GEWEX Process Evaluation Study on Upper Tropospheric Clouds & Convection

GEWEX UTCC PROES

advance understanding on feedback of UT clouds

coordination: Claudia Stubenrauch & Graeme Stephens
LMD/ IPSL, France & NASA JPL

GEWEX UTCC PROES workshop,
Paris, France, 22-23 October 2018
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)
2nd 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
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

2) combining latent / radiative heating rates

3) process studies (observational & with CRMs)

3) diagnostics for evaluating climate models

4) feedback studies with climate models

discoveries

explanations

consequences

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

How long should this working group persist?