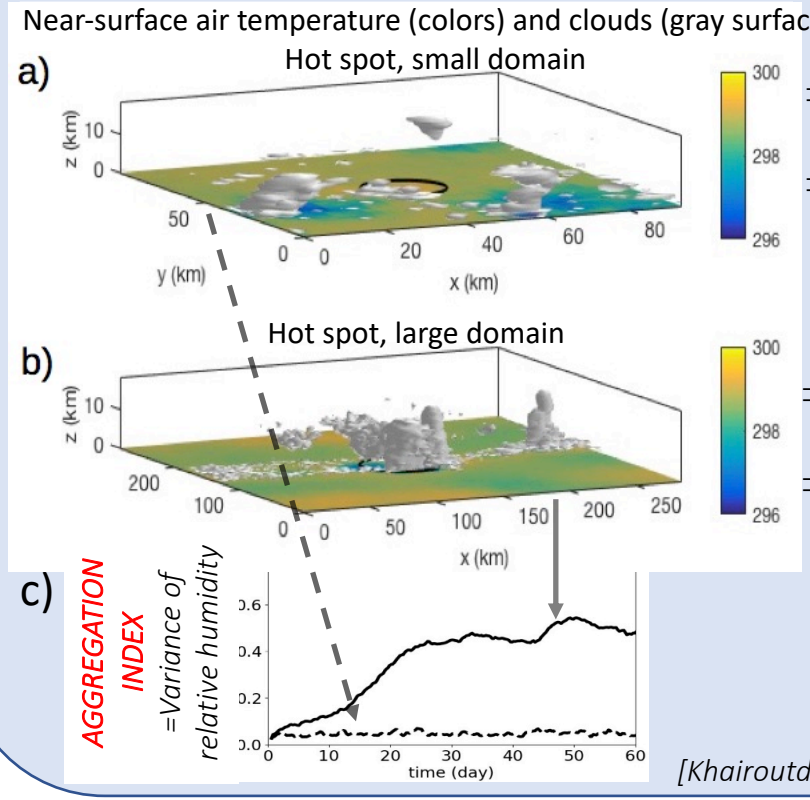
- How an idealized warm circular SST anomaly, referred to as "**hot spot**", **helps organize convection?**
- How **self-aggregation radiative feedbacks modulate** this organization?

Can expect:

- Impact of large-scale circulation generated by SST gradients?
- Migration towards warm SST? *[e.g., Tompkins 2001; Kuang 2012 ; Coppin Bony 2017]*

2. Cloud-resolving simulations with hot spot

Near-surface air temperature (colors) and clouds (gray surfaces)



⇒ Small hot spot & domain

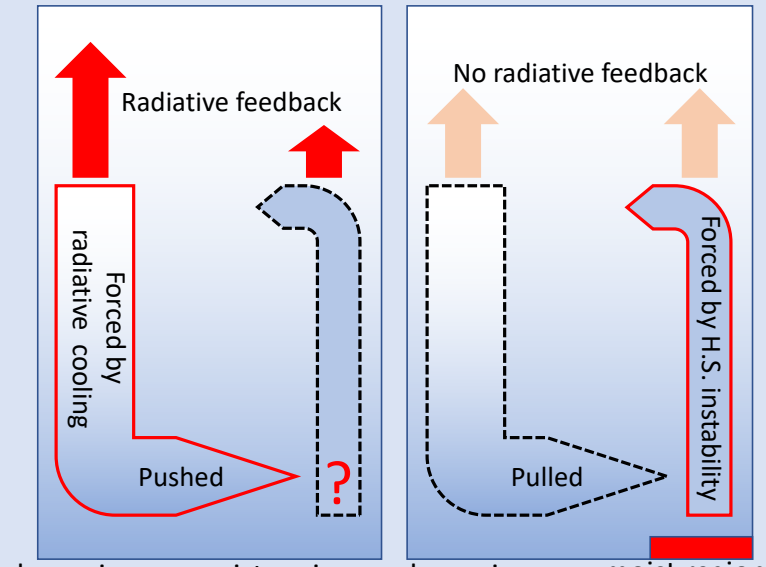
⇒ Some organization but no aggregation

⇒ Large hot spot & domain

⇒ **Aggregation even without radiative feedbacks**

[Khairoutdinov & Randall 2003]

3. aggregation due to large-scale circulation induced by the hot spot



PUSHES the circulation

PULLS the circulation

4. Conclusions

⇒ When SST anomalies are present, circulation induced by the hot spot can accelerate aggregation

⇒ Even without radiative feebdacks, hot spots can lead to aggregation *[Shamekh et al 2020 JAS]*

⇒ Interactive SST delays circulation, thus aggregation *[Shamekh et al 2020 JAMES]*