ROLE OF COLD FRONTS IN SOUTH AMERICAN MONSOON ONSET

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3. Cold Front Climatology:

![Average number of cold fronts during 1979-2007 by month.](image)

In good agreement with previous studies (e.g., Lupo et al., 2001, Mon. Wea. Res.) the frequency of cold fronts is highest in the winter months, with a peak of 5.5 events per month in July. The number of cold front events drops off sharply to about two per month during the summer.

4. SACZ Onset Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>1998</th>
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<th>2001</th>
<th>2002</th>
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<th>2004</th>
<th>2005</th>
<th>2006</th>
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<tbody>
<tr>
<td>1st Onset Data</td>
<td>3 Nov</td>
<td>1 Nov</td>
<td>1 Nov</td>
<td>1 Nov</td>
<td>1 Nov</td>
<td>1 Nov</td>
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Our results show that on average, onset in the SACZ region (region II of Fig. 2a) occurred on pentad 61 (28 October – 1 November), about 2 pentads later than onset in the Amazon Basin (region I of Fig. 2a). This suggests a role for Amazon convection in setting the stage for SACZ onset.

5. Cold Front Composites:

Monsoon onset pentadal dates in the SACZ region were used to select for each year the cold fronts that preceded onset (“pre-onset”), occurred during the onset pentad (“onset”), and followed onset (“post-onset”). “Post-onset” composites (not shown) were very similar to “onset” composites.

![1998-2007 PRE-ONSET Composites Based on PC3 Onset](image)

In summary, the composite analysis confirms that SACZ onset occurs after onset has occurred in the Amazon basin. Moreover, the composites for “pre-onset”, “onset”, and “post-onset” cold fronts showed significant differences in propagation, duration and strength of the convection associated with cold fronts. In particular, the “pre-onset” cold fronts moved across southern South America quickly and did not reach the SACZ region whereas “onset” and “post-onset” cold fronts became stationary in the SACZ region for at least a few days.

6. Conclusions:

- Maximum number of cold fronts occur during wintertime
- Onset in the SACZ region occurs after onset in the Amazon Basin
- “Pre-onset” – quick, eastward propagating cold fronts that do not reach SACZ region.
- “Onset” – slow propagating cold fronts that become stationary in the SACZ region.
- Changes in the structure and propagation of cold fronts lead to the onset of the SACZ.

7. Future Work:

- Identify mechanisms that allow fronts to become stationary at monsoon onset.

8. Acknowledgments:

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