



# IMPLICIT AND EXPLICIT PRECIPITATION PARTITION DEPENDENCE ON HORIZONTAL RESOLUTION FOR A SOUTH ATLANTIC CONVERGENCE ZONE CASE

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## Objectives

The main objectives of this work are:

- To modify the partition of implicit precipitation;
- To evaluate the precipitation production and partition at different horizontal resolutions in the Eta Model with Kain-Fritsch and Ferrier schemes

## Specific objectives:

1. Evaluate the convective/stratiform precipitation partition of the Eta-KF;
2. Adjust Kain-Fritsch precipitation production in the Eta Model with resolution;

## Motivation

•The version of the Eta Model using Kain-Fritsch cumulus parameterization scheme tend to overestimate precipitation over South America;

•Despite the increase of resolution, the cumulus scheme still overproduced convective precipitation;

•Adequate partition of implicit and explicit precipitation by NWP models is important for a better representation of the total precipitation;

•With increasing resolution the explicit scheme should become more important;

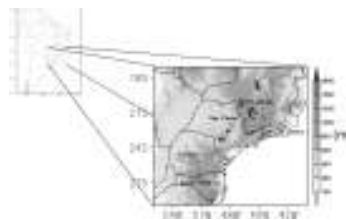
## Methodology

A change is proposed to include horizontal resolution dependence on the parameter that controls the fraction of condensate converted to rain or snow.

As resolution increases, the convective scheme converts less condensed water into precipitation, part of the condensed water is made available to cloud microphysics scheme and another part evaporates. In grid resolution higher than 1 km, convective scheme still acts in removing convective instability but precipitation is produced by cloud microphysics

## Domain and Resolution

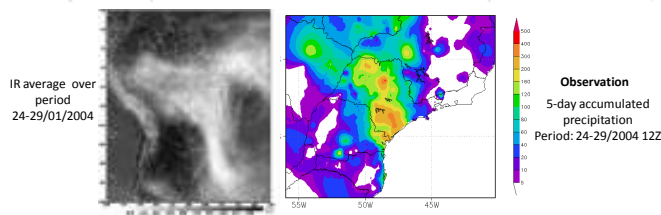
- Resolution 1: 20 km, 38 layers Hydrostatic mode
- Resolution 2: 10 km, 38 layers Hydrostatic mode
- Resolution 3: 5 km, 38 layers Non Hydrostatic mode



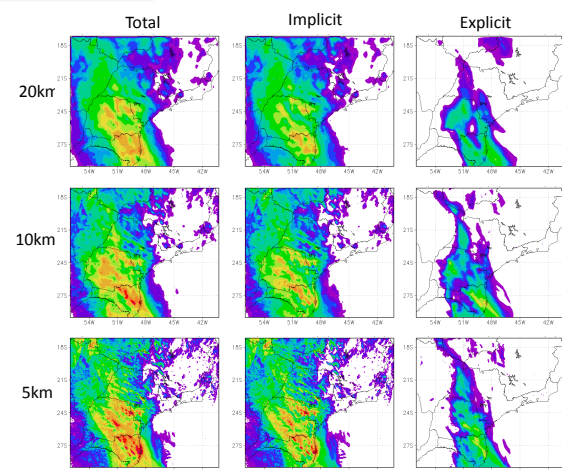
The domain of the 3 resolution versions was the same to reduce differences through lateral boundaries conditions

## Case Study

- South Atlantic Convergence Zone event that established over southeast and southern part of Brazil in the period January 24-29, 2004
- The cloud band exhibited a meridional orientation and significant rainfall over southeast Brazil;
- Widespread heavy rains occurred over the central and southern part of São Paulo state;

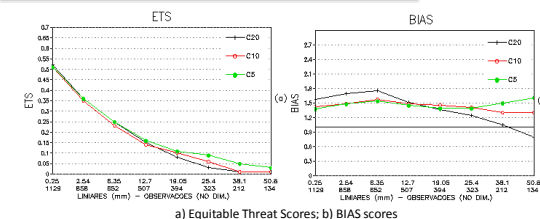


## Control Run



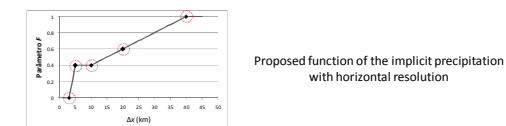
Simulated 5-day accumulated precipitation for the SACZ case for the control runs

## Control Run Objective Evaluation

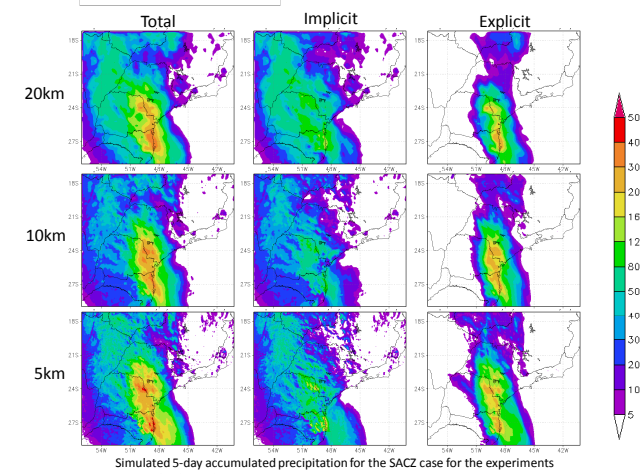


a) Equitable Threat Scores; b) BIAS scores

## Experiment Runs with Adjusted KF

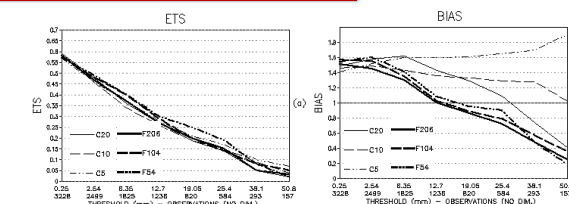


Proposed function of the implicit precipitation with horizontal resolution



Simulated 5-day accumulated precipitation for the SACZ case for the experiments runs with adjusted KF

## Adjusted KF Objective Evaluation



## Conclusions

- The convective activity parameter reduces the precipitation amount generated by the implicit scheme and increases the explicit precipitation with resolution increase;
- The proposed function reduced the positive bias of the model precipitation in the control runs;
- The precipitation band is positioned farther north and closer to the observation;
- Objective verification shows higher ETS for the adjusted KF;
- Adjusted KF at the 20 and 10 km resolution runs has improved skill for heavy rains;