# POST
# (Physics of Stratocumulus Top)

## Overview and Goals

Science and Data Workshop

Feb 5-6, 2009

# Proposed Modeling Studies

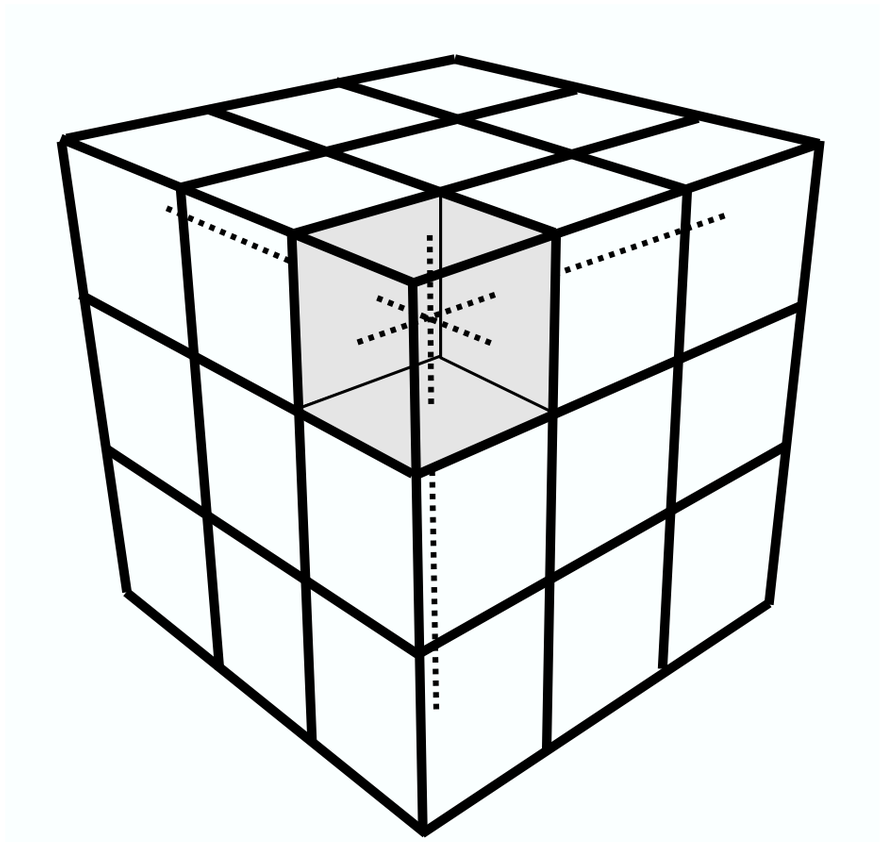
- ***Warsaw University (Szymon Malinowski, Krzysztof Haman, and students)***
  - We will focus our efforts on understanding details of small-scale mixing processes at the top of the marine Sc.
  - Following the measurement period of POST, we would like to perform high-resolution numerical simulations in the spirit of Andrejczuk et al (2004, 2006).The goal is to compare high-resolution records obtained during the measurements with proxy records re-constructed from simulations.

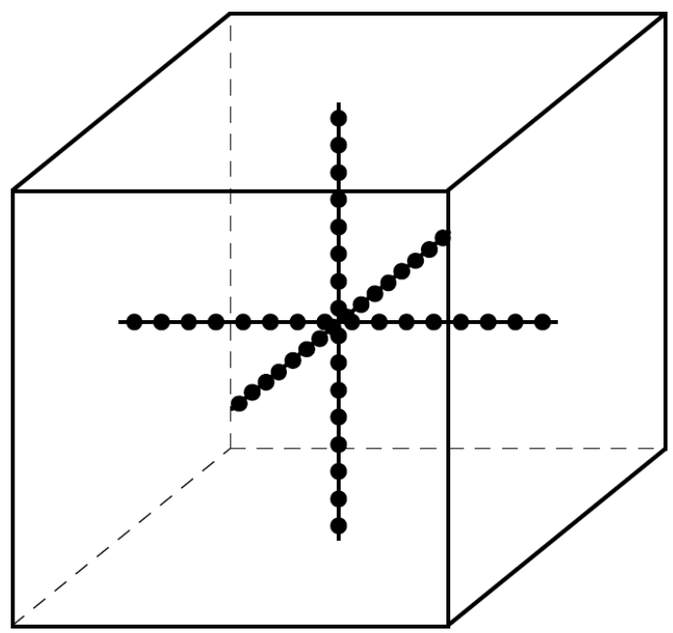
- ***University of California Santa Cruz (Patrick Chuang, and student)***
  - *How are drizzle and entrainment related?* On large-eddy scales, entrainment and drizzle feed back onto each other in complex ways. For example, entrainment can affect collection rates not only through the DSD, but also by affecting production of turbulent kinetic energy, which in turn may alter turbulent collection and/or turbulent fluxes of moisture into the cloud layer. The myriad of feedbacks is likely to be best addressed through models.

- We propose to utilize a simple 1-D mixed-layer model (Lilly, 1968) to examine some of these interactions.
- More complex models (e.g. 3-D LES) may also be needed to study this question, and it is hoped that the LES simulations that will be conducted by the POST modeling PIs will play a role in addressing this question.

- ***University of Utah (Steven Krueger, and student)***
  - The goal of our project is to identify the mechanism by which air is ultimately entrained, and the scales that come into play in the mixing between the free atmosphere, the EIL, and the cloud, by using a combinationof POST aircraft data and fine-scale numerical modeling.
  - *The fine scale measurements of the EIL that were made during POST should be able to resolve the structures that are SGS in current LES*. We will then be in a better position for judging what kind of improvements will be needed before LES models can produce benchmark simulations, and for evaluating attempts to make such improvements.

– We propose to use a novel, multiscale modeling approach to resolve cm-scale structure but circumvent the CPU constraints of 3D LES. In this approach, scales that are not resolved by the LES grid are resolved on a 1D domain in each LES grid cell by the Linear Eddy Model (LEM).





- ***Naval Research Laboratory (Shouping Wang, William Thompson, Tracy Haack, Anthony Bucholtz, Steven Miller)***
  - The NRL team intends to integrate the remote sensing and *in situ* measurements (particularly the high-frequency turbulence data near the cloud top) in POST into COAMPS-LES modeling system and carry out a number of specific case studies.
  - During POST, mesoscale model simulations of flight days will be essential in documenting limitations in the prediction of model-derived entrainment as well as potentially identifying specific processes contributing to cloud-top entrainment variability.

- ***Colorado State University (Takanobu Yamaguchi)***
  - We plan to perform two high-resolution, 6-h LES model simulations based on POST, with grid sizes of $(5\ m)^3$ and domain sizes of 5 km x 5 km. Processes to be investigated include subgrid-scale turbulence, cloud-top radiative effects and entrainment processes and downdraft characteristics.

- ***National Center for Atmospheric Research (Wojciech Grabowski)***
  - I am interested in validation model simulations of small-scale entrainment and mixing, and their effect on the cloud condensate and cloud turbulence.

an example of high-resolution LES...

# UU LES DYCOMS-II Sc LES

- standard setup except spun-up to a horizontal grid size = 6.25 m for a short time