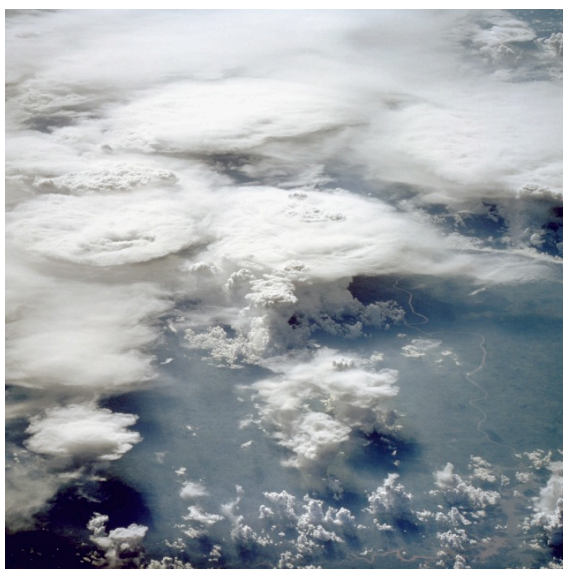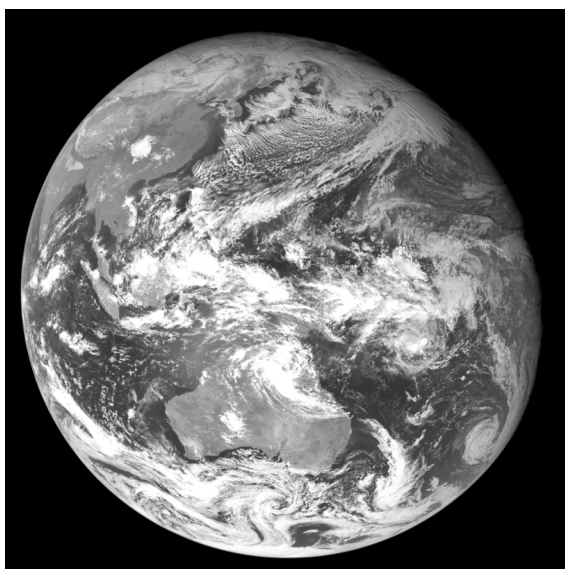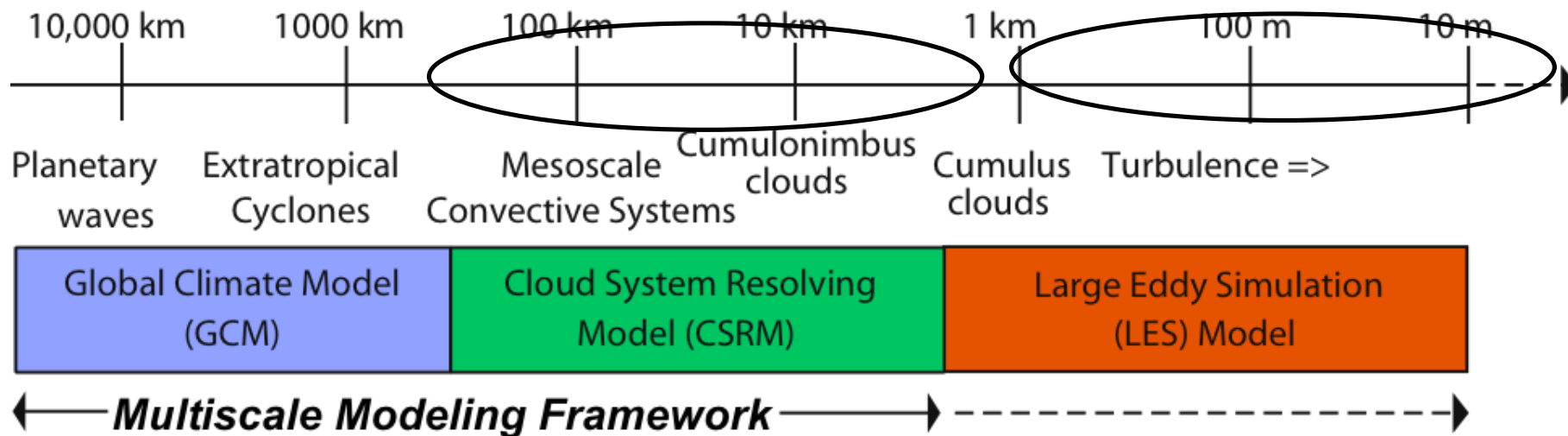# Focus on deep and shallow convection, and turbulence

Steve Krueger and Chin-Hoh Moeng

Los Angeles, CA
January 16, 2008

Scales of Atmospheric Motion

10,000 km	1000 km	100 km	10 km	1 km	100 m	10 m

Planetary waves | Extratropical Cyclones | Mesoscale Convective Systems | Cumulonimbus clouds | Cumulus clouds | Turbulence =>

Global Climate Model (GCM)	Cloud System Resolving Model (CSRM)	Large Eddy Simulation (LES) Model

◄─ *Multiscale Modeling Framework* ─► - - - - - - - - - - ►

Short-term Plans (from last meeting)

- **Better understand interactions of deep and shallow clouds, and turbulence.**

  - Analyze existing and new *benchmark simulations.*

    - *ACTION ITEM: Perform large-domain LES of deep convection.*

      ➤ *Can be done with grid points of ~5000x5000x400*

      ➤ *Will be performed using SAM at Stony Brook (Marat and Minghua)*

      ➤ *Need coordination to include analysis into the code*

  - Analyze *observational datasets.*

    - *ACTION ITEM: Identify and/or develop appropriate datasets.*

  ➤**Being done by LARC group (see presented new work later)**

New work presented (1)

➤ *Develop a new cumulus scheme with vertically variable entrainment rate which improves wind, temperature and precipitation in a MMF (Minoru Chikira, Frontier)*

➤ *Develop methods to evaluate cloud properties from satellite data (TRMM, Terra, Aqua, CERES) (Xu, LARC)*

➤ *Identify mechanisms that determine the transition time from shallow to deep convection over land (Wu, UCLA)*

New work presented (2)

➤ *Examine sensitivity of MMF low-cloud climatology to resolution (Blossey, UW)*

➤ *Show grid sensitivity in simulating shallow cumulus (Krueger, U Utah)*

➤ *Improve stratiform and convective precipitation using a new microphysics scheme (Morrison ,NCAR)*

Issues (from last meeting)

- Computer time will be required for the proposed simulations.

- **Stony Brook's computer; others?**

- Large size of large-domain LES output dataset will make it a challenge to access and analyze. We need help to design.

➢ **Need to form a working team of those who will be interested in using this large dataset.**

- Access to SP-CAM code and results: We need a clone of Marat!

➢ **Any volunteer?**

Long-term Plan

- **improved SGS physics in MMF**

Rename the theme to focus more on deep convection?

Old name: *Interaction between deep and shallow conv, and turbulence*

problems: no "middle" conv? other SGS processes?

New name?

1. Small-scale processes in deep conv system

2. Subgrid-scale processes in cloud-resolving models