Final discussion
Moist Processes in Future High Resolution NWP Models

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Discussion on “challenges in high resolution modeling”

- Are we seeing similar problems in our models?

- Size of convective structures

- Intensity of precipitation

- Onset of precipitation

- Timing and location

- ....

- Are there systematic errors in our models?

- Governed by domain size

- One way forward is to look at an idealized case of mid-latitude open cell convection... to be continued.

Discussion on “challenges in high resolution modeling”

- How should we use more computer power?
- Higher resolution?
- Ensemble forecast?
- Larger domain size?
- Longer forecast time (48 hours)?
- All of the above?
- Domain size – very much governed by “shape of country” (also placement of boundaries).
- How large does our models need to be?

Discussion on “challenges in high resolution modeling”

- Has the gray zone shifted towards smaller scales?

- There will always be processes that act on scales smaller than the horizontal resolution

- Perhaps stretched on both side of the spectra?

Discussion on “challenges in high resolution modeling”

- How do we quantify the “skill” compared to large scale models?

- i.e talks by Federico Grazzini and Sami Niemelä

Impact of aerosols

- When may an aerosol scheme be important in NWP?

- Direct effect: strong gradients in aerosol mass concentrations?

- Indirect effect: Stratiform clouds and rain processes?

Impact of aerosols

- On the wish list of “Aerosol community” (represented by Annica Ekman :))

- Prognostic equation of

  Black carbon, Sulfate, Organic compounds, sea salt, dust

- All represented by mass and number concentration ->10 new prognostic equations!
- + 2-moment scheme liquid and ice
- Complexity

Impact of aerosols

- Peter Clark: Sure! If you assume that there is any predictability on the cloud scale
- Annica Ekman: There is! And cloud ice (cloud water) has similar uncertainty...

Impact of aerosols

- Need to work closer together with aerosol community , get involved in cloud-aerosol discussions

Discussion on deep convection

- Worrying that an artificial parameter such as horizontal diffusion has such a strong influence.

- Not a cure for stability, but rather applied as a physical parameterization

Discussion on deep convection

Is it still useful to work with 1D model to develop new parameterization for micro-physics, shallow convection if the dynamics, hor.diff and SLHD have more impact than physics at high resolution ?

Or shall we develop parametrization with specific constraint from the type of the dynamics or the type of the model ? Interoperability ?

Discussion on deep convection

Predictability of meso scale convective systems?
Initial conditions, difficult if forcing weak

Back to question of domain size...?

Discussion on deep convection

- Semi-Lagrangian, Semi-Implicit dynamics
- Lower boundary condition imposes a flux even though vertical velocity is 0.
- Diffusive

Discussion on deep convection

- Is it a problem that we treat convection as fully mature, without intermediate stage?

- What is the “non-mature” stage of convection?

  Shallow convection?

Discussion on deep convection

- Data assimilation

- Which technique to use?
- How to best use radar
- Simplified physics, will 4D-var keep up?
- Be careful touching the small waves

Discussion on deep convection

- How to eliminate spin-up? High resolution models interesting for nowcasting.

Evaluation

- Use of dataset simulators promising approach for efficient model evaluation based on satellite data comparisons.

- Are we making satellite/models agree for the wrong reason (assumptions made)

Verification

- Structure Amplitude Location

- Object based verification in order to address skill in high resolution NWP compared to large scale models.

- Objects sensitive to threshold... how does it compare to large scale models, can we see that there is any skill in comparison?

Application

- Short range precipitation forecast

- At which level should the background wind be?

Any other issues, questions, concerns?