

WEATHER TYPES  
ASSOCIATED WITH THE  
RÍO DE LA PLATA BASIN  
RAINFALL

# INTRODUCTION

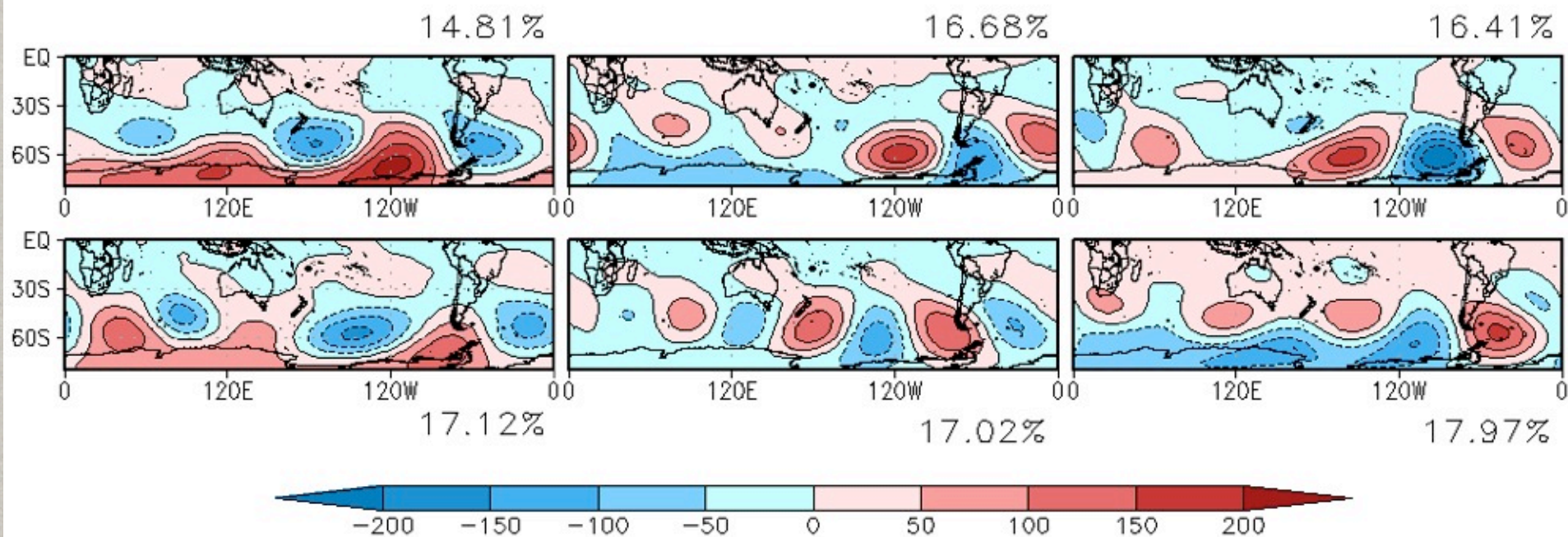
- ✿ We studied southern Río de la Plata basin (Argentina-Uruguay) rainfall states and the associated southern hemisphere circulation.
- ✿ Self Organizing Maps of 250mb geopotential height anomalies.
- ✿ With HMM we aim to find which patterns in upper atmosphere circulation are statistically related to gauge-based rain states. Those patterns were compared to the SOM.

# SELF ORGANIZING MAPS

- ✿ They are a new neural network-like method to detect patterns in time series.
- ✿ They have several advantages over classical techniques (e.g., EOF) as they are not orthogonal to each other.
- ✿ They are more realistic and allow a smooth transition between maps.

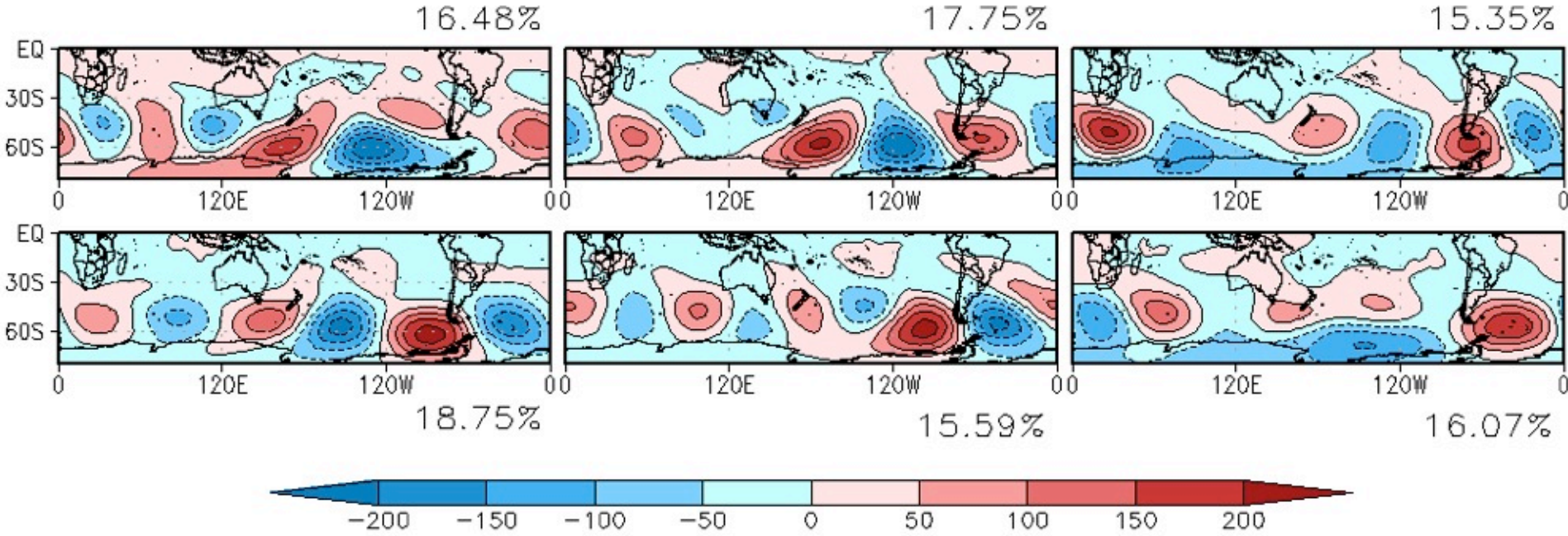
# SOM PATTERNS - JJA

SOM Analysis hgt 250 hPa JJA



# SOM PATTERNS - SON

SOM Analysis hgt 250 hPa SON



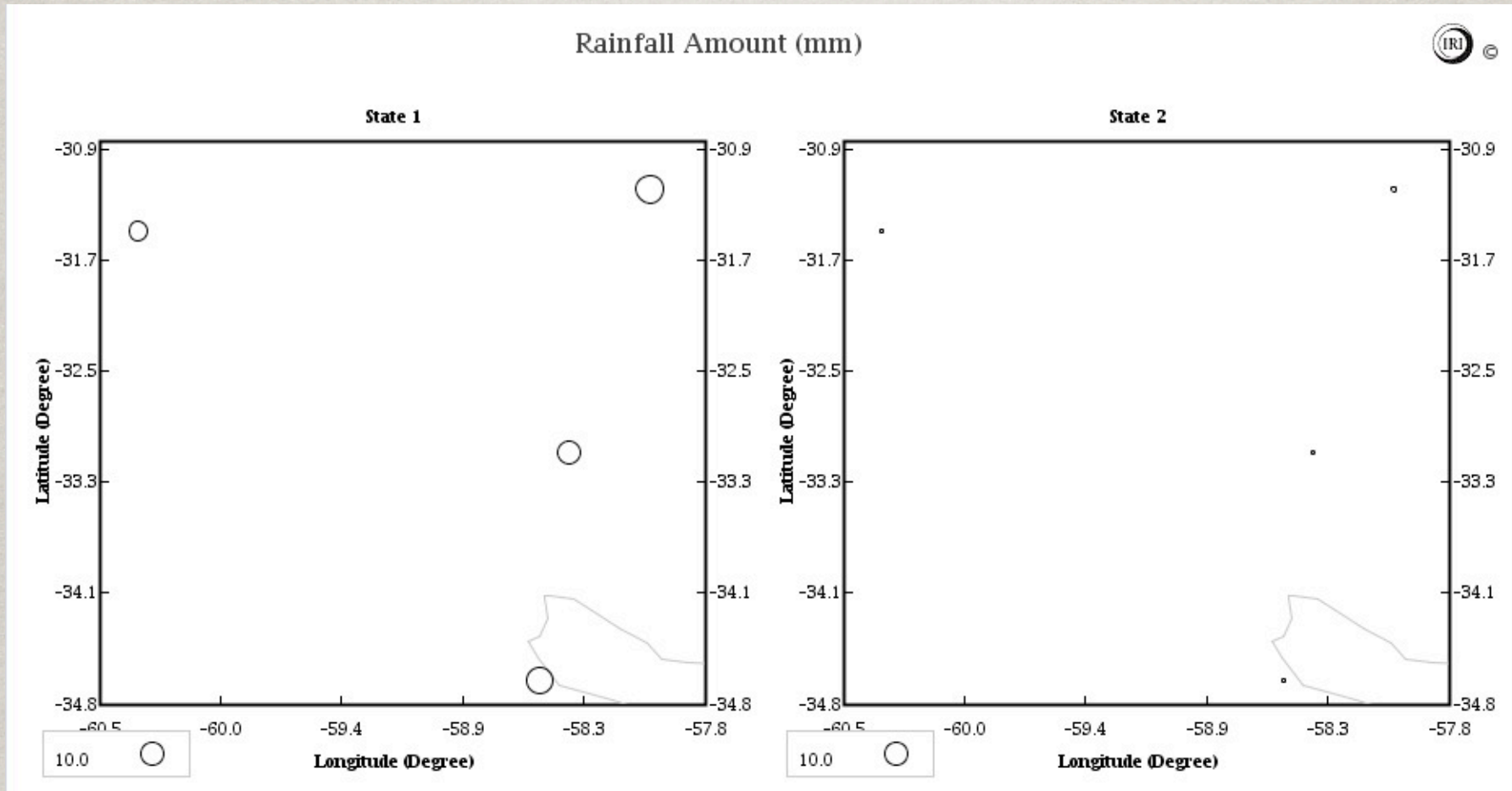
# HIDDEN MARKOV METHOD

- ✿ It identifies weather states in terms of the variability of a given variable (rainfall in this case).
- ✿ Daily rainfall variability is assumed to be controlled by 2 hidden states (wet and dry).
- ✿ We then perform composite maps for the 250mb HGT anomalies observed during each state.

# AREA OF STUDY

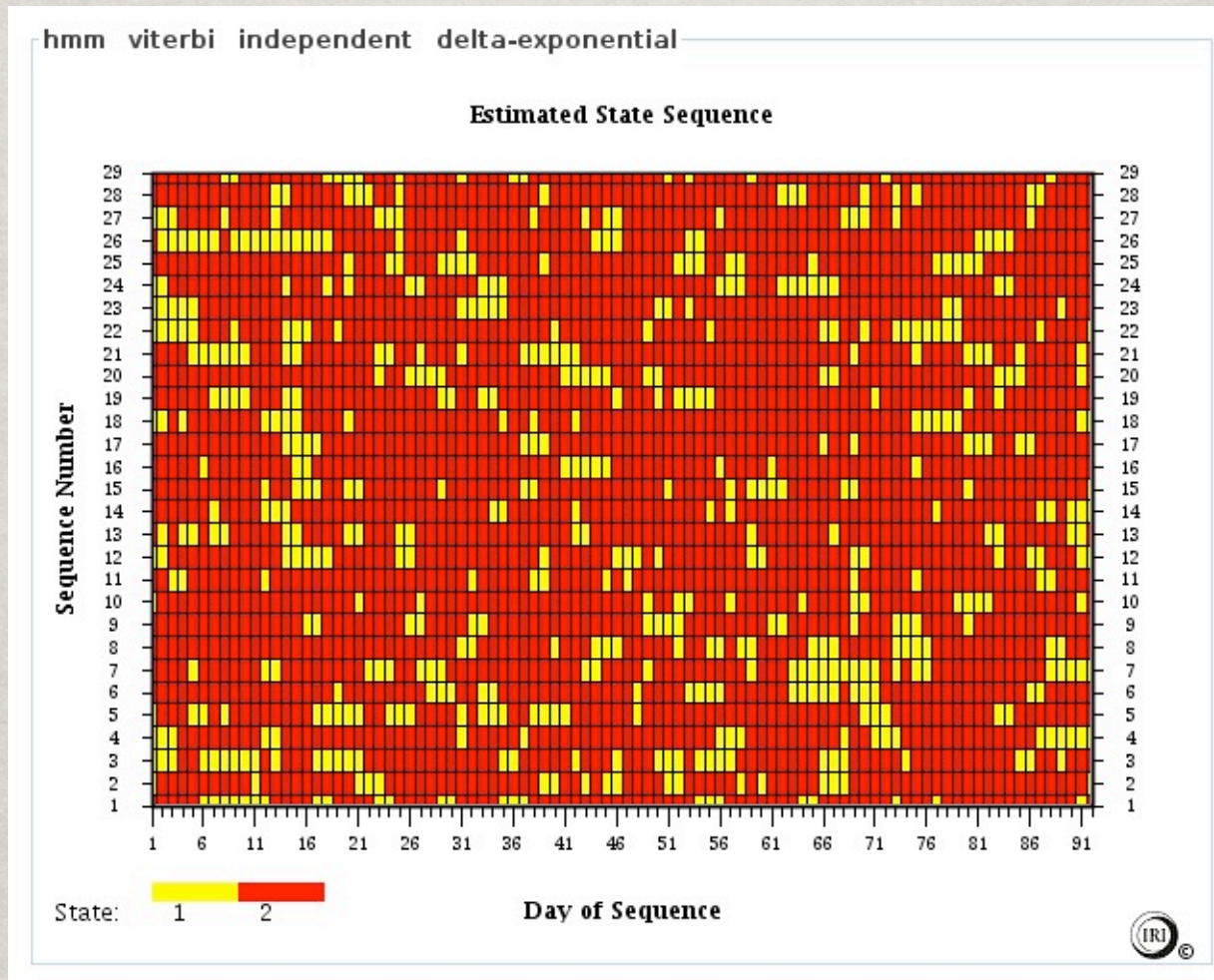


# RAINFALL STATES- JJA

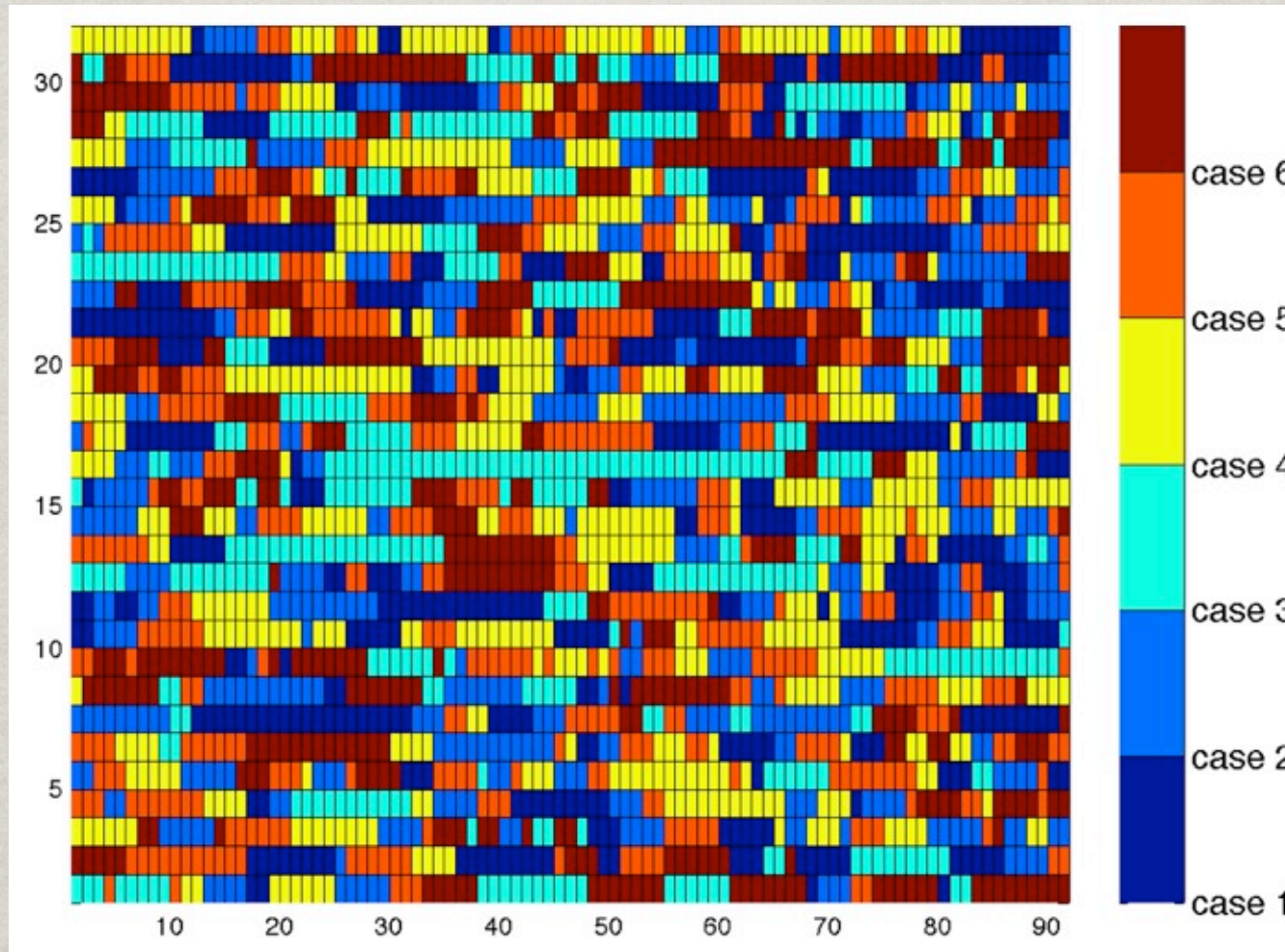




# VITERBI DIAGRAM - JJA

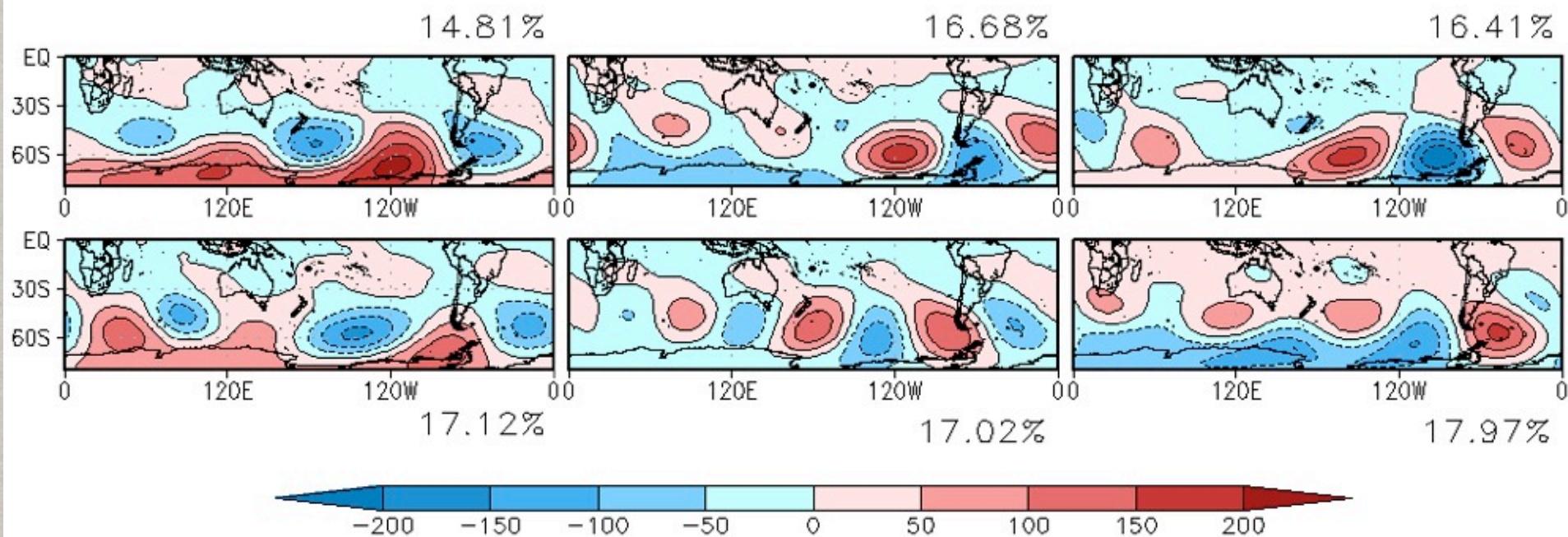


# BEST MATCHING UNIT JJA



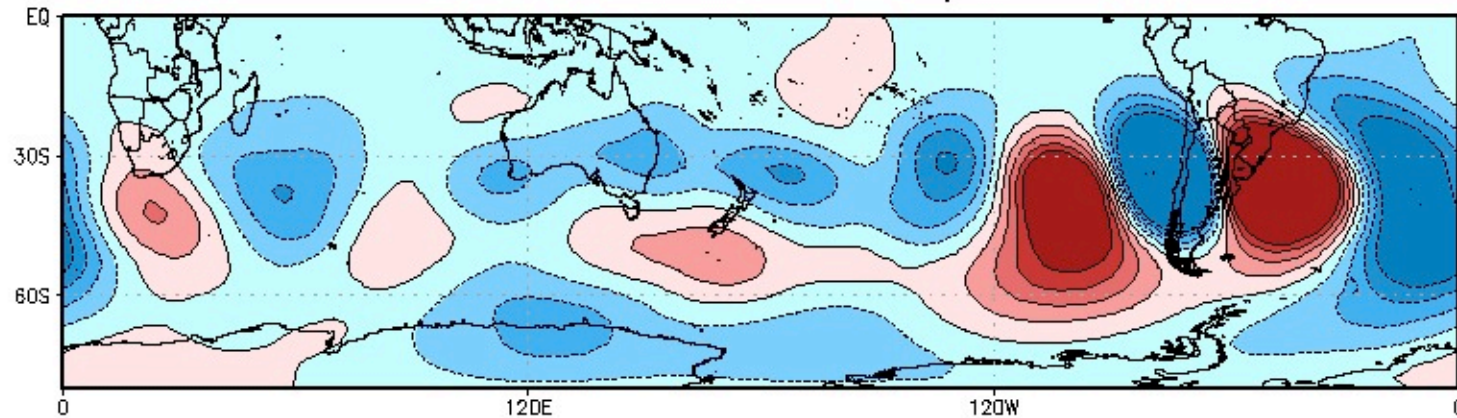
# SOM PATTERNS - JJA

SOM Analysis hgt 250 hPa JJA

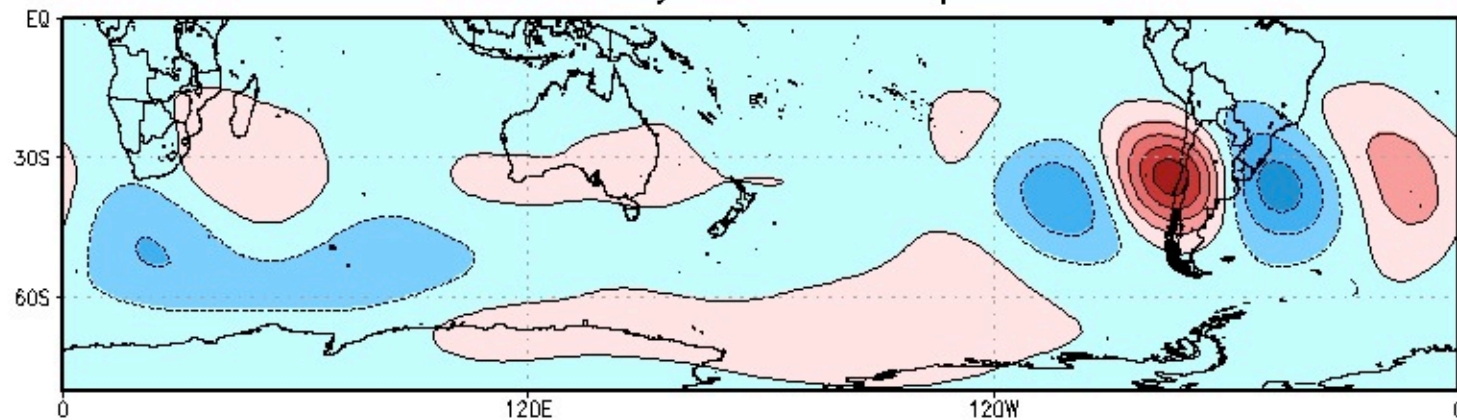


# COMPOSITES HGT - JJA

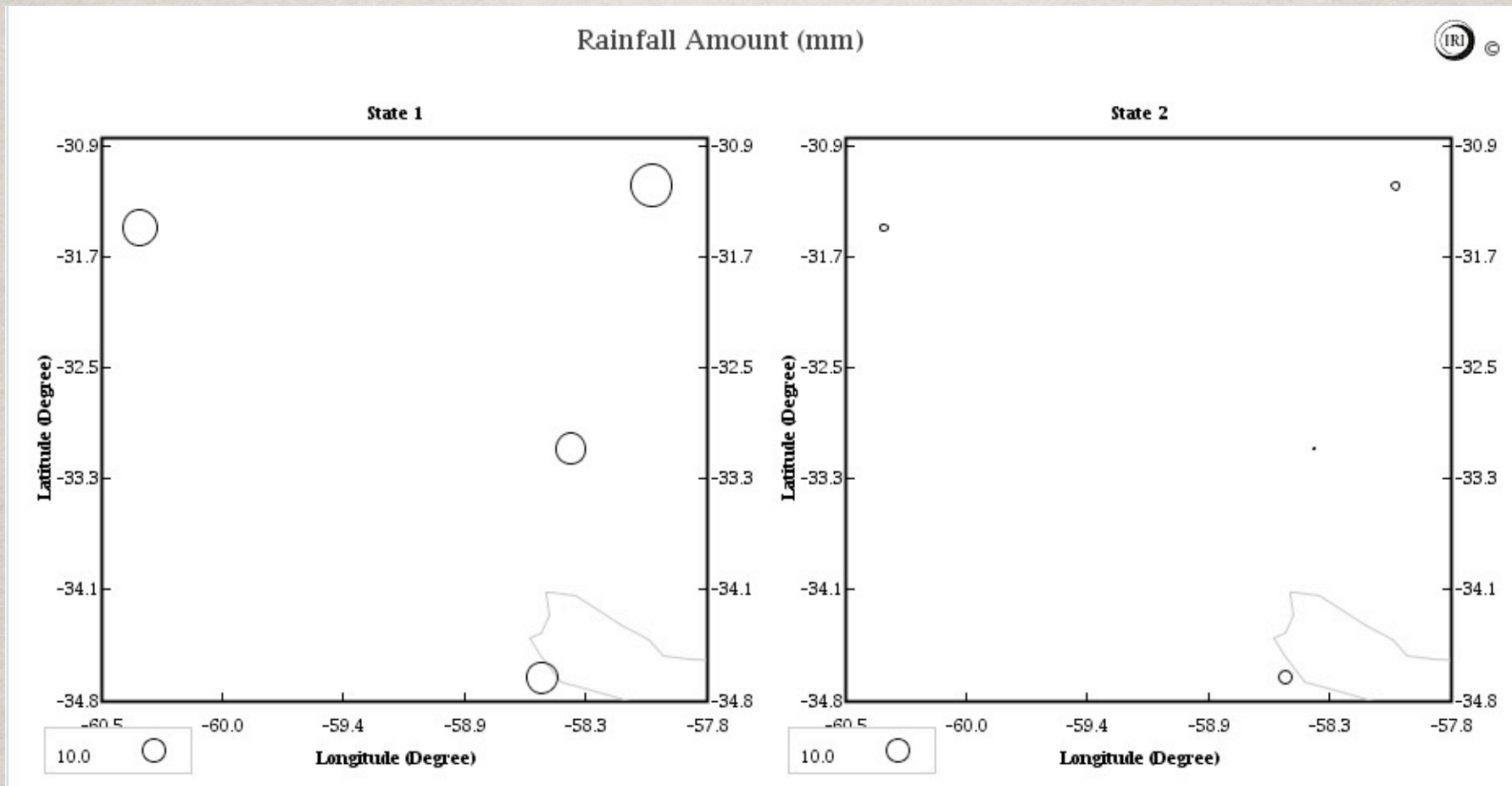
JJA - Wet State Composite



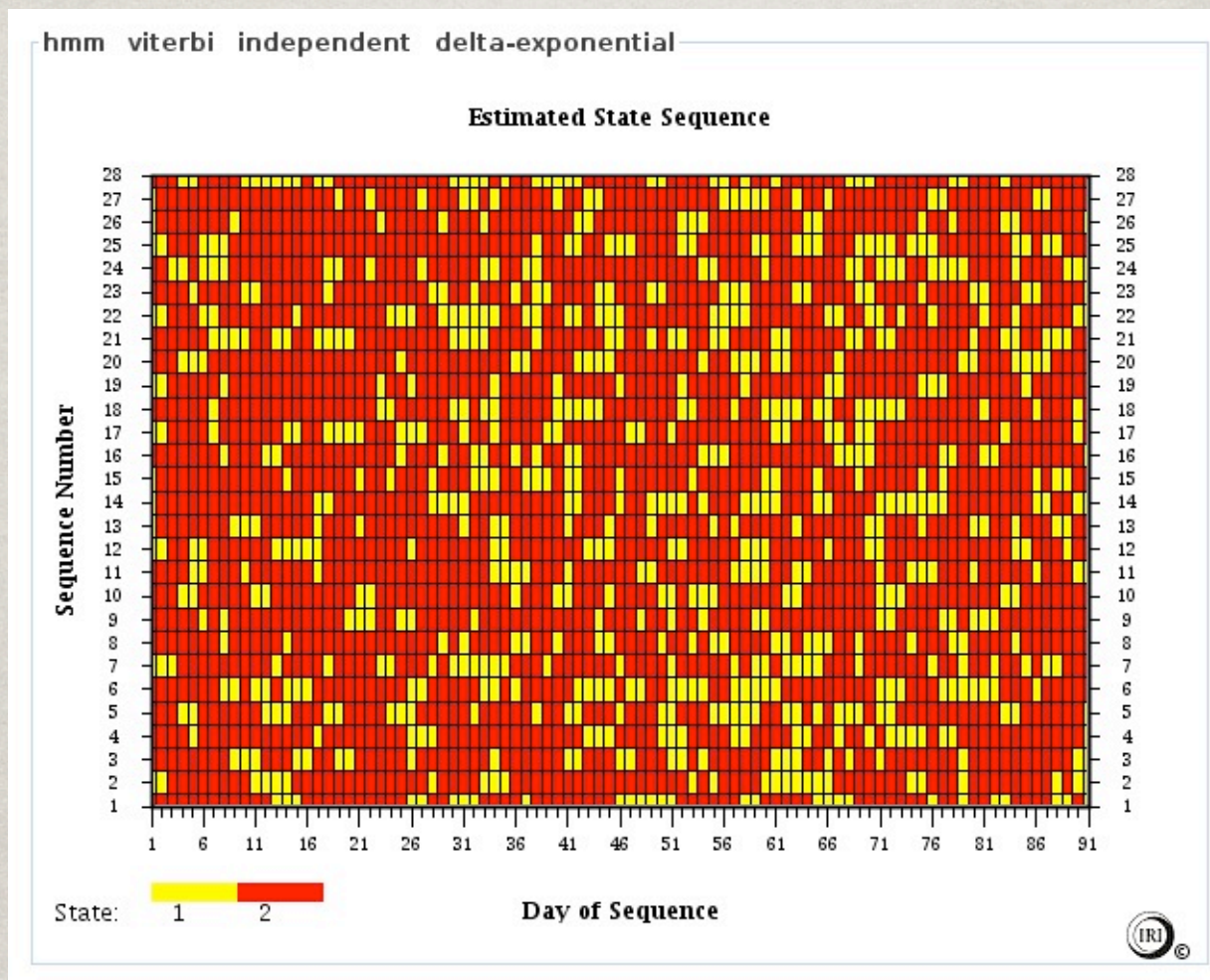
JJA - Dry State Composite



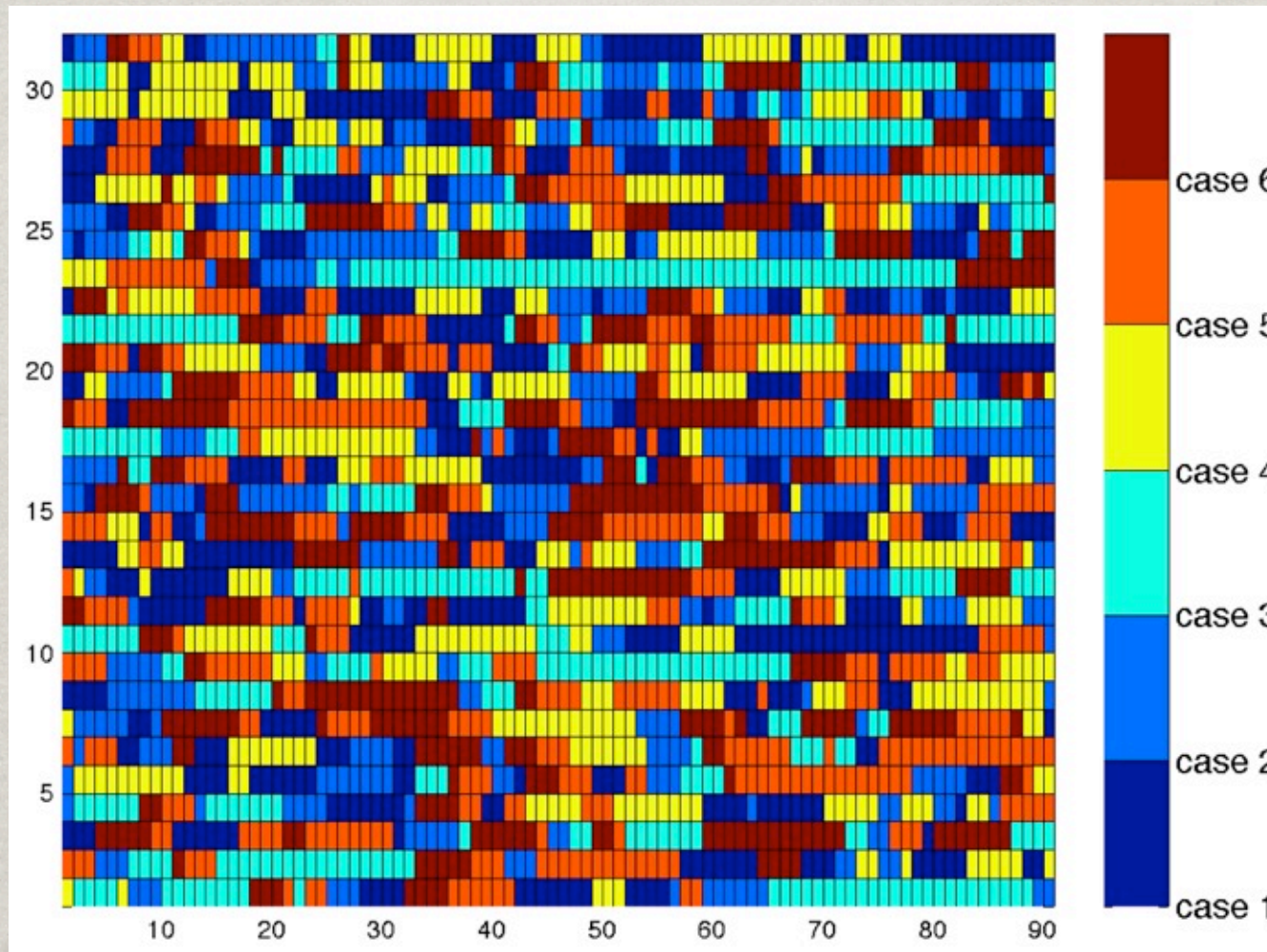
# RAINFALL STATES- SON



# VITERBI DIAGRAM - SON

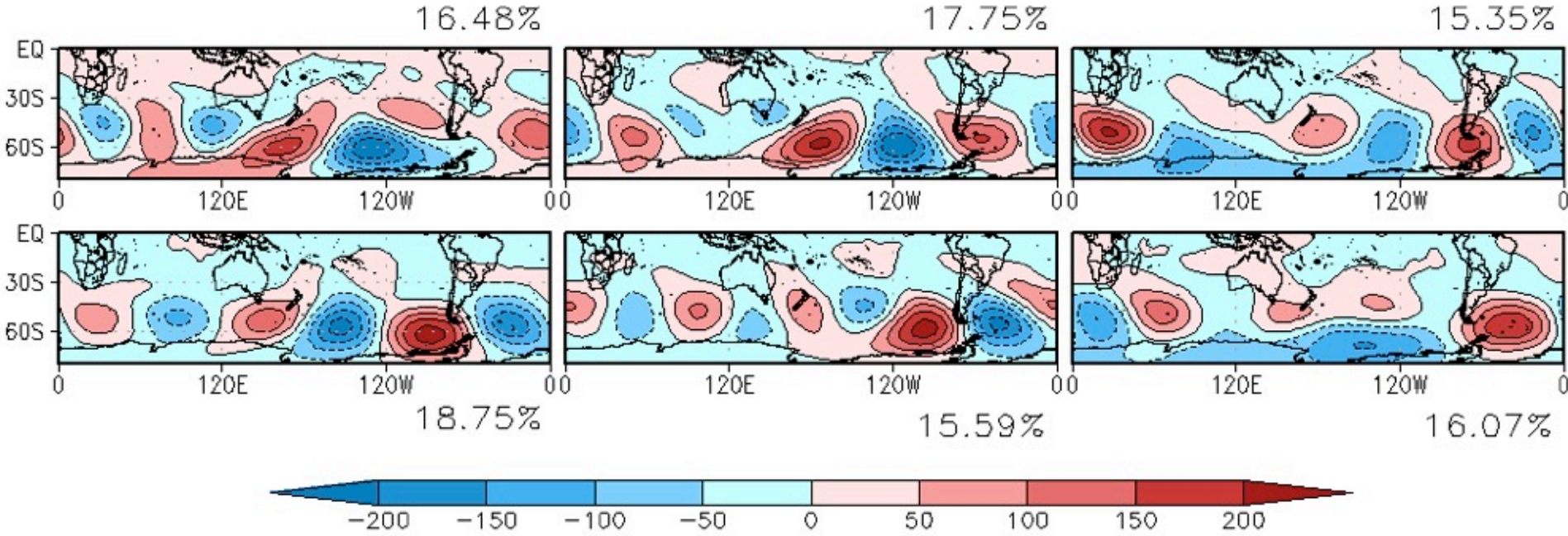


# BEST MATCHING UNIT SON



# SOM PATTERNS - SON

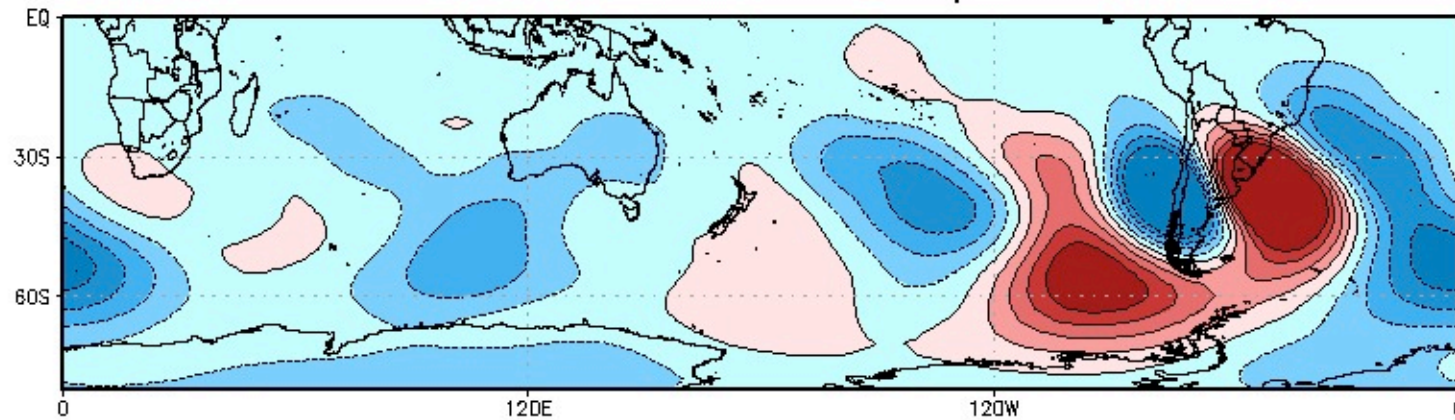
SOM Analysis hgt 250 hPa SON



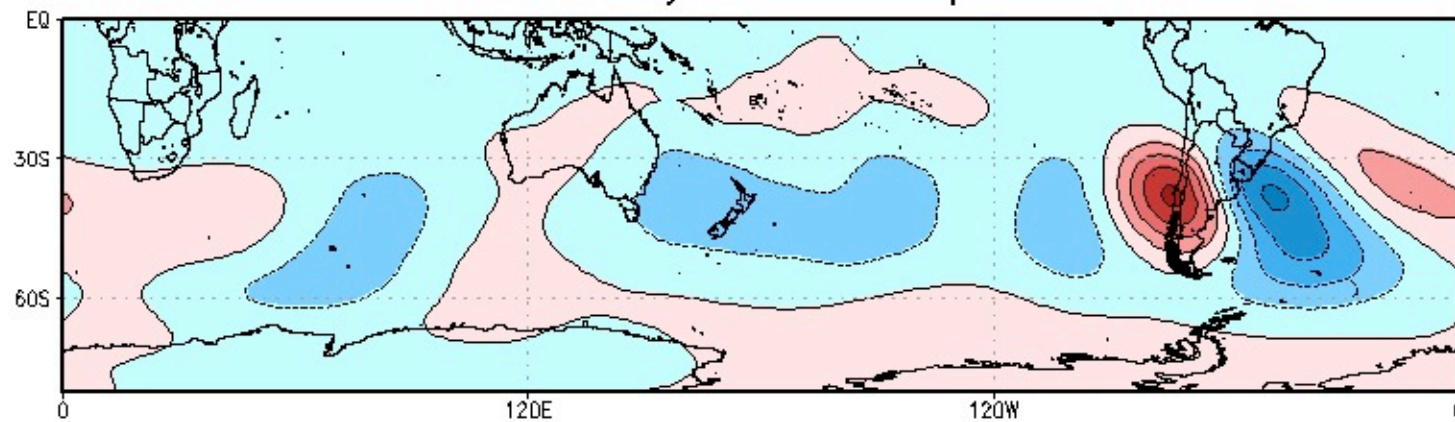


# COMPOSITES HGT - SON

SON - Wet State Composite



SON - Dry State Composite



# CONCLUSIONS

- ✿ Upper level SOM circulation patterns were identified on southern hemisphere winter and spring seasons and they have been related to central Argentina rainfall.
- ✿ Those patterns associated to dry and wet days have been observed to persist along both seasons.

# CONCLUSIONS

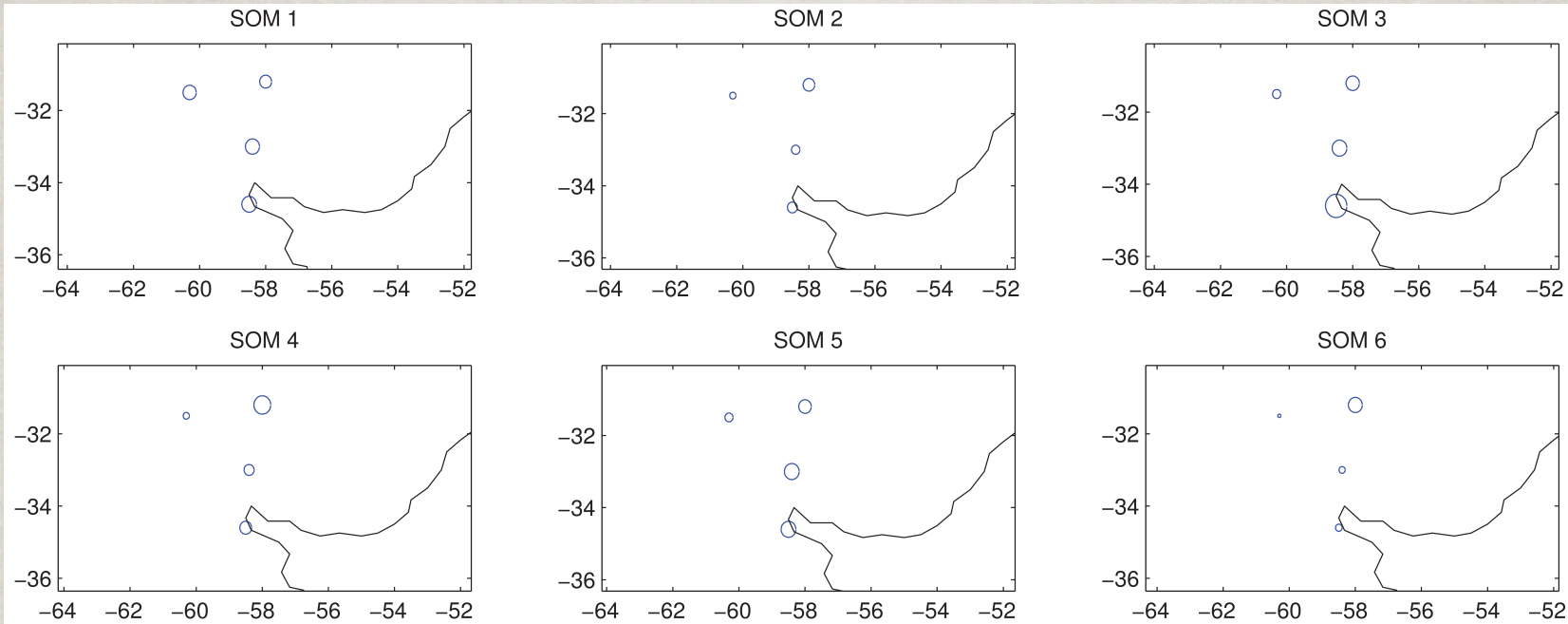
- ✿ HMM Viterbi diagrams showed rainfall to be organized within spells, and dry days seemed dominant, especially in winter.
- ✿ Circulation composites based on the two rainfall states obtained with HMM could be related to certain SOM patterns that might favour mid-level ascent over the region of study.

# SUGGESTIONS

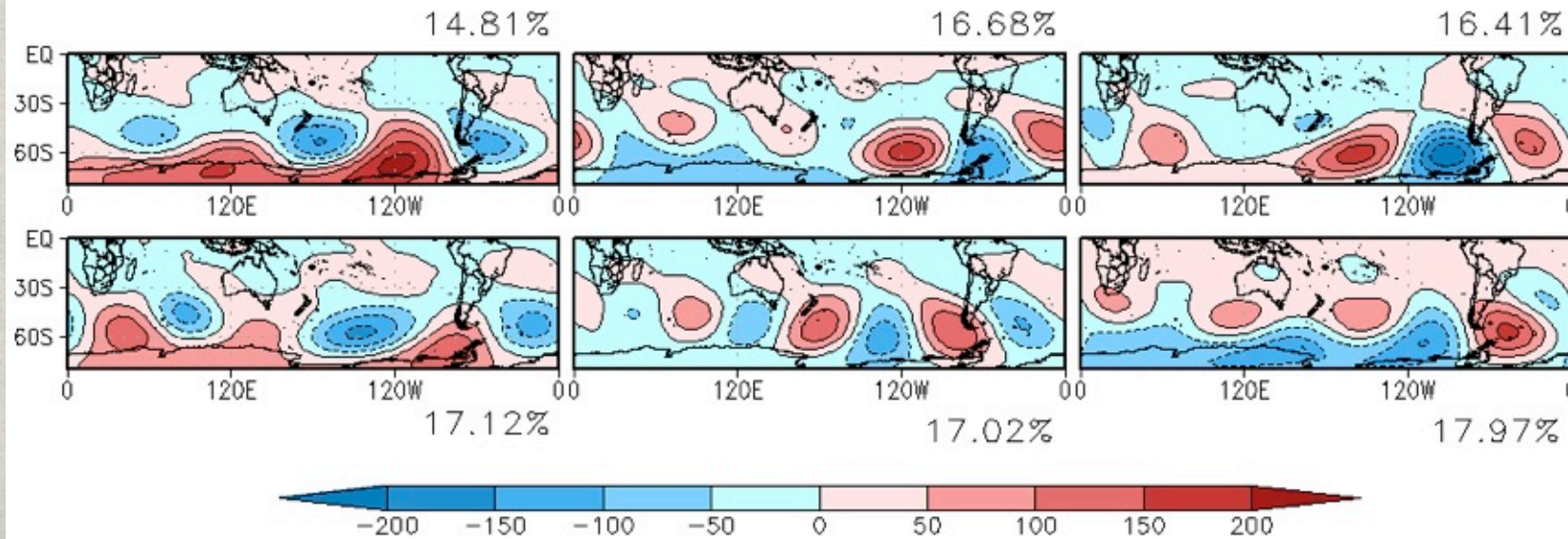
- ✿ Repeat the SOM analysis increasing the number of patterns. Compare to other clustering methods, such as k-means.
- ✿ Add more stations to the region of study and explore the possibility of more states existing within each season, so as to identify transitions between states.

**THANK YOU**

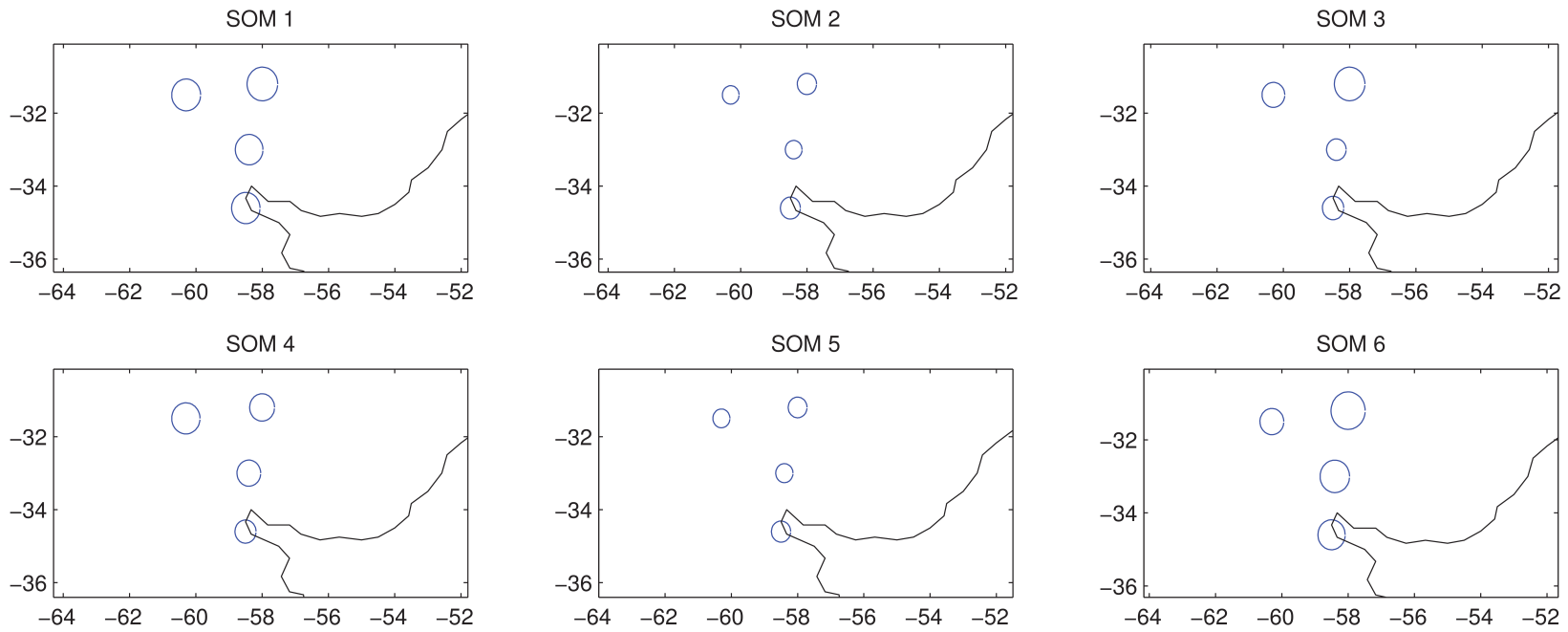
# JJA



SOM Analysis hgt 250 hPa JJA



# SON



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