TSUP position during ENSO phases

by
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PLAN

- INTRODUCTION
- ENSO IMPACTS IN FRENCH POLYNESIA
- WHY IS INTERESTING TO KNOW THE POSITION OF TSUP?
- THE POSITION OF TSUP
- DATA AND METHOD
- RESULTS
- CONCLUSION
Different climate in French Polynesia

**Marquesas climate**: dry and warm

**Tuamotu North and East**: tropical slightly wet and warm

**Society and Tuamotu South**: tropical climate, wet and warm

**Australes North-West and Gambier**: austral climate, wet and slightly fresh

**Australes South**: subtropical climate, wet and fresh
PLAN

- **INTRODUCTION**

- **ENSO IMPACTS IN FRENCH POLYNESIA**
  - WHY IS INTERESTING TO KNOW THE POSITION OF TSUP?
  - THE POSITION OF TSUP

- **DATA AND METHOD**

- **RESULTS**

- **CONCLUSION**
The ENSO IMPACT is global in French Polynesia. During warm phase, rainfall are more important on Marquesas archipelagoes and less important on Australes Islands. Tahiti is on transition area.

Ref: Laurent V., 2000: Variabilities in Rainfall in French Polynesia, Meteo France

Analysis of the first two modes corresponding the ENSO oscillation. Note the difference in sign for the first mode between Marquesas Islands and Austral Islands. This difference could be associated with the southward excursion of the ITCZ.
Warm Phase
Frequency of tropical cyclone increase
Sea level more low
Increase Mara’amu situation

Cold Phase
Frequency of Trade winds increase
Frequency of Storms increase

Ref.: Laurent V. and al., 2004 : Atlas climatologique de la Polynésie française, Meteo France
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Why is interesting to know the position of TSUP?

- TSUP (Talweg Superior)
- High Troposphere (200 hPa)
- Between Equator and 20°S
- Position NO/SE from îles de la ligne until east of Tuamotu
- Associated with Cut Off of altitude
- Generate Super Cell and frequency of storms (Marquesas and Society)
Representation of TSUP
THE POSITION OF TSUP

Figure 17: Circulation moyenne en janvier à 200 hPa d’après SADLER.

Figure 18: Circulation moyenne en juillet à 200 hPa d’après SADLER.

Fig. 6: SCHEMA DE LA CIRCULATION MOYENNE NORMALE EN HAUTE TROPOSPHERE
Mois de Janvier 1983 MFO.PF

Fig. 7: SCHEMA DE LA CIRCULATION MOYENNE EN HAUTE TROPOSPHERE
Mois de Janvier 1983 MFO.PF
DATA

- Parameters: Z200 and Z500
- Upper air Data from radio sounding of ATUONA - FAA’A – and RAPA
- Upper air DATA from ECMWF – ERA40 (01/09/1957 – 31/08/2002)
- AREA: [180 – 105 W / 0 – 20S]
Correlation between Observations and ERA40

Strong Correlation between the upper air data from radio sounding and data from ECMWF reanalysis. Better than with ERA15 ($\approx 0.8$)

<table>
<thead>
<tr>
<th>Parameters and Periods</th>
<th>ATUONA</th>
<th>FAA’A</th>
<th>RAPA</th>
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<td>0.96</td>
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## RESULTS

### Coefficients des Résultats Factoriels

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<th>Eigenvalue</th>
<th>Variance en %</th>
<th>Eigenvalue</th>
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### Diagramme de la Rotation

![Diagramme de Rotation](image)

### Extraction

- Rotation: sans rot.
- Extraction: ACP

### Tableau des Résultats

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<tr>
<th>Temps</th>
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### RÉSULTATS

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RESULTS

Indice de l'Oscillation Austral (SOI)

Moyenne sur 5 mois
RESULTS

Extremes POINTS

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Graph showing temperature trends from February 1997 to February 2002.
RESULTS

Zonal

![Graph showing zonal results with various months and years]
RESULTS

Diagonal
CONCLUSION

In Warm Phase: Positive Value for Z200 TSUP at the EAST of French Polynesia
⇒ Less Storms

In Cold Phase: Negative Value for Z200 TSUP at the West of French Polynesia
⇒ More Storms on the Society Islands
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Thank You