

# Implementing the Thompson microphysics scheme in AROME

Bjørg Jenny K. Engdahl, MET-Norway

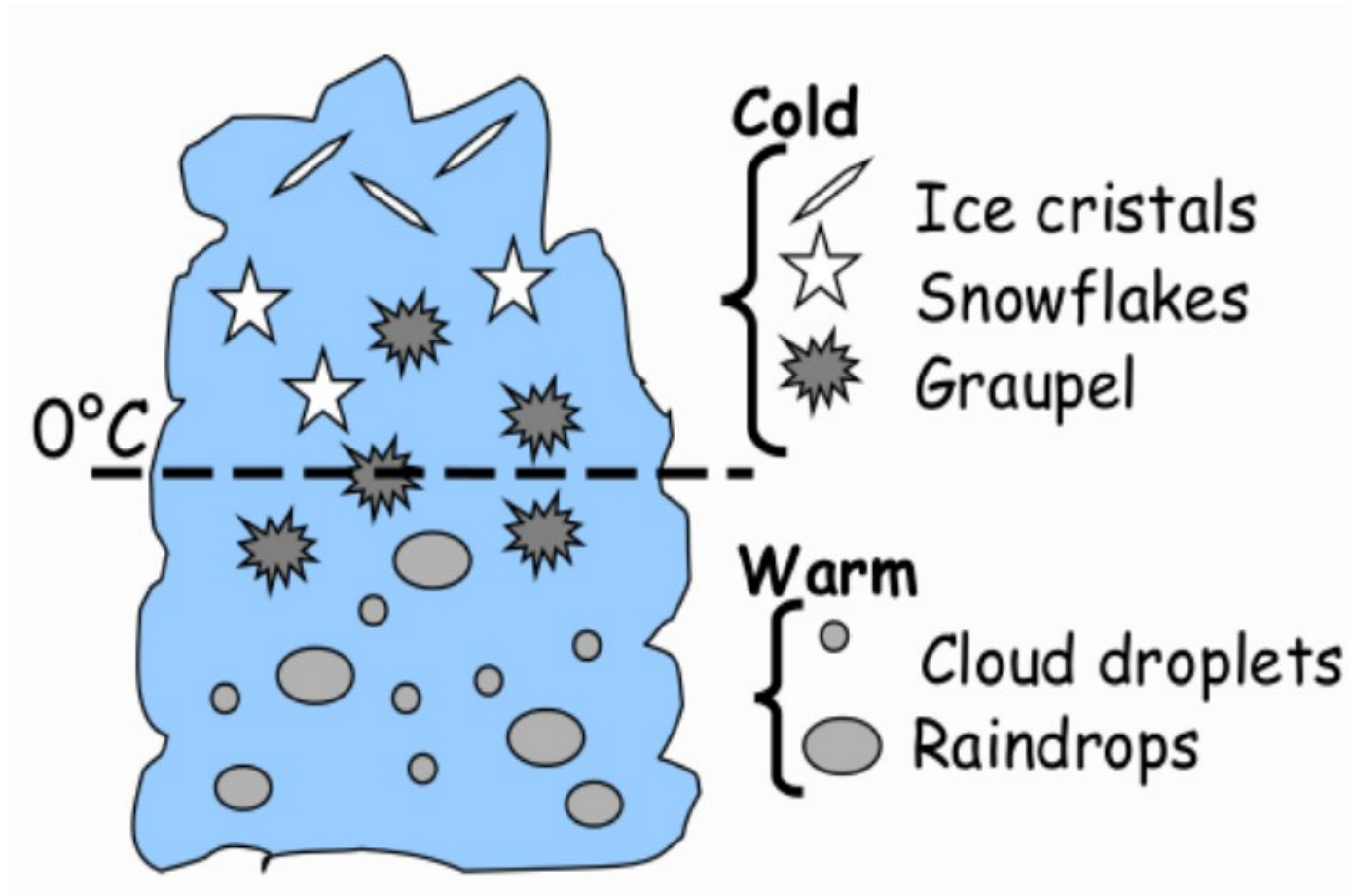
Supervisors: Bjørn Egil Nygaard (KVT), Greg Thompson (NCAR),  
Lisa Bengtsson (SMHI), Jón Egill Kristjánsson (UiO) and Terje Berntsen (UiO)



Major powerline collapse in winter 2013-2014

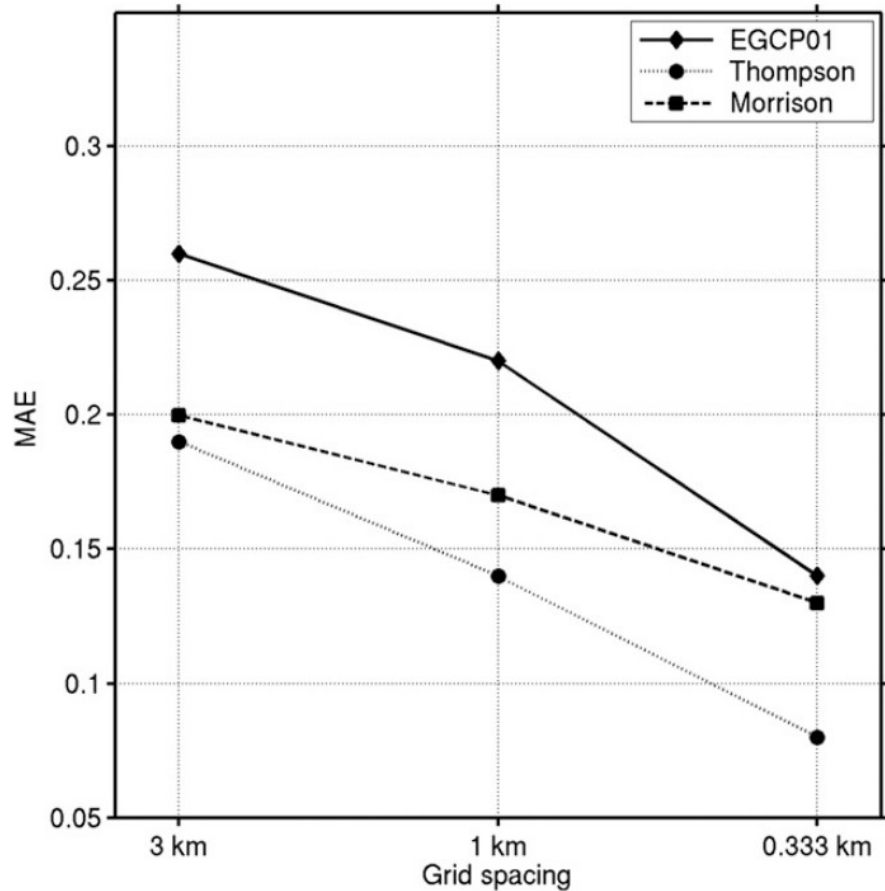


# Cloud microphysics



Supercooled liquid water essential for estimating ice loads

Several studies have found the Thompson et al. 2008 scheme to produce more realistic amounts of supercooled liquid water



Nygaard et al. 2011

# Plan

- Piecewise implementation of the Thompson scheme
- Validation of the new scheme
  - idealized cases
  - real cases using conventional observations and specialized instrumentation for icing measurements
- Run a climate downscaling with the new scheme for present and future ice loads

# Validation of current microphysics

## Ålvikfjellet, hardanger

HARMONIE-AROME cy40 release candidate, with the OCND2 option

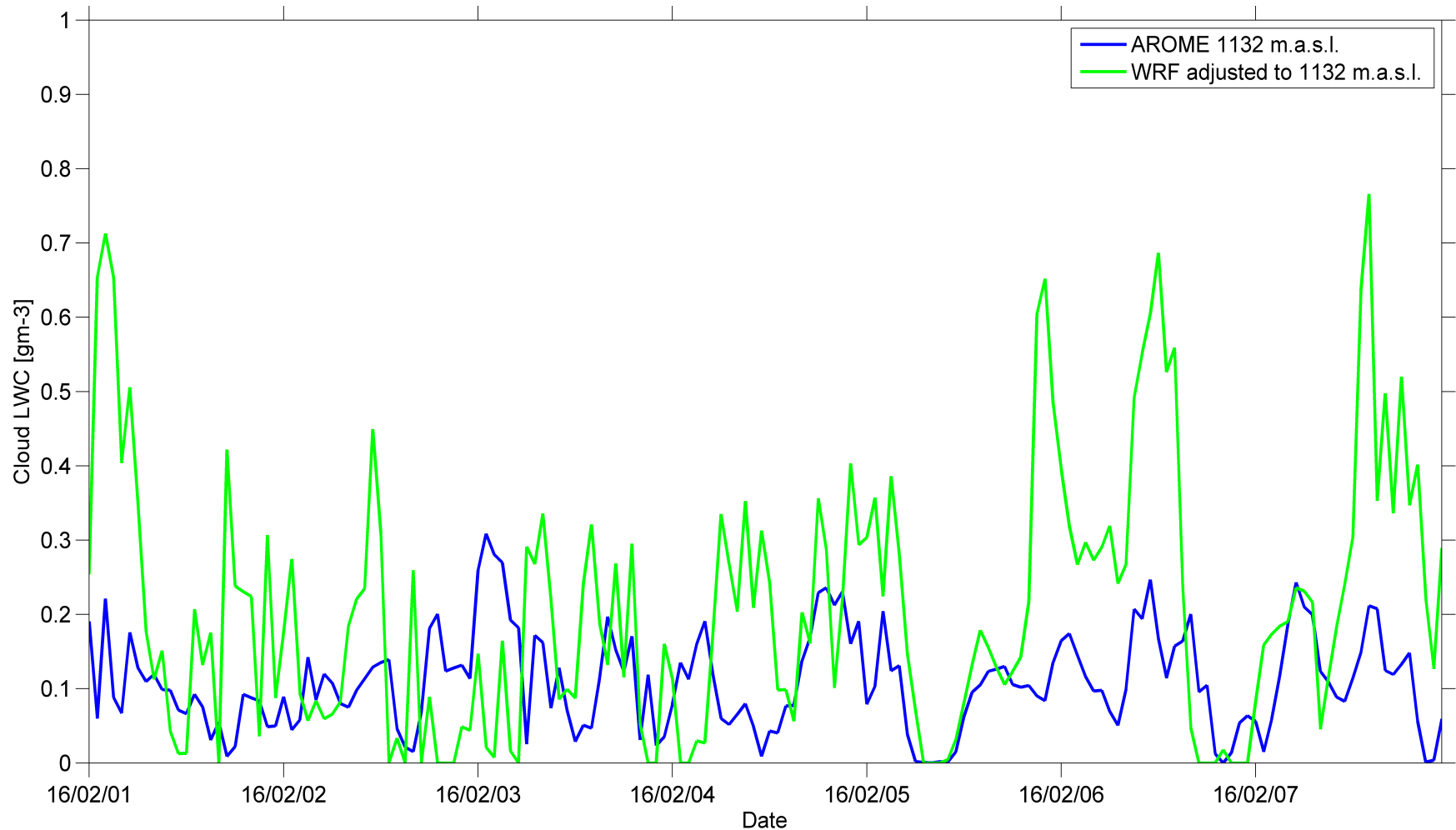
WRF with Thompson microphysics, adjusted to AROME model height

Icing case in February 2016

Very preliminary results!!

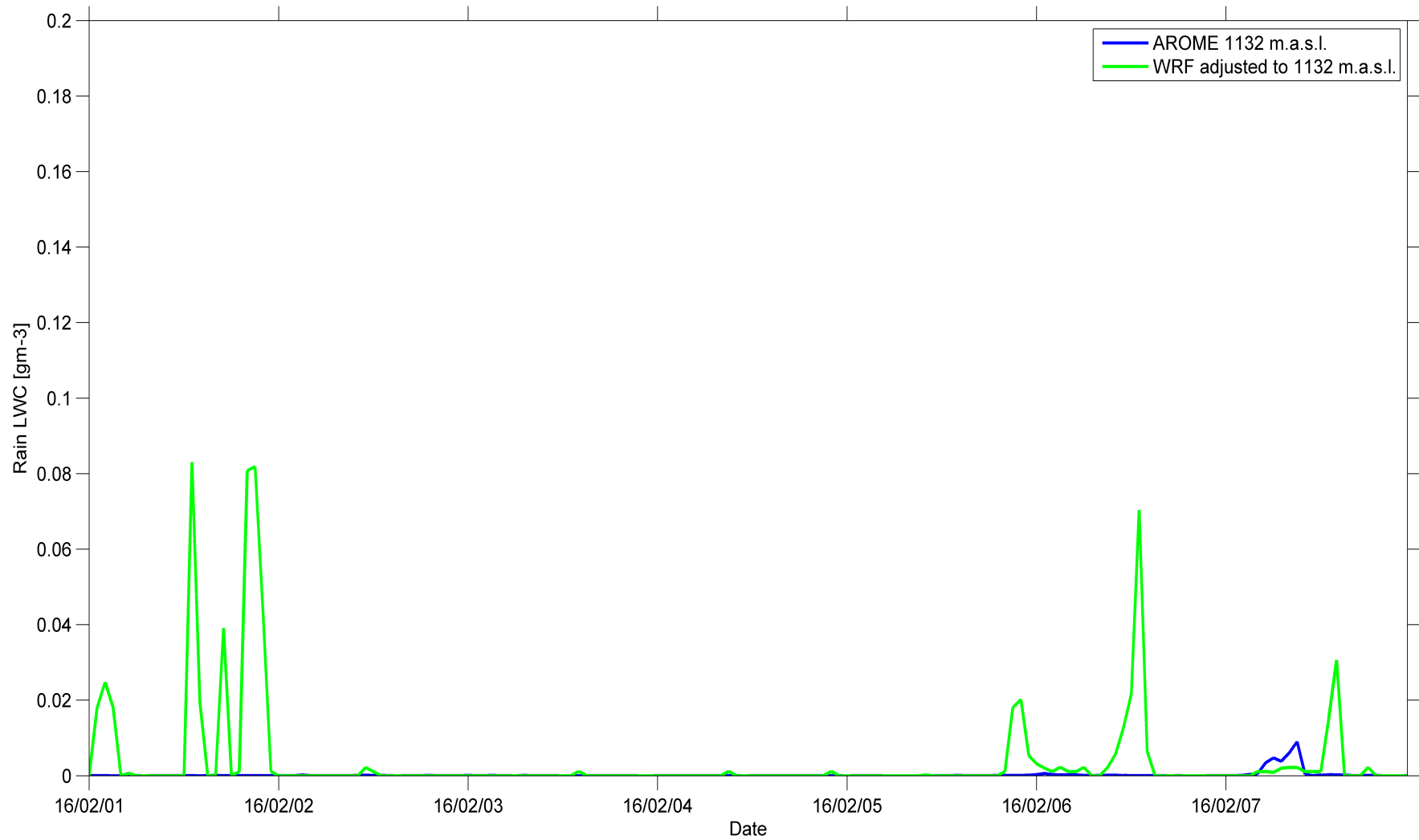


# Cloud liquid water at Ålvikfjellet

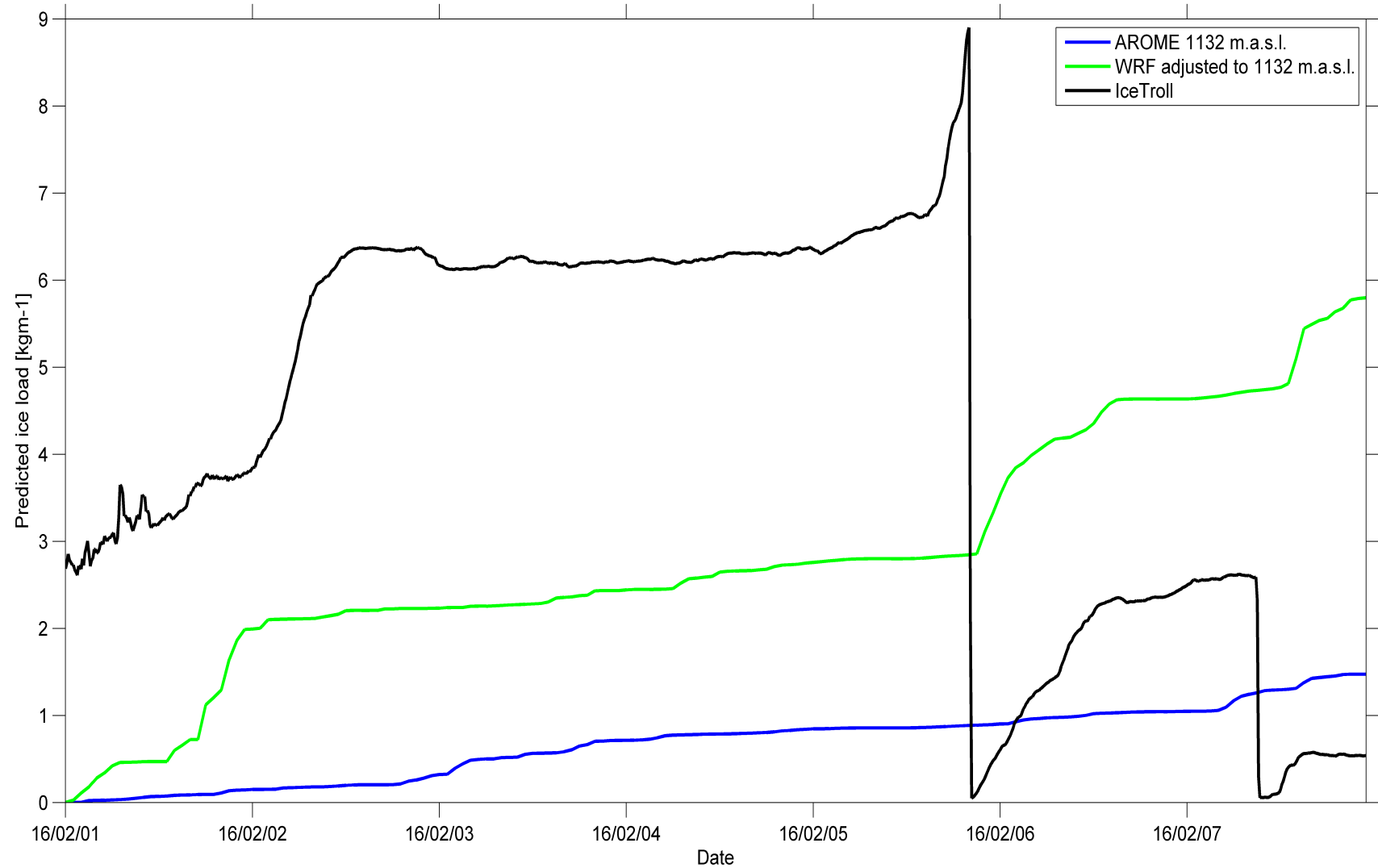




# Rain/drizzle liquid water



# Models vs IceTroll

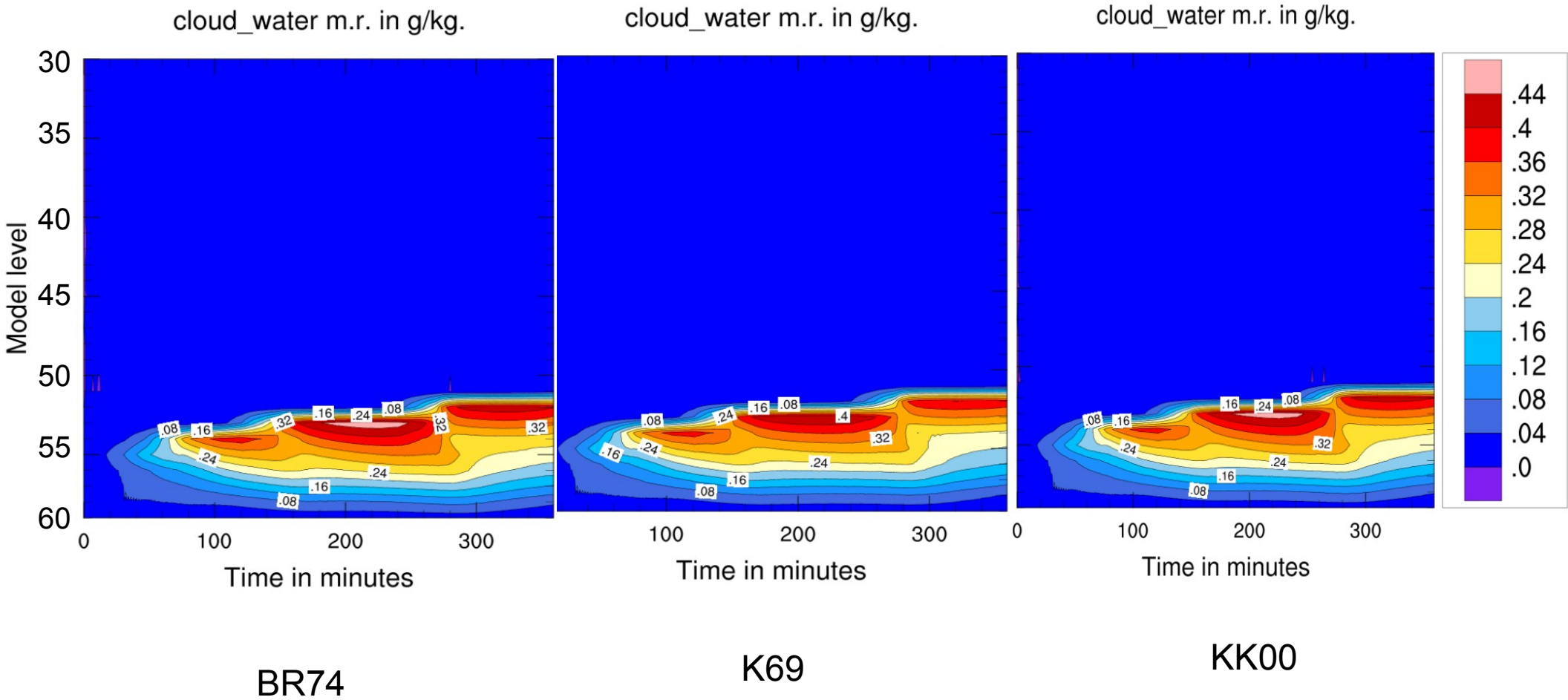


# Status

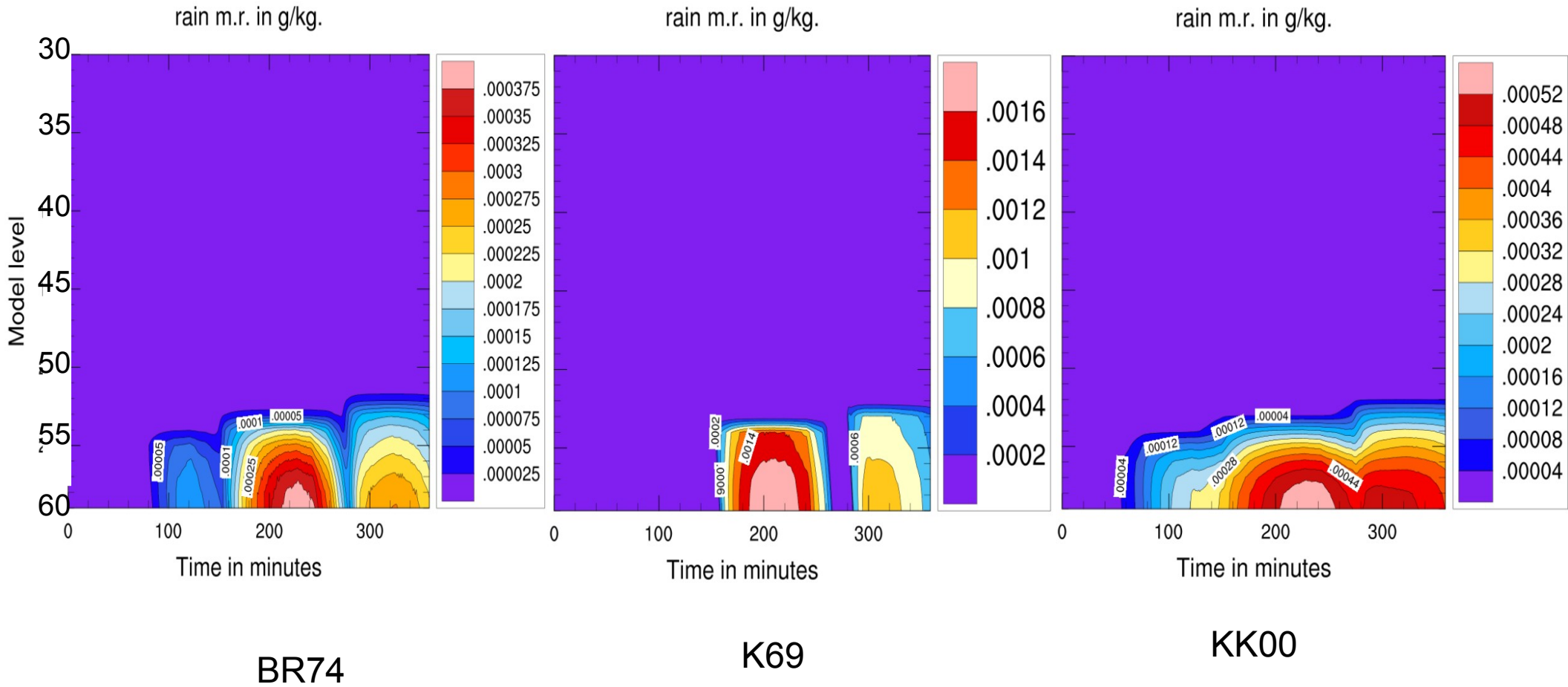
- Autoconversion: Kessler (1969), Khairoutdinov and Kogan (2000), Berry and Reinhardt (1974)
- Accretion of cloud water by rain drops: Added variable collection efficiency
- Ice nucleation: Cooper (1986) formulation

Tested with MUSC

# Autoconversion: cloud water



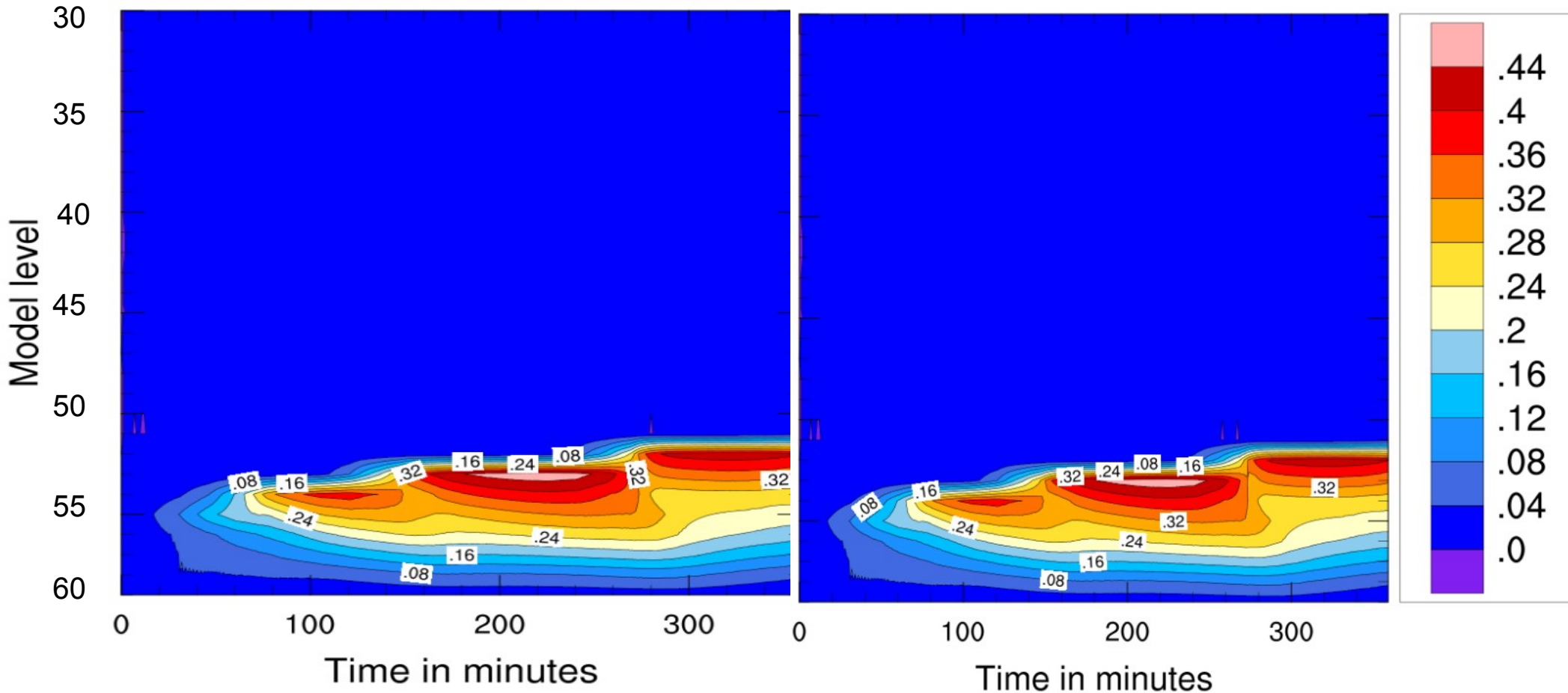
# Autoconversion: rain



# Accretion: cloud water (with BR74 autoconversion)

cloud\_water m.r. in g/kg.

cloud\_water m.r. in g/kg.



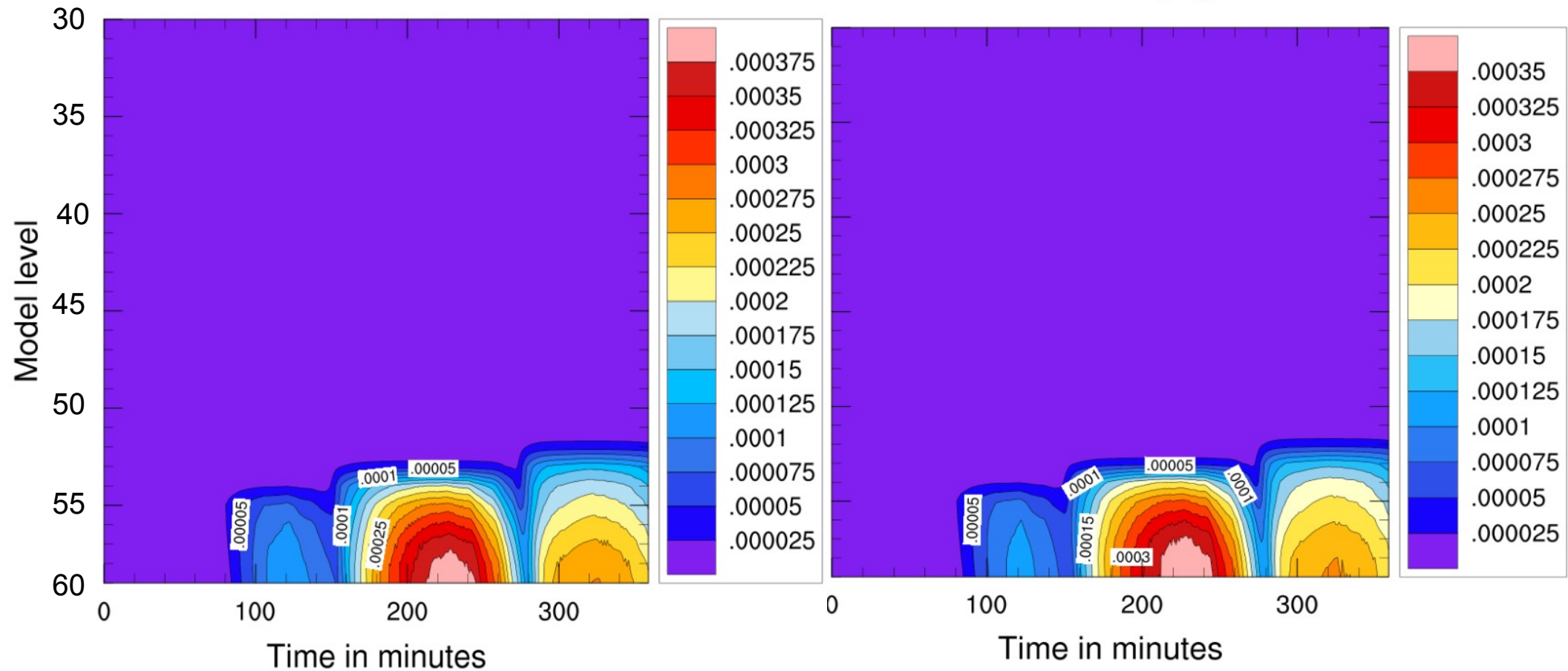
Without variable collision efficiency

With variable collision efficiency

# Accretion: rain (with BR74 autoconversion)

rain m.r. in g/kg.

rain m.r. in g/kg.

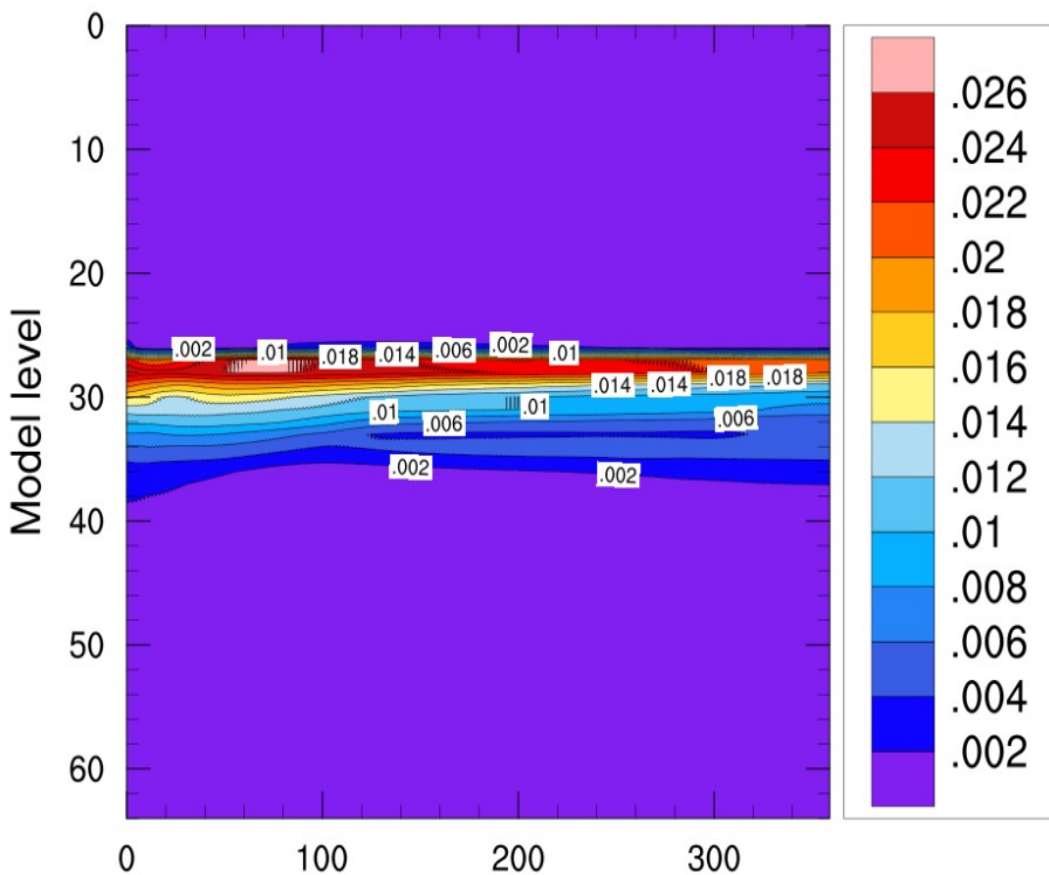


Without variable collision efficiency

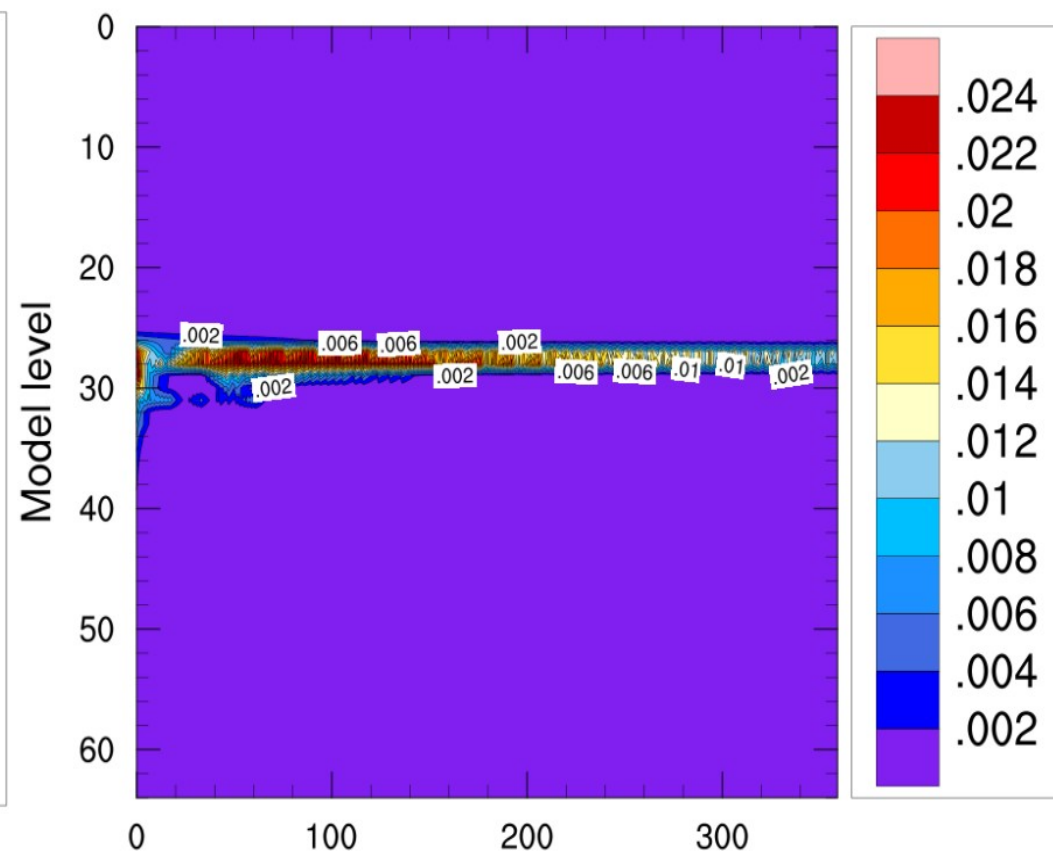
With variable collision efficiency

# Heterogeneous nucleation: cloud ice

cloud\_ice m.r. in g/kg.



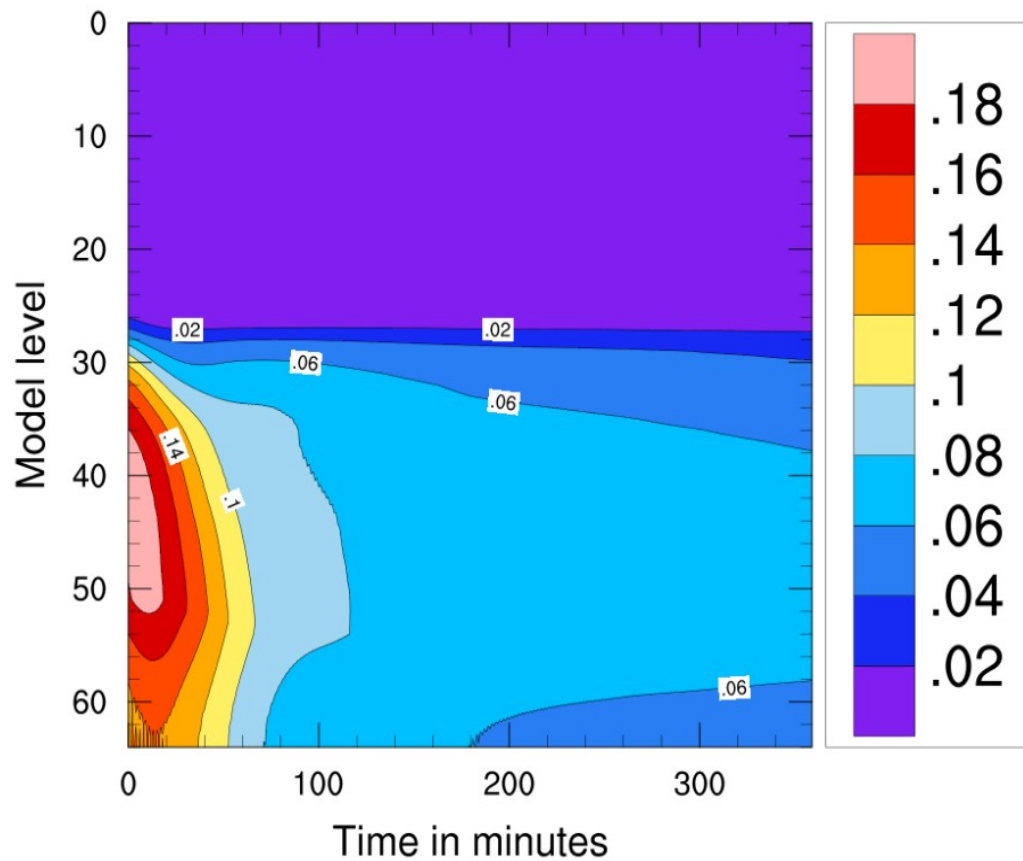
cloud\_ice m.r. in g/kg.



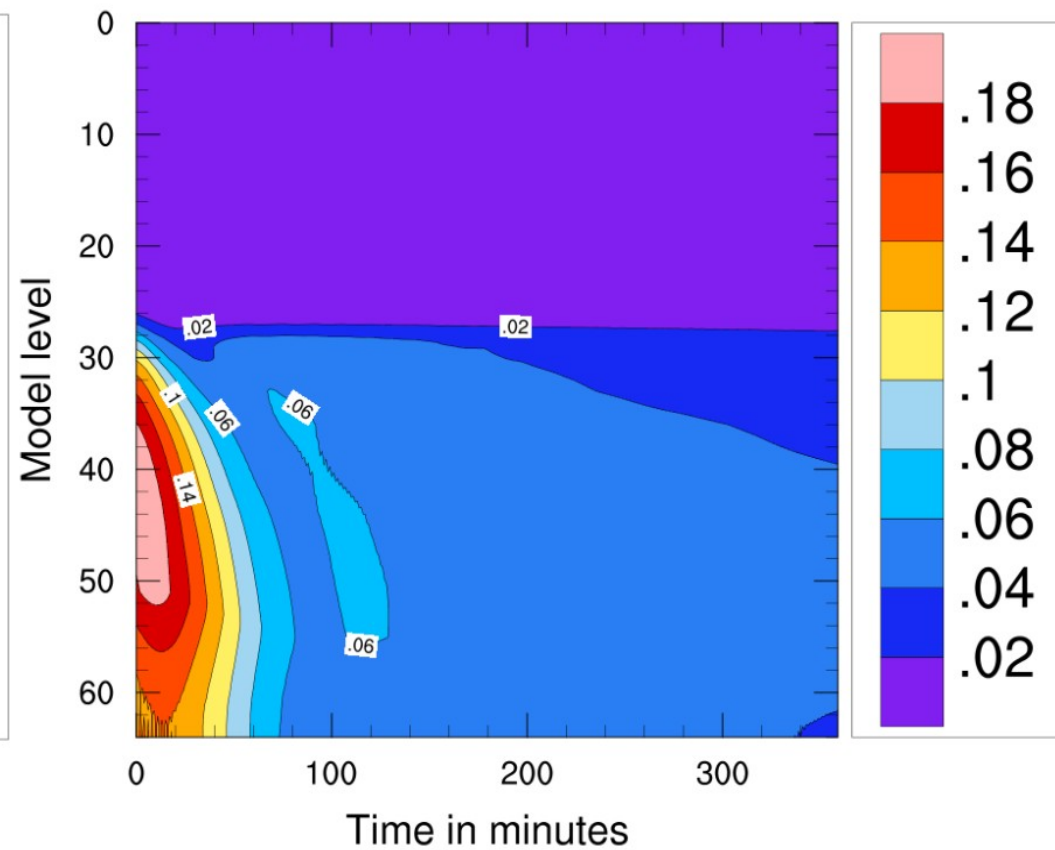


# Heterogeneous nucleation: snow

snow m.r. in g/kg.



snow m.r. in g/kg.



Thank you for your attention!

