# A COMPARISON OF VERY SHORT-TERM QPFS FOR SUMMER CONVECTION OVER COMPLEX TERRAIN AREAS, WITH THE NCAR/ATEC WRF AND MM5-BASED RTFDDA SYSTEMS

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# INTRODUCTION

- Purpose: to assess WRF convective precipitation forecast over complex terrain

- WRF-based RTFDDA system

  ***Liu et al. (2005, 2006) (2005 and 2006 WRF Workshop)***

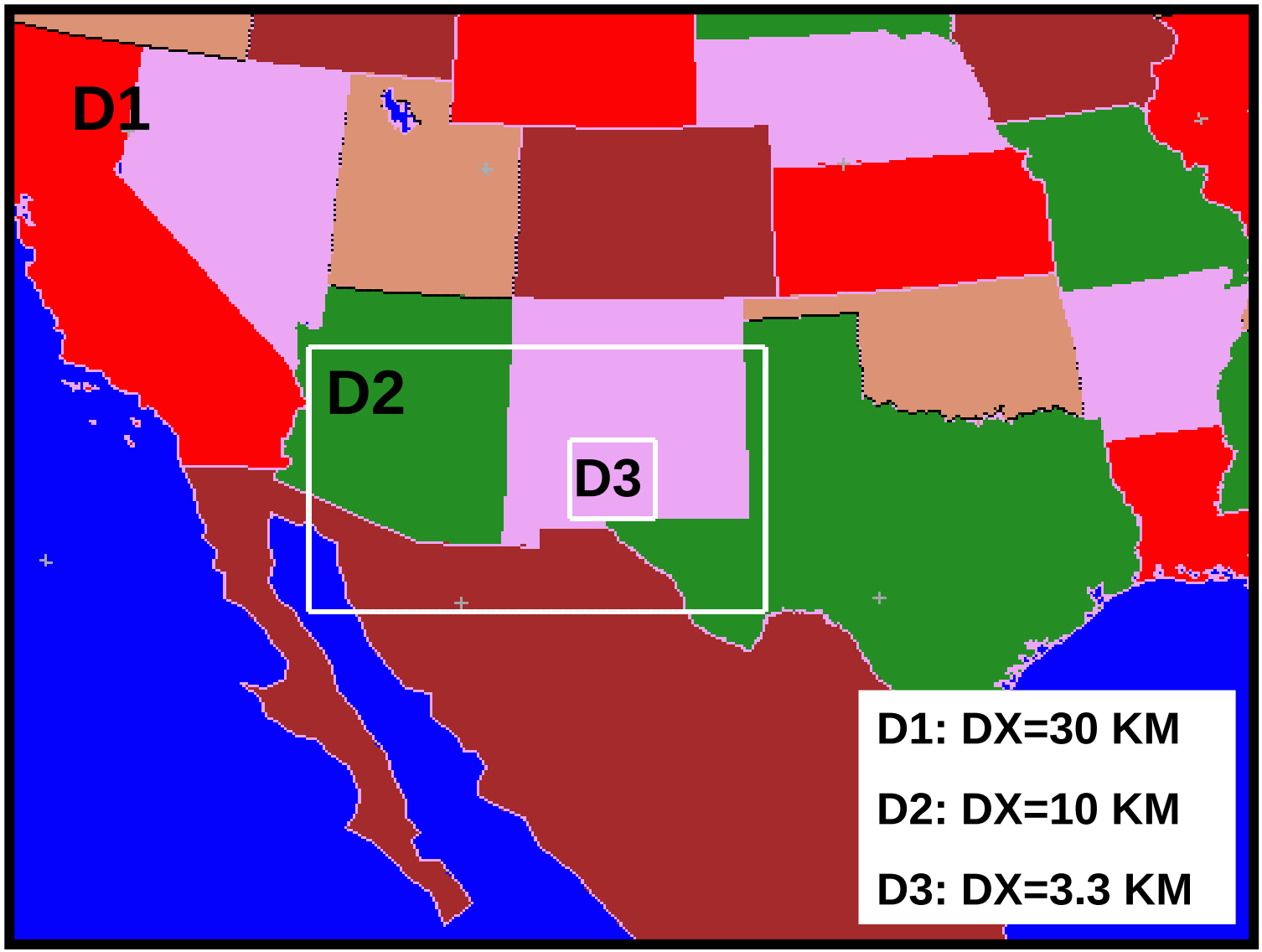
- An object-based QPF verification tool

  ***Randy Bullock, Barbara Brown and Davis, C. A. (2004, 2005)***

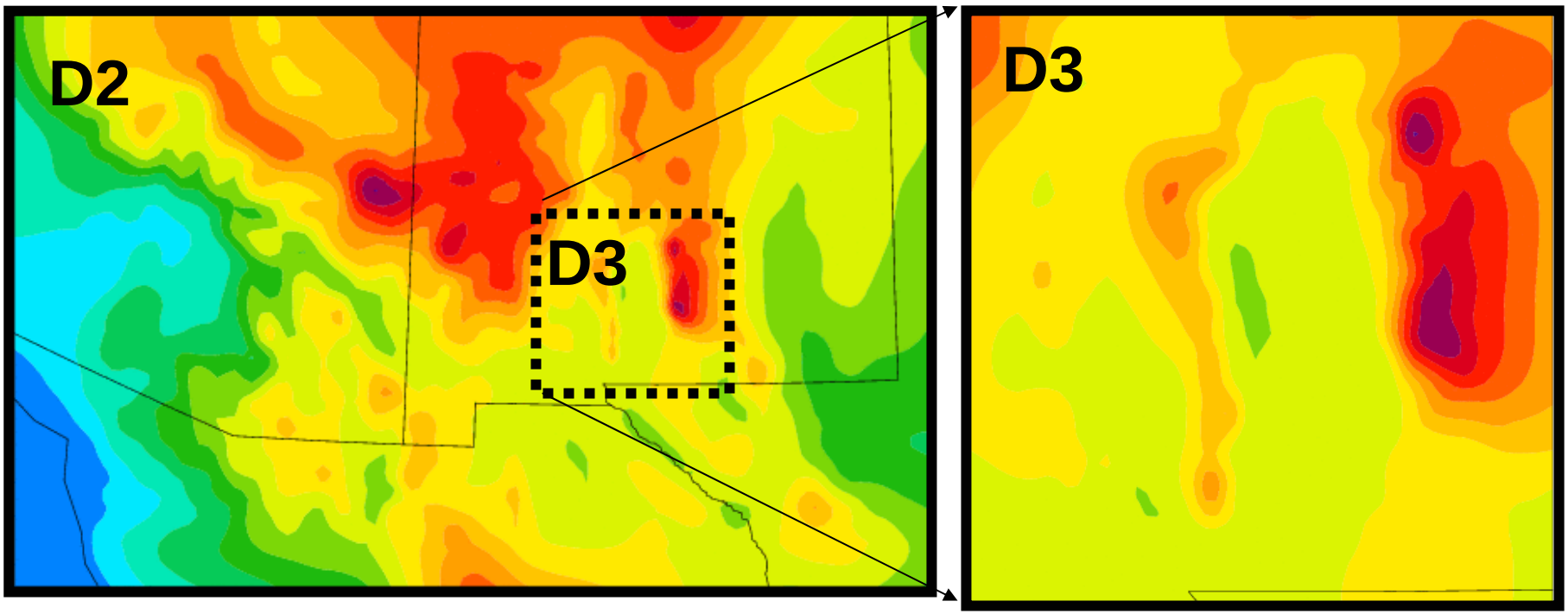
# STUDY METHOD

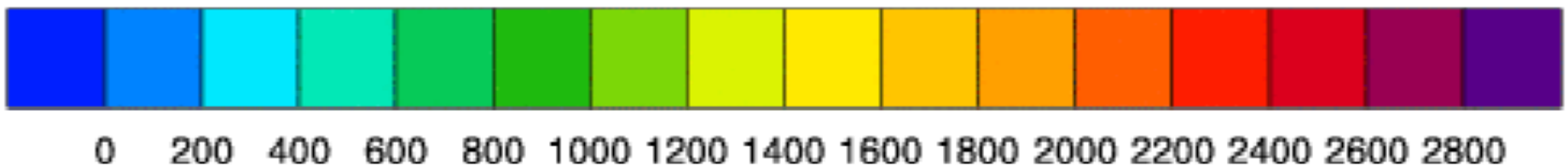
- **Complex Terrain over AZ and NM**
- **Experiments and verification**
  - **Month-long simulation for August 2005**
  - **WRF-RTFDDA and MM5-RTFDDA systems**
  - **Focusing on very short-term (0 and 7h) forecasts**
  - **Verification against NCEP Stage IV analyses**

# Model Domain



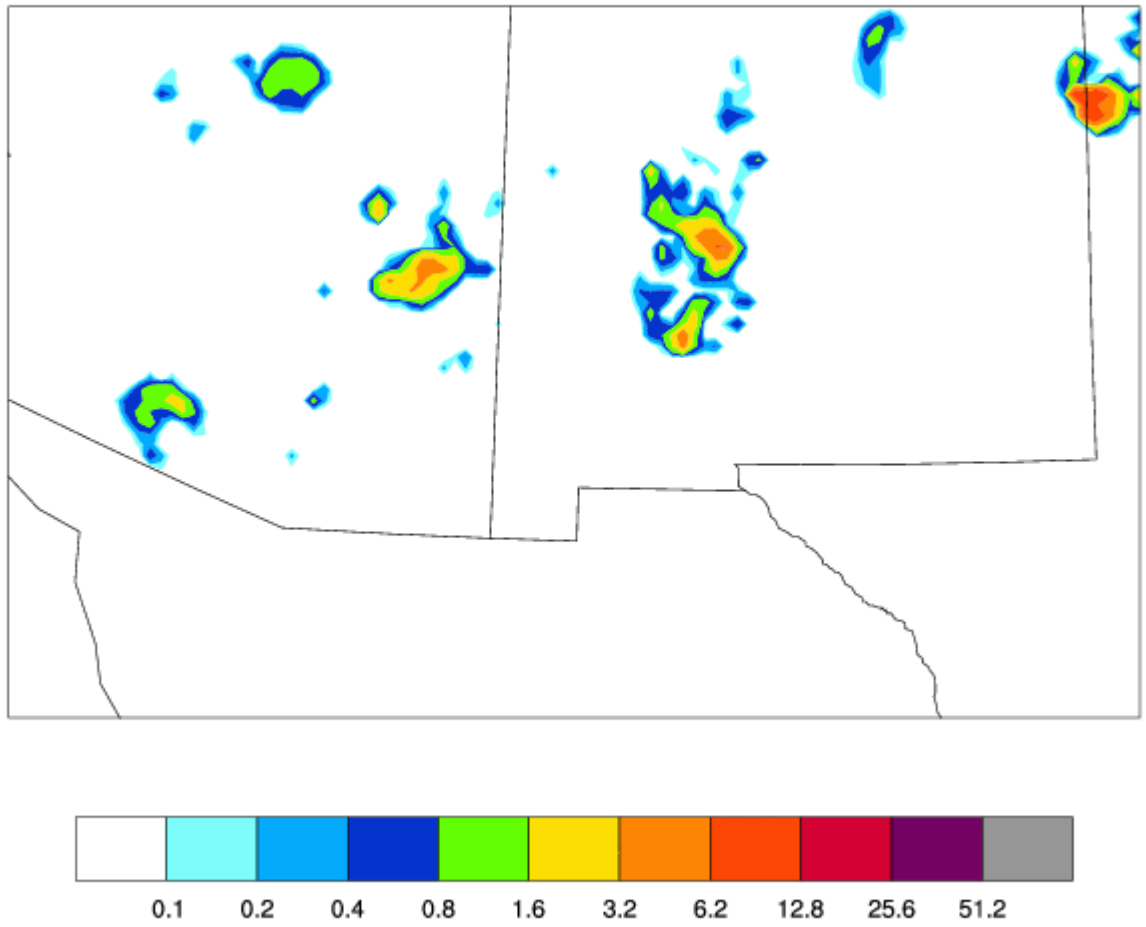
# Terrain Height (m)



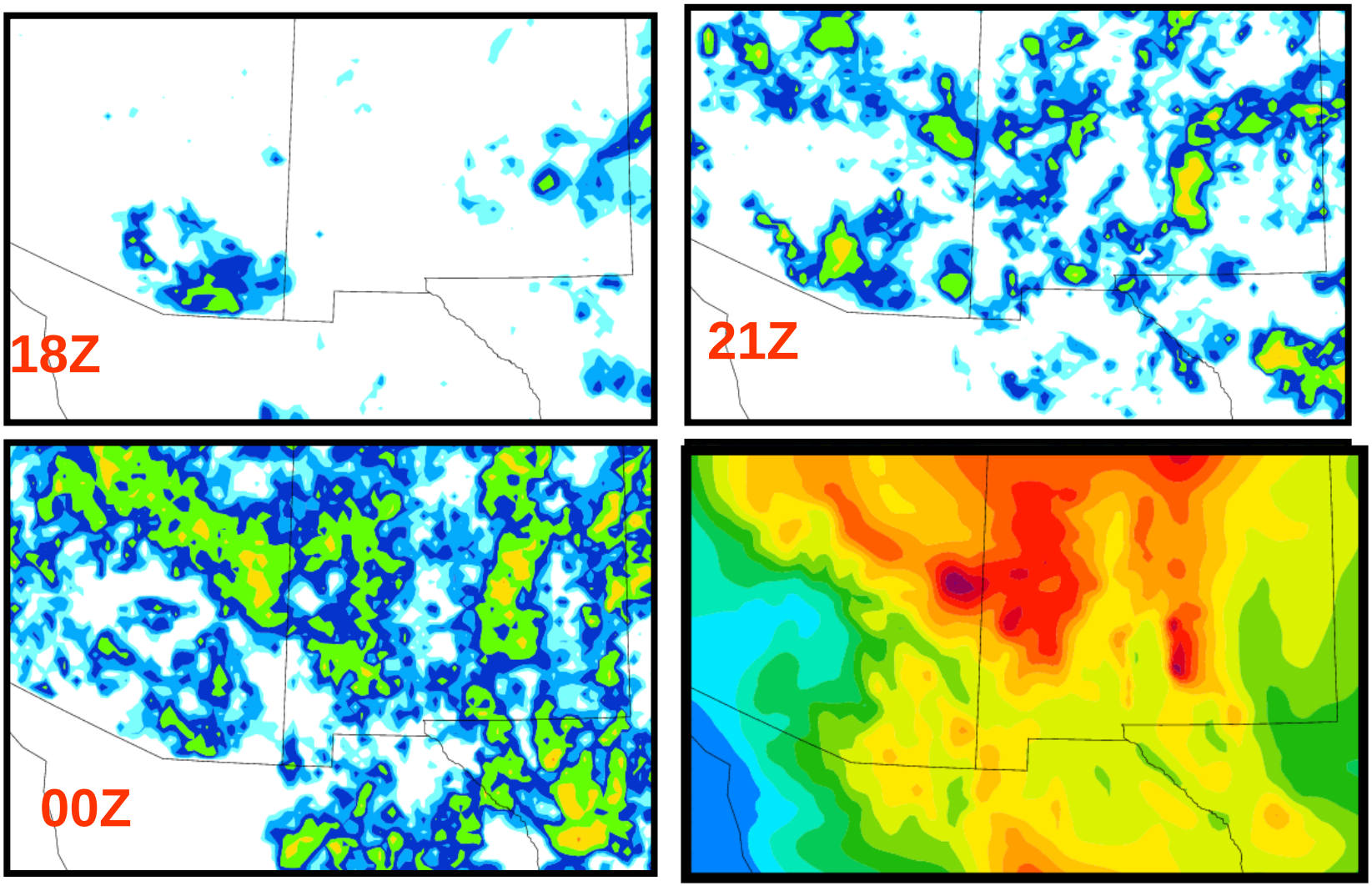



# Stage IV precipitation (mm)

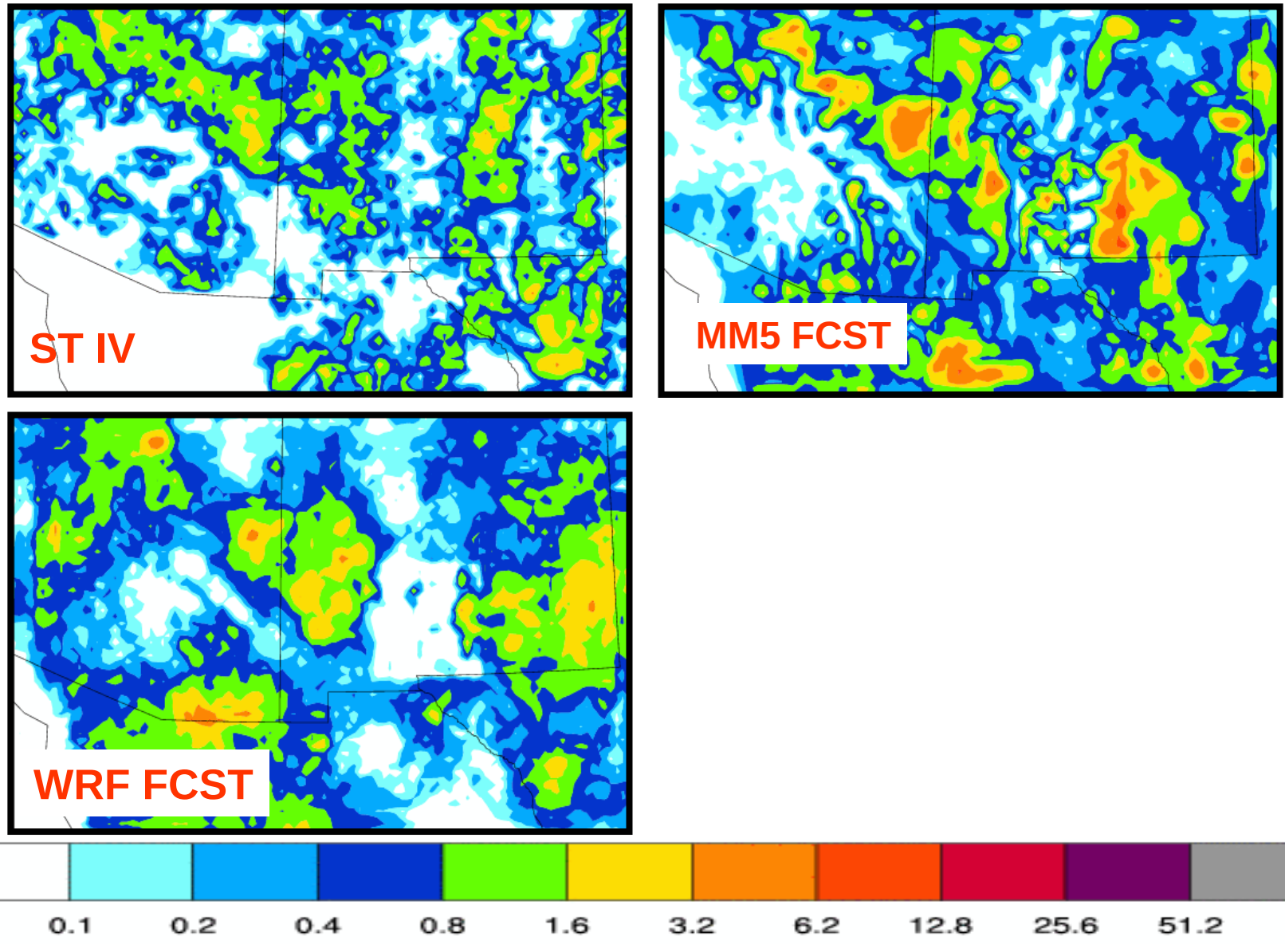
3-hour ending at: 2005-08-07_12:00:00



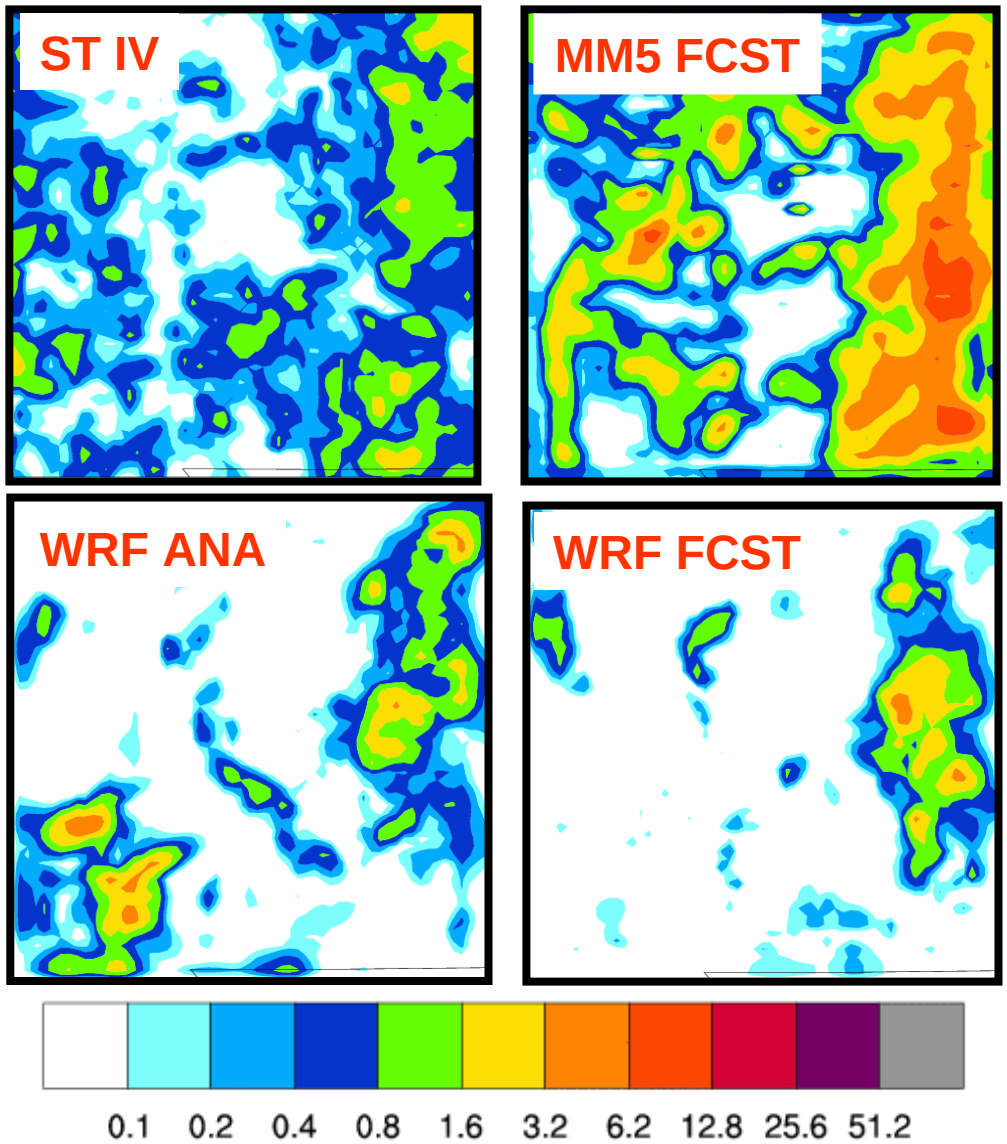
# Averaged 3-hr Precipitation (Stage IV)
# August 2005



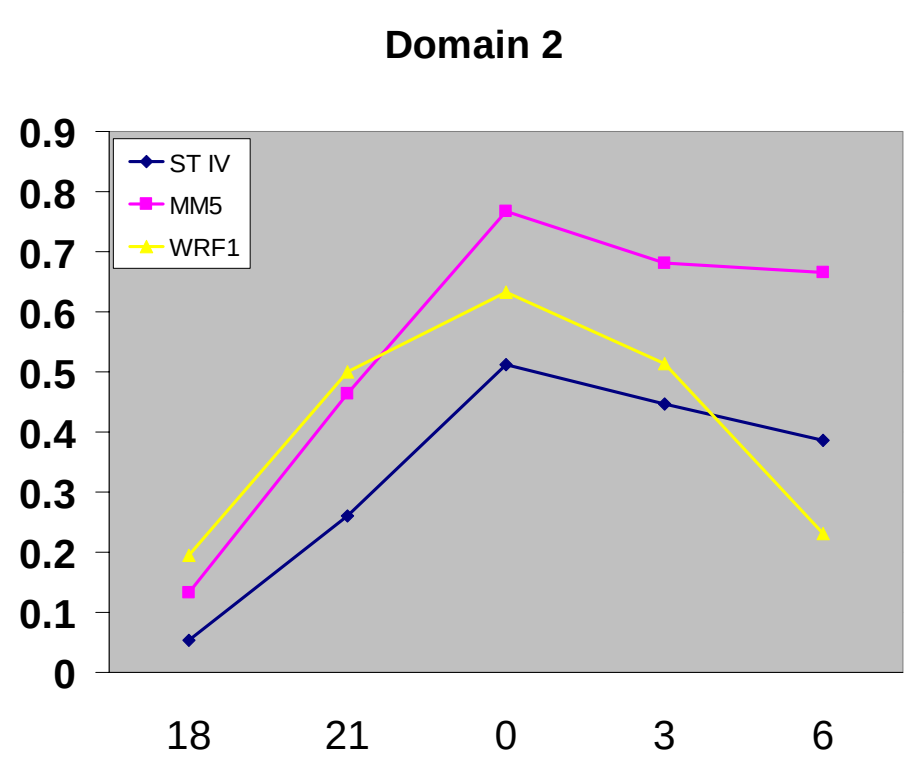
# Averaged 3-hr Precipitation at 00Z August 2005

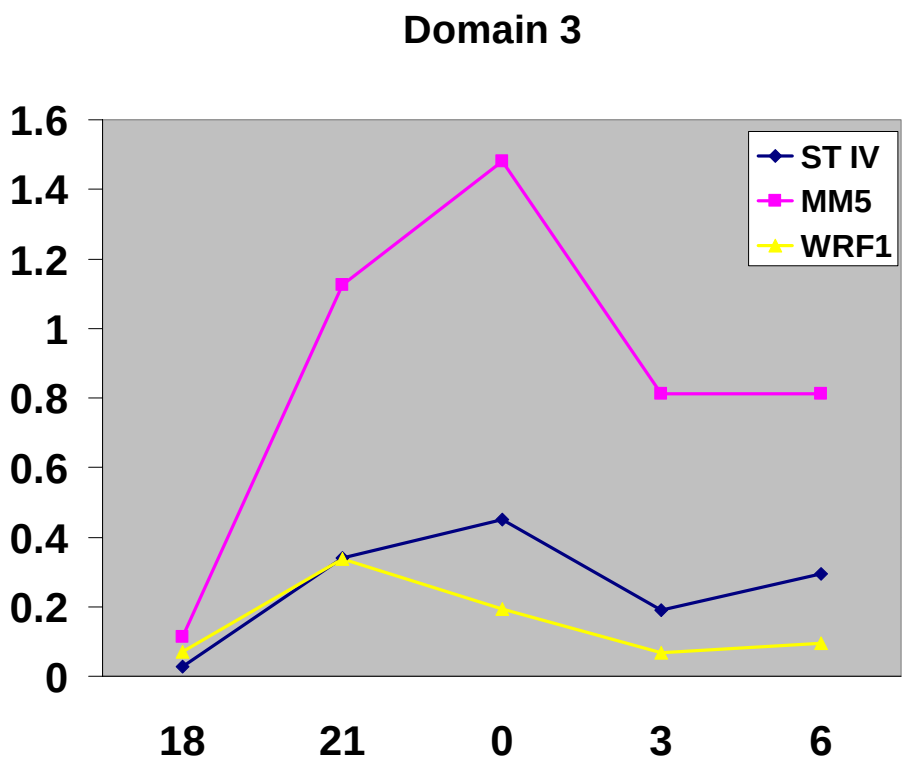


# Averaged 3-hr Precipitation at 00Z August 2005

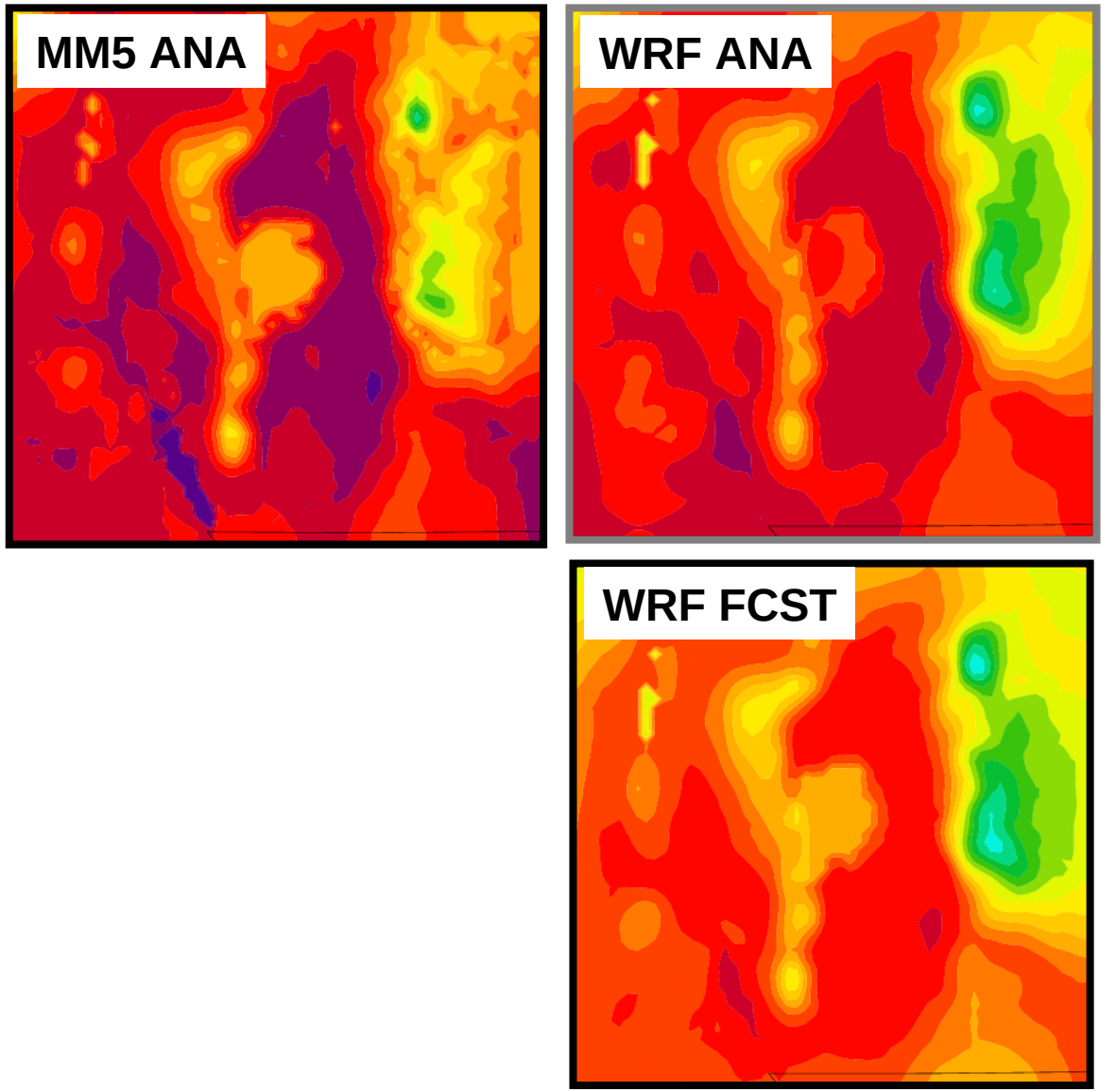


# Domain-averaged 3-hr Precipitation August 2005



# 2 Meter Temperature at 18Z August 2005 (Domain 3)

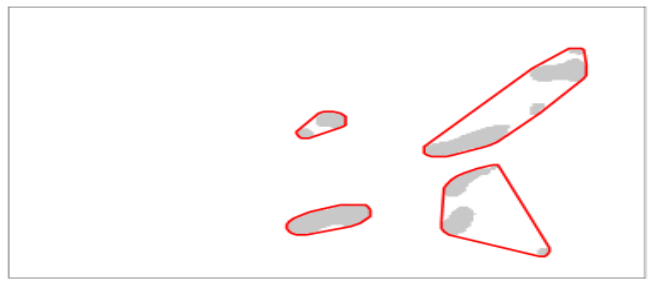


# VERIFICATION (Brown et al.)

## Object Attributes

*Simple or Composite*

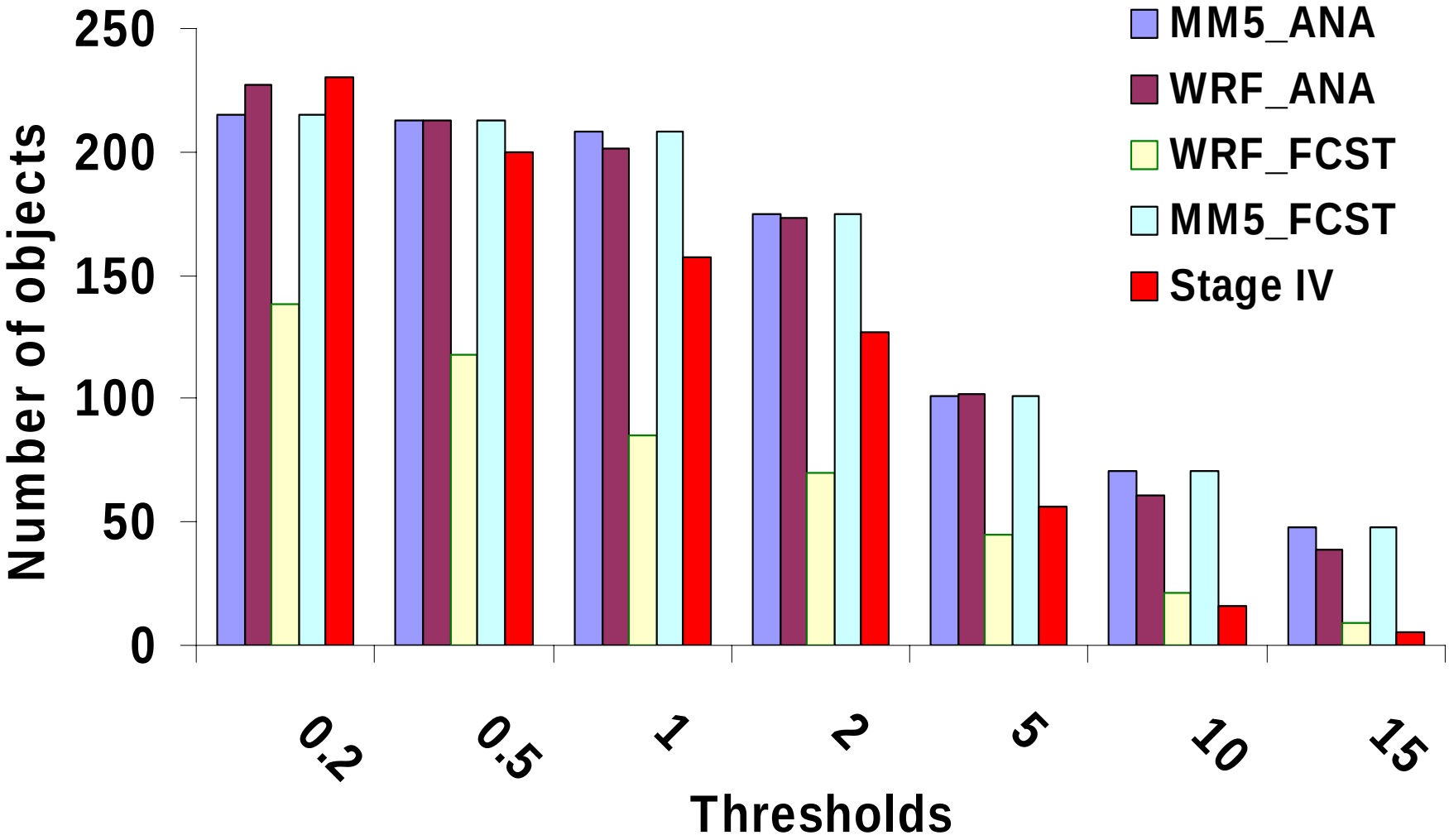
| *Single* | *Pair* |
|---|---|
| *Area* | *Intersection* |
| *Centroid* | *Union* |
| *Axis Angle* | *Centroid Distance* |
| *Angle Confidence* | *Angle Difference* |
| *Median Intensity* | *Area Ratio* |
| | *Intensity Ratio* |



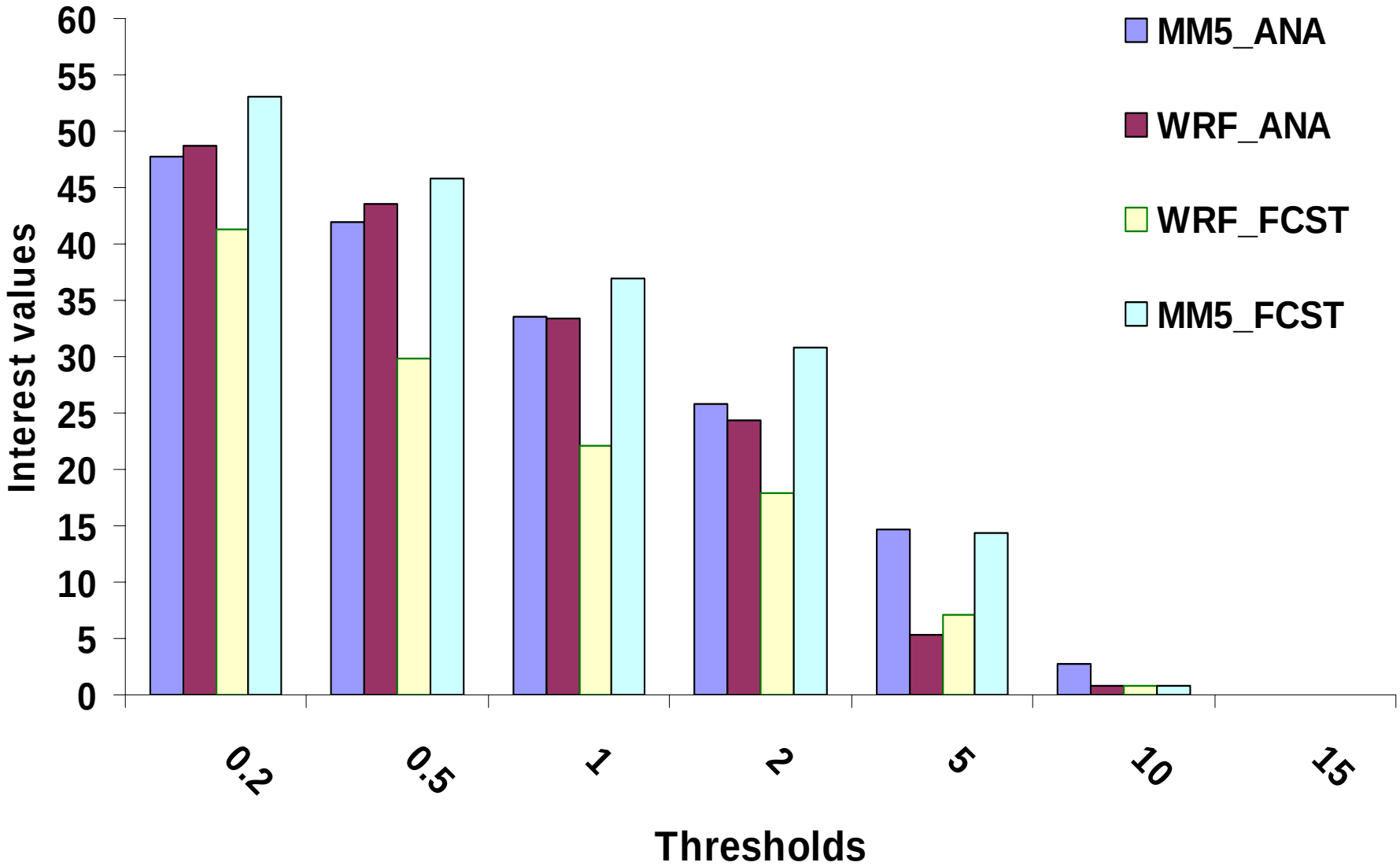
**Total Interest Value**

$$T(\alpha) = \frac{\sum_i w_i \; C_i(\alpha) \; I_i(\alpha_i)}{\sum w_i}$$

# Total number of forecasted precipitation single object with those of Stage IV analyses on domain 3



# Comparison of interest values of the matched composite objects and the Stage IV analysed objects on domain 3



# CONCLUSIONS AND FUTURE WORK

- **Both MM5-RTFDDA and WRF-RTFDDA systems are capable of forecasting the diurnal cycle of convections forced by the complex terrain.**
- **On the finest grid, WRF appears to significantly underestimate convections and MM5 overestimate them. MM5 captures better the mountain convections.**
- **Verification from the object-based approach confirms the above conclusion.**
- **It is found that WRF presents an obvious cool bias in the region, which leads to less active convections. We are in process to investigate this problem.**

# ACKNOWLEDGEMENTS


- **Carol Park**
- **Francois Vandenberghe**
- **Julie Schramm**
- **Andrea Hahmann**