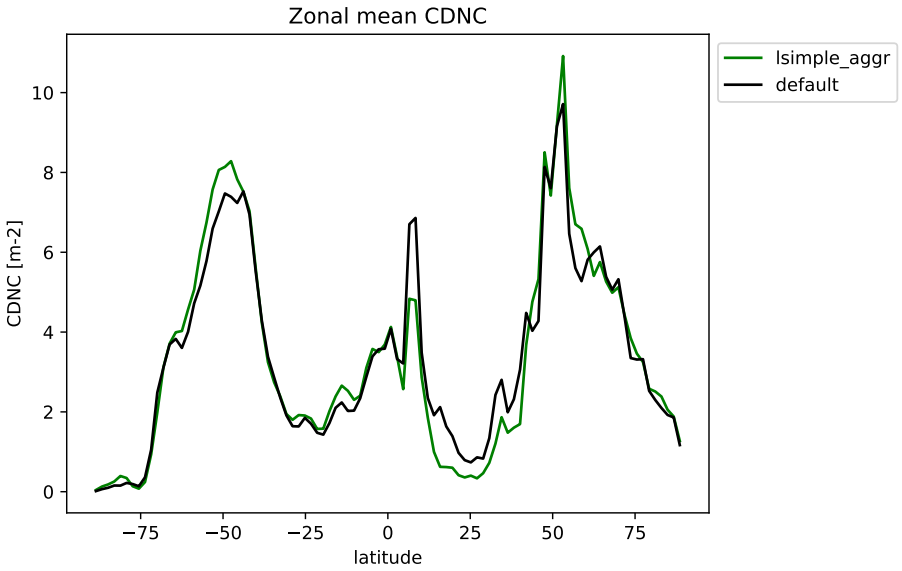
Simplifying the Cloud Micro-physical Aggregation Process in the Climate Model ECHAM-HAM and Analyzing its Effect on the Model



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Abstract

Lorem ipsum dolor...

Contents

1 Introduction

- cloud microphysical model
- echam hammoz
- CMP processes - riming, accretion aggregation
- focus on aggregation
- simplifaction of model

2 Background

- on aggregation
- on ECHAM-HAM

3 Methods

- taylor series expansion
  - problems with compiling
  - set timer to see efficiency: no significant change (only simpler to understand)
  - for debugging: exchange line by line to figure out where the mistake lies
    - didn't work
    - solution: apply merge (as for other arrays) at the end and try again
    - zdiag0 diagnostics to see if it worked or not
  - diagnostics variable, outputting wrong values
    - reason: variables exist in grid, but since only 1:kproma are considered there was a problem when dividing into blocks for parallelization, last block was partly filled with random values
  - in the end for model not as important but can be interesting for python diagram (comparison)
- drastic simplification
  - set to const value (ztmp1 = 2)
    - worked, but Fnet value = -4.4388 (should be between 0-1)
  - set to const value (ztmp1 = -2000)
    - wrong results, since log becomes negative for small values: in the end positive and big values
  - estimate value with estimate_range.py
    - tried values between 100-400
    - values between 100-200 worked best
    - detailed explanation how we got these values:
      - ...
  - estimate value with different parameters with estimate_range_sina.py
    - write down detailed formulation for aggregation to find dependencies
    - output different parameters (arrays) with zdiag02, zdiag03 etc in mo_cloud_micro.f90 and determine ranges to apply to python script for plotting
    - try to simplify with taylor series expansion
- compiling with intel on euler and nag4 on aerosol
  - nag4 more detailed but only for short timeframe (5 days in october 2003)
  - intel less detailed, run for 1 year (2003)

4 Analysis and Results

- plots
  - figure out parameters: melina's plots, david's paper
  - difference plots of default vs lsimple_aggr = true
  - zonal mean plots
  - separate plots in comparison
- use module conda, iacpy3_2020 environment

5 Conclusion

6 Discussion

7 Bibliography