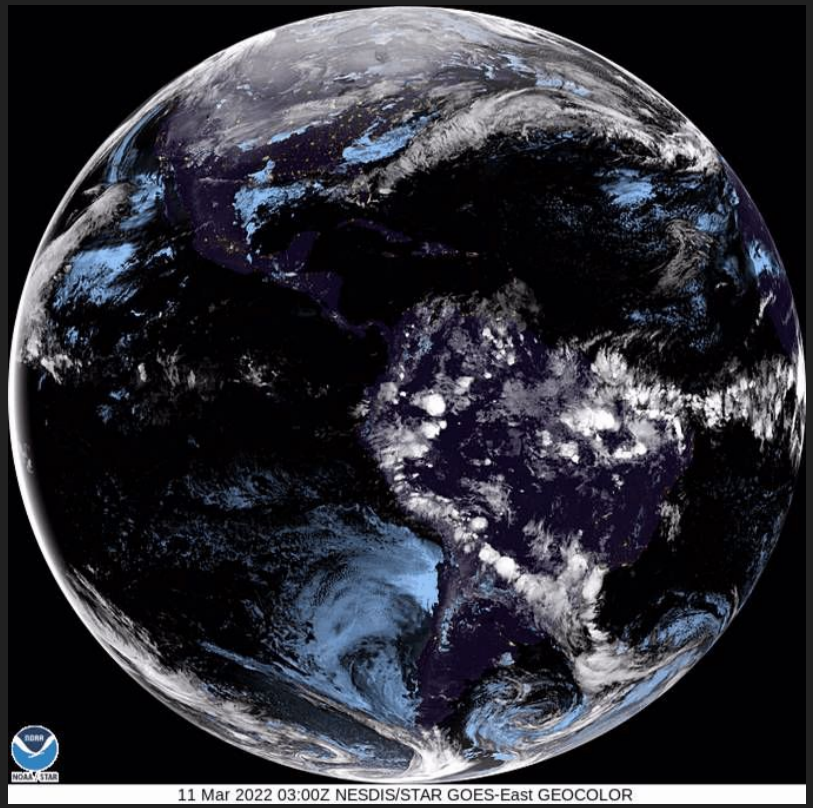
Cloud Processes in the Climate System

CLIVAR Summit 2022
Charlotte DeMott, Hailong Wang, Patrick Taylor (PSMI)
Aaron Levine (POS)
Haiyan Teng (PPAI)

Clouds across the globe



- Formed by water, ice, or both
- Organize on multiple scales
- Reflect incoming solar radiation
- Trap outgoing longwave radiation
- Transport heat, moisture, aerosols
- Generate rain and snow
- Shade and freshen the oceans
- Sustain ice caps and glaciers
- Fascinate and frustrate modelers

Daytime: multispectral “True Color”
Nighttime: blue = liquid clouds (fog, stratus); white = ice clouds
Source: NOAA GOES Image Viewer

Purpose/Objective

In this session, we aim to:

- Identify promising synergistic use of observation and modeling approaches to constrain cloud-climate feedback
- Identify specific gaps in convective process understanding and how to address them
- Identify and prioritize climate-relevant gaps in cloud-aerosol interaction science and candidate solutions

Topics and speakers

- **Hui Su** (NASA JPL): *Process-oriented model diagnostics and observational constraints on cloud feedback and climate sensitivity*
- **Yang Tian** (NCAR): *Understanding moist convection-environment interaction from high-resolution modeling and observations.*
- **Po-Lun Ma** (PNNL): *Assessing cloud-aerosol interactions as a source of climate predictability*

Plenary Discussion Questions

- What are the key priorities/knowledge gaps in our understanding of cloud processes that limit Earth system prediction?
- What actions can US CLIVAR take to advance our understanding of cloud processes in the climate system?

Panel Discussion Questions

- **POS:** In what ways do the uncertainties in cloud processes influence ocean variability?
- **POS:** What are the current capabilities of our sustained observing system for understanding cloud processes and cloud-climate interactions? What are the biggest gaps?

- **PSMI**: Are there specific process studies needed to advance our understanding of cloud processes in the climate system and improve their representation in earth system models?
- **PSMI**: What are the current capabilities of our sustained observing system for understanding cloud processes and cloud-climate interactions? What are the biggest gaps?