

# GEWEX Process Evaluation Study on Upper Tropospheric Clouds & Convection

GEWEX UTCC PROES

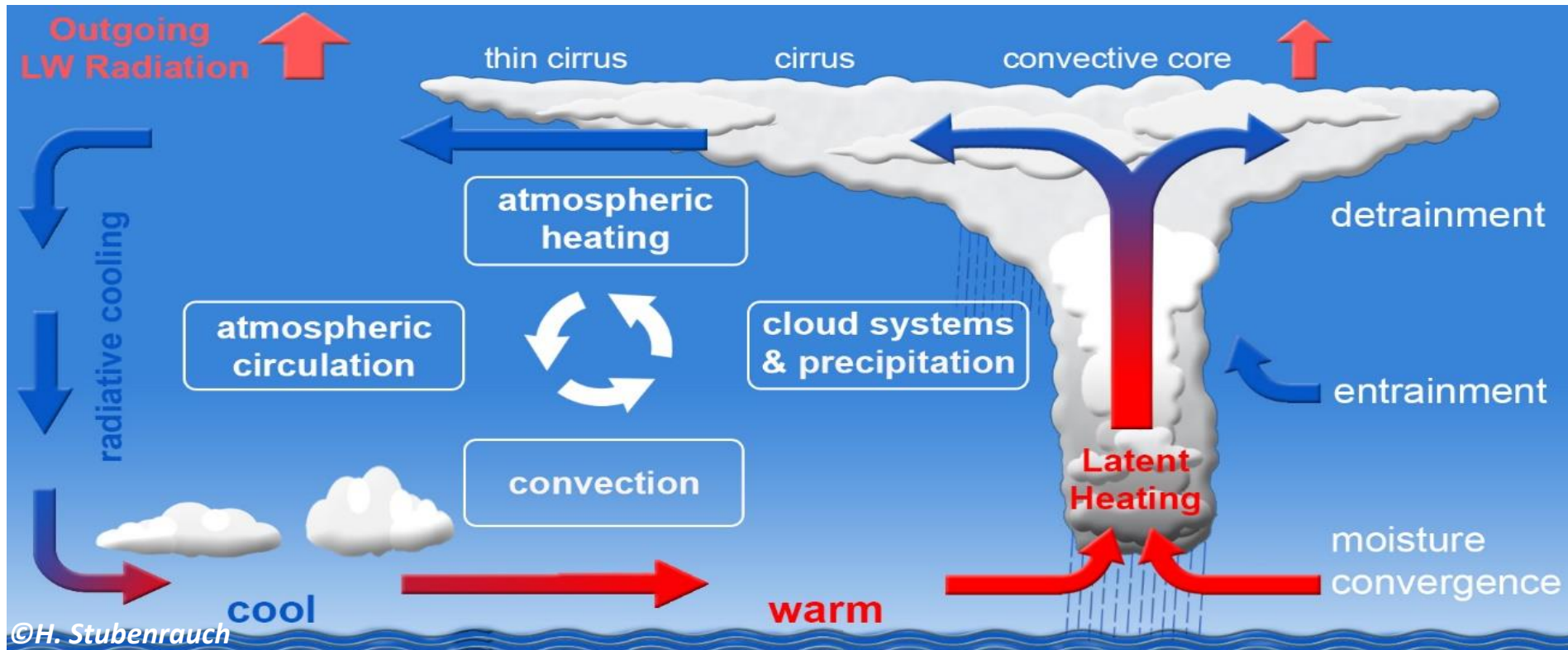
*advance understanding on feedback of UT clouds*

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*LMD/ IPSL, France & NASA JPL*

GEWEX UTCC PROES workshop,  
Paris, France, 22-23 October 2018

# Elements of UT cloud feedback



**height & amount of UT clouds constrained by clear sky mass & energy budget**

**Hypothesis:** climate warming -> increasing convection -> changes in cirrus anvils -> changes in UT radiative heating -> impact on large-scale atmospheric circulation

**large-scale modelling necessary to identify most influential feedback mechanisms**

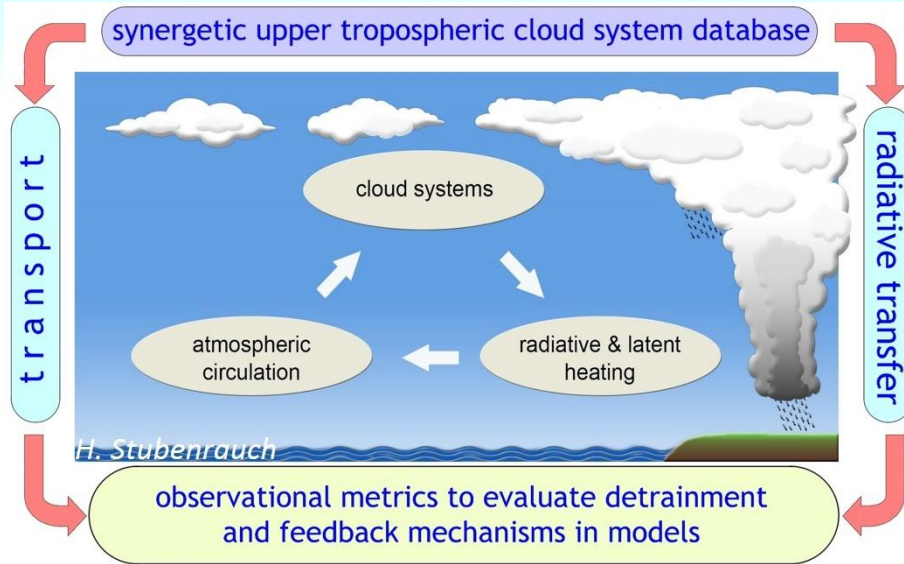
**-> models should be in agreement with observations**

**Goals:** - understand relation between convection, cirrus anvils & radiative heating  
- provide obs. based metrics to evaluate detrainment processes in models

# UTCC PROES Strategy

meetings: Nov 2015, Apr 2016, Mar 2017

**working group** links communities from observations, radiative transfer, transport, process & climate modelling



**focus on tropical convective systems & cirrus originating from large-scale forcing**

- **Cloud System Concept, anchored on IR sounder data**  
(horizontal extent & convective cores/cirrus anvil/thin cirrus *based on*  $p_{cld}$ ,  $\varepsilon_{cld}$ )  
-> **relationships between anvil properties & convective strength**
- **build synergetic data** (vert. dimension, atmosph. environment, temporal res.)
- **determine heating rates** of different parts of UT cloud systems
- **follow snapshots** by Lagrangian transfer -> **evolution & feedbacks**
- **investigate how cloud systems behave in CRM studies**  
**& in GCM simulations** (*under different parameterizations of convection/detrainment/microphysics*)

# GEWEX UTCC PROES highlights 2017

## ➤ 2<sup>nd</sup> GEWEX UTCC PROES meeting

hosted by Johnny Luo, at City College, University of New York, 28 – 29 March 2017

*vivid discussions about synergies & cooperations (funding dependent):*

*data, observational & CRM process studies & climate model parameterizations*

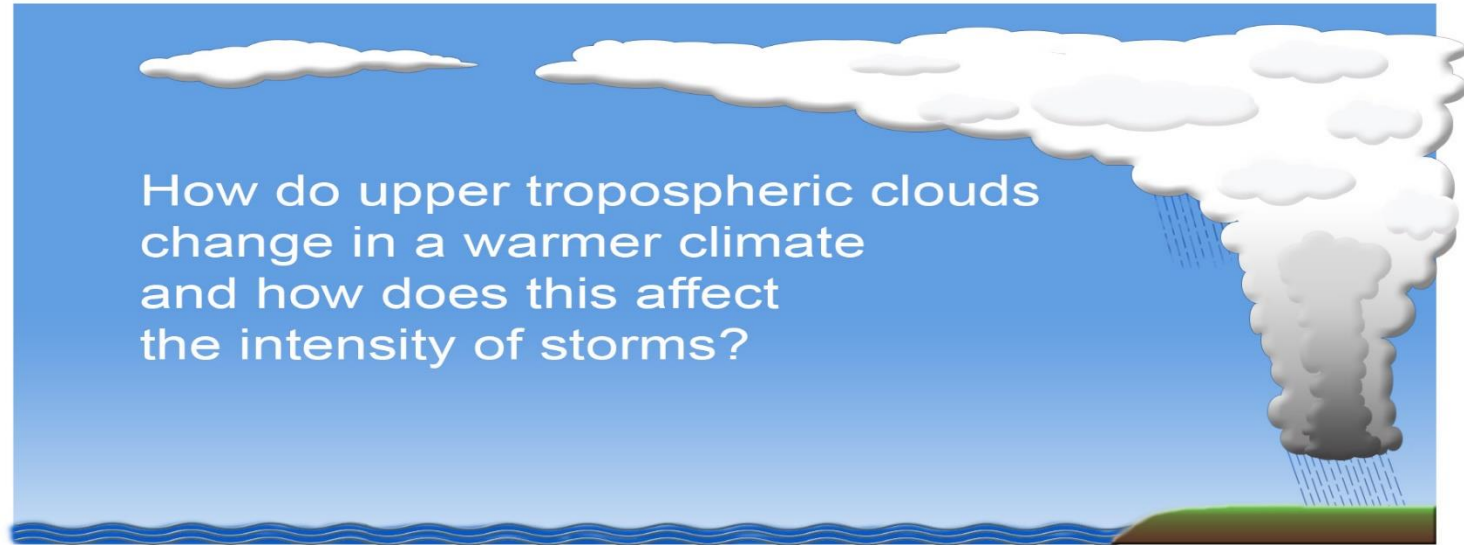


## ➤ article in GEWEX Newsletter May 2017

## ➤ AGU session, convened by H. Takahashi, R. Storer

## ➤ UTCC PROES website constructed, in cooperation with French data centre AERIS goals, talks of the meetings, references

# Actionable Questions



- 1) How much are anvil properties influenced by convective strength?
- 2) What types of cirrus are most responsible for heating the atmosphere and thus influential to climate sensitivity?
  - How much of the heating can be traced to convectively generated cirrus ?
  - How much of the variability of UT heating is governed by variability in areal coverage, emissivity and microphysics ?
- 3) How does the heating affect the convection ?
- 4) How does the heating affect the large-scale atm. circulation?

# Goals & discussion points of this meeting

1) available observations & analyses to study relationships between convection and anvils

**discoveries**

2) combining latent / radiative heating rates

3) process studies (observational & with CRMs)

**explanations**

3) diagnostics for evaluating climate models

4) feedback studies with climate models

**consequences**

Is it time to write a review on the subject ? ....

How long should this working group persist?